The Most Significant Modifiable and non-Modifiable Factors Associated among Patients Whom Previously Diagnosed with Prediabetes and Developed to Type Two Diabetes Mellitus Attending to Endocrine Clinic in all Hail Governmental Hospitals

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Abstract

The purpose of study to evaluate the Most significant Modifiable Factor Associated With Patients Previously Diagnosed with Prediabetes and Developed to T2DM in all Hail region,, because 38% of Saudi people with or at risk of diabetes mellitus and the Saudi Arabia Kingdom occupied the first position in middle east and north Africa proportion of DM with and the number may extended. [43, 45] also Hail and Tabouk became the highest proportion of DM in KSA followed by Riyadh and Medina. **Method**: Quantitative, non-experimental descriptive corelational design, because the study wants to indentify empirical relationship between causal and effect on the time and describe the relationship without explains the mechanism. **Result:** The most significant modifiable factor develop prediabetes to T2DM is increasing the body mass index more than normal, physical activity and total cholesterol plays also an important role to develop also prediabetes, and finally large portion of obese patients and patient how is physically inactive; cannot control of blood glucose level which reflect my significant of study Hail City and Tabouk considered the highest two city of incidence of Type2 DM and these two city and others cities in same country make Saudi Arabia populations are the highest country with patient diagnosed of T2DM in middle east and north Africa. **Conclusion**: our study found that support our hypothesis (Modifiable factor -includes body mass index, cholesterol level and physical activity - for patients previously diagnosed with prediabetes increases the risk of type two diabetes mellitus)

Keywords: type two diabetes, pre-diabetes, dyslipidemia, obesity, smoking, body mass index, physical activity

1. Introduction

Diabetes mellitus (DM) is a chronic metabolic disease with increase prevalence and mortality in the worldwide. [7, 34] Diabetes mellitus (DM) are affected on 382 million in the worldwide, affected on 8.3 of the global population, expected that the number will increased to 592 million in 2035 for diabetes people between 20-79 years old [38]. Diabetes Affect 25.8 million people, 8.6 from united states , 18.8 of these people were diagnosed and 7 million were not diagnosed, Also the NDFS stated that in 2005-2008 depending on fasting Glucose and HBa1C 35 percent of US adult over 20 years old had prediabetes at least 50 percent adult aged 65 years or more, this percentage give the NDFA an estimation that the number of who had diabetes in 2010 will increased to 79 million on age 20 year or above. [32] More than 180 million people have type two diabetes mellitus worldwide and it is estimated that prevalence will increase more than double in 2030[33].

The prevalence of prediabetes in the United States will be approximately 35% mainly associated with obesity and decrease of physical activity which considered the fundamental serious medical problem. [32] The prevalence of diabetes in the Arabic region have the same rate of diabetes in the world depend on the following value, Saudi population DM formed 16.7%, united Arabic Emirates DM formed 19.5%, Bahrain DM formed 15.2 of the total population, Kuwait DM formed 14.4% , Oman DM formed 13.1% of the total population, Egyptian population DM formed 10%.[7] 86 million American adult, more than one of three adult person have prediabetes and nine of 10 adult person with prediabetes don't know they have it. Prediabetes increase risk of type two diabetes mellitus (T2DM) and heart disease and stroke. [14]

People with prediabetes are relatively high risk of developing type two DM (T2DM), the condition is associated with 3-10 times increasing risk of onset T2DM. [5] Prediabetes developed to type two DM (T2DM) were associated with some factors such as physical inactivity and gender. [7] Adult for about 30% of patients with prediabetes and will develop to type two diabetes within five years without weight loss and do moderate physical activity. [10-14] About 1.6 billion adult age above 15 were overweight and at least 400 million adult were obese in year 2005 and will increased to 2.3 billion adult will be overweight and more than 700 million will be obese in year 2015, and mentioned the root cause of obesity and overweight is an energy imbalance between calories consumed on one hand and calories expended on the other hand. [26] Obesity considered the global of health problem; it has been identified as the most risk factor for high blood pressure and diabetes. [2] More than one third of US adult are obese attribute to many factor including dietary changes and low physical activity which may lead to (T2DM). [6] Obesity is the cause of numerous of health problem separately and it is association with other

