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CLINICAL AND LABORATORY RISK FACTORS OF NEWLY DIAGNOSED WITH TYPE 2 DIABETES ADULTS

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Introduction: Our study aimed to investigate clinical and laboratory characteristics of adults newly diagnosed with type 2 diabetes.

Materials and Methods: A cross-sectional study was conducted with 150 adults newly diagnosed with type 2 diabetes (T2DM) in Ulaanbaatar. Body height, weight, body mass index (BMI), waist circumference (WC), Body fat percent (BFP), fasting blood glucose (FBG), hemoglobin A_{1C} (HBA_{1C}), total cholesterol, triglycerides (TG), high density lipoprotein (HDL), low density lipoprotein (LDL), systolic blood pressure (SBP) and diastolic blood pressure (DBP) were measured.

Results: Among the 150 participants 43.6% were (65) men and more than half of the participant's women 56.7% (85). The mean age was 48.8±8.6 years. WC was 102.1±12.8 cm and there were no statistically significant difference comparing male and female. However, the mean PBF was significantly different between men (28.0±5.5%) and women (37.5±4.1%). All participants were hyperglycemia FBG 85.8% (10.1±3.9mmol/l) and HBA1C level was high 93.6% (10.3±1.5%), dyslipidemias occur in 21.3% cases which is associated with increased TG and decreased LDL and HDL detected in blood.

Conclusion: Newly diagnosed T2DM adult's BFP was high. The BMI, BFP, and WC were having significant correlation.

Keywords: Overweight, Abdominal obesity, Dyslipidemias, Type 2 Diabetes Mellitus, Hyperglycemia

INTRODUCTION

The number of people with diabetes is increasing due to population growth, aging, urbanization and increasing prevalence of obesity and physical inactivity (Bloom *et al.*, 2012). Quantifying the prevalence of diabetes and the number of people affected by diabetes, now and in the future, it is important to allow rational planning and allocation of resources. Latest reports of World Health Organization (WHO) predicts that diabetes population will increase by 122% in 2025 in developing countries, the number of patients will increase from 84 million to 228 million people, which shows a 170% increase. The increasing burden of DM among adults (aged 20-70 years) is a major public health concern globally (International Diabetes Federation, 2006). The estimated prevalence of Diabetes Mellitus (DM)currently increased to 425 million of the global adult population and the estimated prevalence of DM will increase to 642 million by 2040. In recent years, a good number of patients are suffering from DM, which has been increasing rapidly in Mongolia relating to the changes in

socio-economic lifestyle and habits. Prevalence of DM has been conducted to be 5.4% in Mongolia in 2016 (Vazquez *et al.*, 2007). Asian countries contribute to more than 60% of the world's diabetic population as the prevalence of diabetes is increasing in these countries. Socio-economic growth and industrialization are rapidly occurring in many of these countries. The urban-rural divide in prevalence is narrowing as urbanization is spreading widely, adversely affecting the lifestyle of populations. Asians have a strong ethnic and