illnesses, in particular it is associated with development of T2DM. coronary heart disease, certain type of cancer, respiratory complication and osteoarthritis of joints, also the study mentioned that the risk of death among patient with obesity and T2DM within 26 years old or more will increase by 1% for each extra weight (0.45 Kg) and increased 30 -42 years old and 2 % risk of death among patient between 50-62 years old. [9-18] Obesity with insulin resistance is considered the main risk factor for developing T2DM regardless of genetic predisposition. 50% of total Arabic populations are less than 25 years of age. A major health issue in the Arabic world is the rising prevalence of uncontrolled weight gain which reflect increase the prevalence of several disease particularly type two diabetes, these study mentioned the obesity constitutes a large component of the pathogeneses and worsening of develop type two diabetes. Body mass index above normal range above 24.9 kg\m^2 is associated with a high risk of T2DM, also the researcher found 90% of T2DM is attributed to excess weight and mentioned several study have found that the risk of diabetes increase by 20 times for female and 10 time for male when body mass index between 30-35 kg\m^2. [28] The most common pattern of dyslipidemia in T2DM patient is elevated triglyceride (TG) levels and decrease high density lipoprotein (HDL) cholesterol. [16] Diabetes and obesity are major public health concern of the 21st century. Both type T2DM and obesity are generally believed to result from the interaction between genetics and environmental associated with life style factor. [1] American Diabetes Association (ADA) stated that about Modifiable Risk Factors.

1.1 Significant
Prediabetes is a high risk for development of T2DM but little is known about the factors that associated with prediabetes, the researcher try to identify modifiable risk factor associated with prediabetes in men and women and mentioned the obesity and low HDL cholesterol were considered modifiable risk factor separately related to presence of prediabetes in male and female also mentioned abdominal obesity in male and female played a strong risk factor association with prediabetes. [21] The cost of diabetes and its complication was estimated to be $ 245 Billion in 2012 representing approximately 9% of total health care cost in the United State. [6] Several study found the prevalence of diabetes is expected to doubled in year 2025 because at least 57 million diagnosed with prediabetes [13].T2DM is increasingly common, because of increases in the prevalence of a bad life style and obesity. [17] T2DM, and obesity are common growing and related problem, the obesity which promote insulin resistance, may account of 80%the population attribute risk for type two diabetes. [30] Obesity is the strong risk factor for T2DM and life style, intervention including weight loss reduced the risk of DM. [29] Obesity and diabetes remains a significant concern for Arabic country and the relationship between obesity and chronic disease will increased. [28] there is a strong correlation between obesity which is one of the most common health problem in the worldwide and high blood glucose level. Also the researcher marked that the prevalence of obesity in children and adult considered epidemic of diabetes and prevalence diabetes will continue to rises. [7] Obesity is now so common with the world's that is beginning to replace under nutrition and infection disease as a most significant contributor to ill health, the obesity is associated with coronary heart disease, DM, cancer and sleep breathing disorder. [9] Approximately above 1 billion overweight adult approximately above 300 million of them obese and all of these people at risk of T2DM and obesity has reached epidemic proportion globally. The developing type two diabetes and hypertension rises with increase body fat and the disease now effect on obese children even for puberty for about 85% people with T2DM and from these people 90% are obese or overweight, by WHO (2006)[26] the number of epidemic of overweight 1.6 billion and obesity increased 400 million and by comparing these two study we found the number of cases of obesity and overweight increased yearly. [11]

1.2 Problem statement
Dr. Mohammad Saedi – consultant in family medicine in ministry of health in Saudi Arabia marked that **Hail and Tabouk** region was becoming the highest proportion of diabetes Mellitus in Saudi Arabia followed by Riyadh and Medina, also stated that the prevalence of DM is 13.4% (14.8% among male and 11.7% among female) and the incidence will increase by age also mentioned that 40.2% of male and 48.4 of female had DM without known and 17% of total male population had prediabetes and 15.5% in female population had prediabetes. [42] Dr. Saud Al-Safri endocrinology consultant in Military Hospital in Saudi Arabia mentioned **that 38% of Saudi people with or at risk of diabetes mellitus and the Saudi** Arabia Kingdom occupied the first position in middle east and north Africa proportion of DM with (3.6 million people and the number may extended), also stated that all endocrinology physician mentioned T2DM the most proportion and it is due to the fixed habit and life style. [43, 45]

2. Statement of the purpose
The purpose of study to evaluate The Most significant non-modifiable Factor Associated with Patients Whom Previously Diagnosed with Prediabetes and Developed to T2DM attending to Endocrine Clinic in all Hail Governmental Hospitals (ECHGH)

3. Research question and hypothesis
3.1. Primary question:
For Patient Previously Diagnosed with Prediabetes dose modifiable factor increase the risk of type two diabetes mellitus?

3.2. Research hypothesis (Null hypothesis: Ho):
Modifiable factor for patients previously diagnosed with prediabetes increases the risk of type two diabetes mellitus

3.3. Alternative hypothesis:
H1: Modifiable factor for patients previously diagnosed with prediabetes does not increase the risk of type two diabetes mellitus

3.4. Secondary questions:
Question: In Patient Previously Diagnosed with Prediabetes how prevalence is (age, sex, family history, ethnicity, obese patients, hypertensive patients, dyslipidemia patients, smoker patients and physically inactive patient)?

4. Defining the theoretical framework and develop conceptual definition
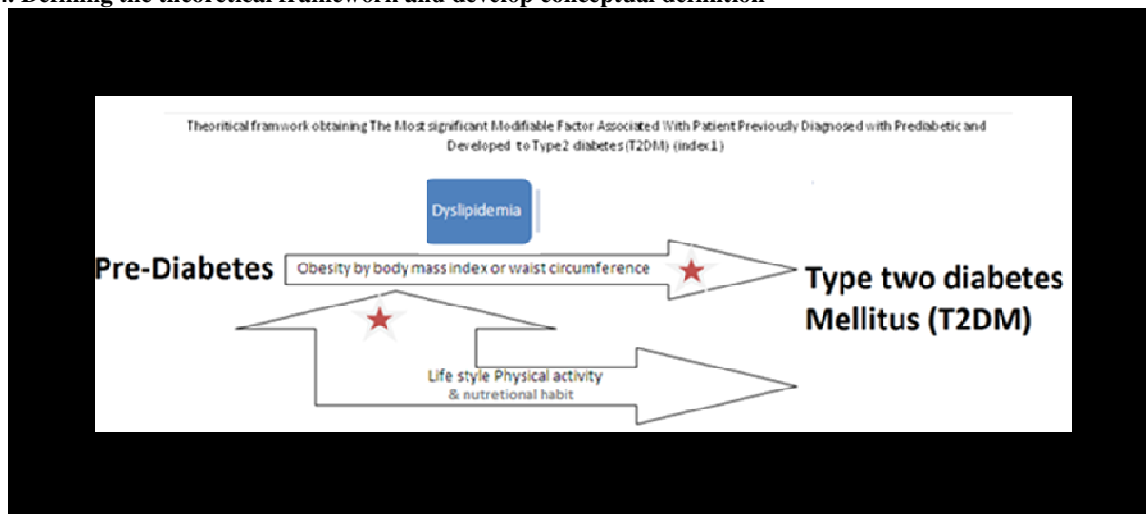
4.1 Theoretical framework
4.2 Variables of the study
4.2.1. T2DM (type two diabetes mellitus) T2DM and prediabetes

Diabetes: A disorder of glucose metabolism, the body does not produce any insulin or insufficient insulin. Three type of diabetes: type one and type two and gestational diabetes (our study focus on patient previously diagnosed with prediabetes and now developed to type two diabetes. T2DM: a disorder of glucose metabolism and body does not produce sufficient insulin and does not utilize insulin properly.

Diabetes Research and Wellness Foundation (DRWF) [22] defined prediabetes as blood glucose level is higher than normal but not high enough to be diagnosed as T2DM. [14] prediabetes defined as impaired fasting glucose (IFG), fasting plasma glucose 100-125 mg\dl, impaired of glucose tolerance (IGT) , by two hours plasma glucose value after a 75 gram oral glucose tolerance test (OGTT) of 140-199 mg\dl after administration and elevated Glycosylated Hemoglobin (HBA1C) 5.7-6.4%. [5] High-performance liquid chromatography method used to measure HBA1C. In our study classification of glucose level criteria depend on HBA1C According American Diabetes Association

(2011)[25]   depend (table 1)

Table 1: the result of IFG, IGT and HBA1C

	HB1AC	IFG	IGT
None Diabetic	Less than 5.7 %	Less than 100	Less than 140
Prediabetes	5.7-6.4%	100-125 mg-dl	140-199 mg\dl
Hyperglycemia (diabetes patient)	>= 6.5%	>=126 mg\dl	>=200 mg\dl

4.2.2. American diabetes Association (ADA) [37] stated that there are a number of modifiable risk factors that contribute to developing T2DM and heart disease including Overweight/Obesity, High Blood sugar, high blood pressure, dyslipidemia, Physical Inactivity and Smoking.

4.2.2.1. Obesity

Obesity can measure by Body mass index or waist circumference, WHO (2006)[26] and Kopelman (2000)[9] and Canadian diabetes association (2013) [20] defined Body mass index (BMI) by: weight in kilogram divided by sugar of the high in meters Measured by electrical and non electrical L-shape digital weighting scales and measure in centimeters and meter units without shoes using and minimal clothing , also both studies marked that the disadvantages of measuring BMI cannot distinguish between lean and fat mass, both same studies classify the body mass index according (table 2).

Table 2: Body mass index (BMI) by: weight in kilogram divided by sugar of the high in meters.

Body mass index	
Underweight	<18.5 kg\ M^2
Healthy weight	18.5 – 24.9 kg\ M^2
Over weight	25-29.9 kg\ M^2
Obesity	30-39.9 kg\ M^2
morbid obesity	>= 40 kg\ M^2

4.2.2.2 Dyslipidemia

Depending on American Diabetes Association (2004) defined dyslipidemia as the presence of one or more of the lipid profile which include high TC>= 200 mg\dl, Low HDL < 40 mg\dl in men and < 50 mg\dl in women, high LDL > 100 mg\dl in both male and female and high TG > 150 mg\dl. [31] dyslipidemia in T2DM patient is elevated TG levels and low HDL. The concentration of LDL cholesterol in T2DM is usually not significantly different from none diabetic individual. [1]

4.2.2.3. Physical activity

American Diabetes Association (ADA) - recommended that the patient with prediabetes should participate in a program with the goal decrease body weight 7% and increase physical activity over 150 minutes per week, improve lipid profile, that reduce risk of develop T2DM and decrease the risk 58% at 3 years according this study [5] Physical activity included improve both cardiorespiratory fitness and muscles strength achieving by more than 4 hours of exercise per week was a significant with reduction the risk of T2DM. [17] Operational definition: My classification of physical activity that assist me as a researcher in the questionnaire depending on previous study as the following, good physical activity per week ranged from at least 150 to 240 minute per week (2:30-4) hours per week) or in 5 days that prevent the complication including T2DM and coronary artery disease , from 60-150 minute per week considered at risk, less than 60 minute per week considered high risk, no exercise considered very high risk according (table 3).

Table 3: classification of physical activity (minute\week)

Operational definition classification of physical activity (minute\week)	
150 to 240 minutes\ week	good physical activity prevent developing chronic disease (e.g.: T2DM)
60-150 minutes\week	at risk of developing chronic disease including T2DM
less than 60 minutes\week	High Risk developing chronic disease including T2DM
No Exercise	Very high Risk developing chronic disease including T2DM

5. Reviewing the relating lecture

Source of data used in this study Started with electronic research and focus on full copies of relevant studies from CINAHL (cumulative index to nursing and allied health lecture), MEDLINE (medical literature on line) and Google search.

5.1Type two diabetes mellitus (T2DM)

The effective lifestyle intervention delay and protect prediabetes to change to type two diabetes, ADA (2002) suggested that the effective life style intervention include regular physical activity, nutritional intake and subsequent weight loss. [13] 50%-80% of patient diagnosed with type two, and the remaining patient diagnosed with type one diabetes mellitus. [2] Approximately over than 180 million people have T2DM worldwide and it is estimated that prevalence will increase more than double in 2030. [5] The prevalence of prediabetes and diabetes in the United States will be approximately 50% mainly associated with obesity which considered the fundamental serious medical problem. [24] The Ministry of health in Saudi Arabia recognize that the DM has created a heavy financial and social burdens and a number of efforts to control the growing problem the prevalence of DM in Saudi Arabia not only of the highest in the area, but is also one of highest in the world in year 2014 , also this study stated that ministry of Health spending 1333 $ per each person on health care in year 2014, also this study stated that ministry of health spending, also marked that other the cost of treatment of

diabetes hypertension and dyslipidemia in 2014 reached 29 milliard, 34% of these cost on diabetes which equal 10 Milliard. [45]

The IDF (international diabetes federation) marked that the prevalence of diabetes in the Arabic region have the same rate of DM in the world depend on the following value, Saudi population DM formed 16.7%, united Arabic Emirates DM formed 19.5%, Bahrain DM formed 15.2 of the total population, Kuwait DM formed 14.4%, Oman DM formed 13.1% of the total population, Egyptian population DM formed 10%. [7] 86 million American adult, more than one of three adult person have prediabetes and nine of 10 adult person with prediabetes don't know they have it. People with prediabetes are risk for T2DM and is associated with 3-10 times increasing risk. [5] Prediabetes developed to type two DM (T2DM) were associated with some factors such as smoking, physical inactivity and gender. [7] Adult for about 30% of patients with prediabetes and will develop to T2DM during five years without weight loss and do physical activity. [10-14] Dr. Ajani, S. the secretary general in Saudi Arabia is the first Middle East and North Africa in the proportion of patients with diabetes between ages 10-14. [45]

5.2. Type two diabetes mellitus (T2DM) and prediabetes

People have prediabetes are relatively high risk of T2DM and associated with 3-10 times increasing this risk. [5] Prediabetes developed to type two DM (T2DM) were associated with some factors such as smoking, physical inactivity and gender. [7] stated that adult approximately 30% of patients with prediabetes and will convert to T2DM within five years without weight loss and do moderate physical activity. [10-14]

5.3. Type two diabetes mellitus (T2DM) and all non-modifiable risk factor

American Diabetes Association (ADA) indicate that the non modifiable factor that develop prediabetes to T2DM include age, ethnicity and race, gender and family history, and stated that the people with older age at risk to develop T2DM, and men under age 55 more likely to develop heart disease and diabetes more than women, ADA marked that family history play important role to increase liability and risk of cardiovascular disease and diabetes, and mentioned that the ethnic group including African, Mexican, Indian and Hawaiians people more likely to develop diabetes that Hispanic and white colored people related to high blood pressure and obesity. [36] National center for chronic disease prevention and health promotion marked that age and sex and ethnicity considered a direct effect to develop prediabetes to T2DM and founded that the T2DM increase by increasing the age in men more than women, also the CDC mentioned that the American Indian people more likely to develop T2DM followed in descending order Black, Hispanic, Asian and finally White. [35] This study mentioned that the white color and Asian people are less likely to developed T2DM). CDC focuses on patient with prediabetes and develops to T2DM due too many because one of these causes the patient follow the guidance of drug use. And stated that 208000 people younger than 20 years old has diagnosed with diabetes type 1 and type 2, 25% of all these people did not know he\she had DM. [35]

5.4. Type two diabetes mellitus (T2DM) and all modifiable risk factor

Many modifiable variables play important role to convert prediabetes to T2DM including BMI, glucose, HbA1C, physical activity and lipid profile. [10-24] The risk factor of developing prediabetes to T2DM include low high density lipoprotein (decrease HDL), elevated triglyceride (increase TG), decrease physical activity , polycystic ovarian syndrome, gestational diabetes, having given birth to a baby over than 4.5 Kg and ethnic group like black people. The researcher recommended for primary prevention of T2DM focus on achieving and maintaining normal weight and blood lipid level through life style modification that including eating healthy diet and regular physical exercise. Depend on American Diabetes Association (ADA) – stated that the patient with prediabetes should participate in a program with the goal of decrease weight of 7% and increase physical activity not less than 150 m/w, improve lipid level to reduce risk new onset the T2DM to decrease the risk 58% at 3 years according his study. [5] Prediabetes convert to T2DM by many risk factors include obesity, bad life style, dyslipidemia, genetics, high blood pressure, smoking, bad habit diet, consider age and ethnicity. [23]

5.5. Type two diabetes mellitus (T2DM) and obesity

Obese patient with prediabetes who were treated with anti-obesity drugs demonstrated 40-52% reduction in T2DM, also the researcher and ADA (2008) marked that not recommended to use routine pharmacological agent as a substitute for life style and focus on change dietary habit and increase physical activity and suggested to use Metformin especially prediabetes patient and have a BMI more than 35 kg\m^2 and age more than 60 years old. [5] 60 to 90% of cases, obesity was determined prediabetes developed to type two diabetes [13]. WHO revealed 46% of the diabetic patient were obese. [28] Cohort Korean studies reflect that the most predictable risk factors for diabetes were obesity, low physical activity, bad habit diet and smoking. [3] There is positive correlation between increasing obesity and insulin resistance. [9] About the prevalence of diabetes in Kuwait which reached 23% in year 2013 and other study in same country founded 48 % of total respondent are obese- 18% of those respondent

are diabetic patient, also in united Emirate same study done on 5758 adults founded 20% of total respondent are diabetic and 40 % of total diabetic were obese, another study done in the middle eastern founded that the prevalence of T2DM 42% compared with Asian, European and African people. Also the study mentioned that the obesity considered a preventable disease by decreasing body weight to decrease developing of T2DM. [28] Study about obesity and diabetes, the number of respondent 1526 students found approximately 82% overweight or obese and have the same degree of increased risk of DM. [18]

5.6. Type two diabetes mellitus (T2DM) and dyslipidemia

41.4% of overweight and obese people in population from western part of Romania have prediabetes during puberty and adolescence and had high prevalence of dyslipidemia. [10] The frequency of hypercholesterolemia among 702 respondent formed (TC) 77.2%, and number of respondent with low high density lipoprotein (HDL) 83.9%, high LDL formed 91.5% and triglycerides (TG) formed 83.1% and found dyslipidemia in female more than male. Over 90% of patients with T2DM have one or more dyslipidemia, and dyslipidemia considered most common among patient with diabetes. [19]

5.7 Type two diabetes mellitus (T2DM) and lifestyle (physical)

The rapidly increasing prevalence of type two diabetes is believed to be a result of life style related to bad habit diet and physical activity, also the researcher mentioned that developed of T2DM can be prevented in patient with prediabetes by improve lifestyle and using pharmacological drugs or surgery. [5] Physical activities plays an important protective role in the diabetes and hypertension, the study mentioned that 42% diabetes patient had normal BP, in other dimension the researcher stated that the diabetes decreased 46% for who is doing exercise by decrease the body weight. [2] Exercise is improve both cardiorespiratory fitness and muscles strength by doing exercises more than four hours per week was associated with a significant reduction on the risk of DM. [17] The best diabetes prevention program among prediabetes patient could prevent the develop of T2DM by 58% by losing 5-7 percent of their body weight and walking for about 30 minute 5 days in a week. [22]

5.8. Summary

Therefore Obesity is the main risk factor attributed to diabetes in the Arab world also reported that the sedentary life style in most Arabic countries coupled with unique culture barrier to physical activity. [28] In a report released by the National Center for Media and health education at the Ministry of Health, pointed out that the diabetes rate increases with age; reaching its infection rate in Saudi Arabia - according to a survey of health information for the year 2013 - 13.4 per cent age groups from the age of 15 years and older, and the ratio of 50.4% among those who have reached 65 years and over. Similarly, 45 % of those who had DM, do not know they have the presence of diabetes. [44]   therefore the researchers are seeking to raise awareness of diabetes, and rates of occurrence, and how to prevent the disease in most cases, and how to control of the modifiable factors related to DM disease. According many literatures review and previous study we founded that the most significant risk factor developed prediabetes to diabetes is the obesity manifested and measured by BMI, although life style including physical activity and dyslipidemia take a large space to developed patient to type two diabetes mellitus and had direct effect on obesity.

6. Research design and setting

Quantitative, non-experimental descriptive design and Sampling design: Cross-sectional, Probability and Cluster sampling design,

6.1 setting

The Hail Governmental Hospitals was in KSA considered as one of the centers received millions of people. The main goal of these hospitals is providing quality health care, education and training in the fields of diabetes, endocrinology and genetics, we will collect data from two hospitals Hail general hospital and King Khalid Hospital.

6.2. Identify the population

The population include all patients come from any are in Hail region and who diagnosed with Type two diabetes mellitus (T2DM) and previously diagnosed with Prediabetes. Attending to all Hail Governmental Hospitals (HGH), Inclusion criteria includes Patient with Type two diabetes mellitus (T2DM), Patient who previously diagnosed of prediabetes, all males and females with all ages all patients from all nationalities whose visits the clinic and Whose had previous chemical laboratory study in the medical file record. Exclusion criteria includes Females with gestational diabetes, Type one diabetes patients, Refused interview data collection, Prediabetes patient not developed to type two diabetes.

Finally the target group (largest group) all patient with type two diabetes mellitus previously diagnosed

of prediabetes, and the entire group is all patient with type two diabetes mellitus previously diagnosed of prediabetes visit Endocrine Clinic in all Hail Governmental Hospitals (ECHGH). The number of cases available in the hospital during the data collection type the total numbers of cases used in this research (86 cases).

7. Study limitation
To consider the study can be generalized should increase the sample size more than mention in this study to ensure the sample representative population. The data collector found some difficulties to access people and their documents.

8. Developing method of safeguard human and animal right (Ethical Consideration)
Data collection start after we took the approval from the administration office of these ministry of health and ministry of health also our research focus on Applying beneficence and try to maximize the benefit without harming the participant because the patient have right to protect from Hazard whatever physically, socially or mentally. The data collector should give the participant full disclosure and describe the benefit and risk of the study. The research will follow respecting all participant dignity by give him a chance to decide voluntary to participate in the study and cooperate with the data collector and right to withdrawn or refuse to participate. We will apply the implied consent agreement which reflect the participant will approve to participate by complete the interview or cell phone call, answering our question without any pressure and without signature in formal inform consent, complete call or interview questionnaire indicate the participant will accept to participate. The Researcher and data collector will focus on provide privacy among the Participant during call, interview Questionnaires and take Data from the Medical file by just take the number of the file and the data without mention the national number, name or family name of the participant. Any vulnerable participant the researcher and the data collector will take the approval from whom responsible for him (e.g.: Children will take the approval from the parents, and the Hospitalized or Prisons person the approval will take from the institutions).

9. Specifying method to measure variable
Questionnaires filled from medical file, all data that collected will convert to nominal, ordinal, interval measurement to analyze it on SPSS program. These data was taking from the file and completed by doing interview directed toward patient to complete assessment of all data. The instrument considered a researcher tools and need to take a pilot study on 20 respondents to check reliability and validity focusing in measuring Cranach's Alpha and found (0.717) for 10 items

9.1 Data collection
As researcher we had an approval from the hospitals and the ministry of health and we start data collection from patient how accept to participate. We make an interview among the respondent and explain to him about the research topic and the purpose of study and why we apply these study and we take from him implied consent agreement by answer all question of the interview and the data collector complete the survey, then check the patient file to fill some data about cholesterol level and do some measurement among patient include weight and high as a preparation to calculate the body mass index so finally we will used interview, medical report and measurement to complete the questionnaires. The total number of respondent 86, T2DM patients, we number all questionnaires start from 1 to 86 as a preparation of data entry on SPSS program, and we did fast look on these questionnaires to check any problem that included but finally no problem of all questionnaires because it was filled by us during data collection.

10. Interpret the result
The researchers start analyzed thesis data using SPSS software with frequencies data measurements. The total number of the valid cases considered was 86 cases with no missed value at all. The analysis reflect that large sample of patient with T2DM are obese or with high body mass index approved by the mean of the body mass index -above normal- equal (2.76) over 3.

The first two variables of the study are age and sex. Therefore, the sample of the study included males and females of several age groups. The findings show that 32.6% of the respondents are above 65 years of age. The largest proportion of participants is the age group between 45-64 years old with a percentage of 39.5%. Moreover, 27.9% of the respondents are between 20-44 years old. In addition, the percentage of the female respondents in the study is 57%, while male participants form 43% of the sample of the study.

Another variable of the study is the level of education. As a result, the sample of the study consists of males and females of different educational levels. A quick look at the results of the study shows that the largest percentage of respondents is that of the uneducated by (51%). (33.7%) of participants hold the Secondary Certificates. respondents who hold university degree form (15.1%) of the sample. In Addition to the uneducated respondents, a large portion of the sample are the unemployed respondents who form (60.5%) of the total

sample. The findings of the study prove that family history doesn't play a significant role in this study because (45.3%) of respondents don't have a family history of T2DM On the other hand, (54.7%) of respondents has a positive family history of T2DM. The surprising result of this study is that (73.3%) of the respondents don't know that they are at risk or have been diagnosed of pre-diabetes. On the contrary, (23.7%) of respondents informed the researchers that they were under the risk of T2DM Moreover, the same number of respondents which is (73.3%) visit hospitals without knowing they have T2DM. (53%) of those patients have been diagnosed more than 10 years ago of T2DM. In addition to this, (45.3%) of those patients cannot control the blood sugar level during their daily life due to their bad life style, eating habits and physical inactivity which is evident in the analysis of the other variables. All these indicators scored the worst result in the analysis. One of the most significant findings of the study is that (79.8%) of the patients who have T2DM have the worst body mass index as well as being overweight and obese . In contrast, (27.9%) of the respondents have normal weight levels. (60.5%) of those who have T2DM do not perform any physical activity at all while (23.3%) perform physical activity less than 2 hours of per day . (16.3%) perform physical activity for more than two hours per day. In addition to the large portion of the sample who do not perform any physical activity and those who are obese. (44.2%) of those who have T2DM have high cholesterol levels too. The study reflects that (71.4%) of the female respondents are obese, but (26.5%) have normal body mass index, so obesity levels in females is more than male. (59.2%) females are considered to be physically inactive, while (62.2%) of the male respondents are also considered to be physically inactive. (69.2%0) of the respondents cannot control blood glucose level since they do not perform any physical activity which plays an important role in the control of blood glucose level. Based on another tabulation which clarifies controlling blood glucose level and obesity, the researchers have found that (48.3%) of obese persons cannot control blood glucose level.

Table 4: diagnosed with T2DM * body mass index Crosstabulation

		body mass index			
		obsese(class1 and class2) and overwieght patient	normal BMI	underwieght body mass index	Total
diagnosed with T2DM diagnosed with T2DM	Count	60	24	2	86
	% within diagnosed with T2DM	69.8%	27.9%	2.3%	100.0%
	% within body mass index	100.0%	100.0%	100.0%	100.0%
	% of Total	69.8%	27.9%	2.3%	100.0%
Total	Count	60	24	2	86
	% within diagnosed with T2DM	69.8%	27.9%	2.3%	100.0%
	% within body mass index	100.0%	100.0%	100.0%	100.0%
	% of Total	69.8%	27.9%	2.3%	100.0%

Table 5: physical activity * diagnosed with T2DM Crosstabulation

Count		diagnosed with T2DM	
		diagnosed with T2DM	Total
physical activity	no physical activity	52	52
	less than two hours daily	20	20
	more than two hours daily	14	14
	Total	86	86

11. Conclusion

The most significant modifiable factor develop prediabetes to T2DM is increasing the body mass index more than normal, physical activity and total cholesterol plays also an important role to develop also prediabetes, and finally large portion of obese patients and patient how is physically in active; cannot control of blood glucose level which reflect my significant of study Hail City and Tabouk considered the highest two city of incidence of Type2 DM and these two city and others cities in same country make Saudi Arabia populations are the highest country with patient diagnosed of T2DM in middle east and north Africa

12. Recommendations

The ministry of health in Saudi Arabia should establish Diabetes and endocrinology center in Hail city for multipurpose include primary prevention and early detection the prediabetes before the problem developed.

Health education among the community in Hail region about the importance of decreasing weight loss through official clinic or agency that reduce the incidence of type two diabetes (T2DM), especially large portion of community over 40 years old and un-educated because we founded T2DM incidence among those persons is high in hail city. Educate the community in Hail city about the importance of physical activity especially we found in this research the people how cannot control blood sugar level not perform any physical activity.

Women health committees should play important role in hail city to increase level of understanding among females about type two diabetes, obesity and physical activity, because a large portion of the research stated that high number of female had T2 DM and not perform physical activity and also obese, and this committees should establish education program and physical activity program corresponding to the Saudi Arabia culture and hail city culture and, these programs should be suitable and acceptable by the government rules and

13. ACKNOWLEDGEMENT

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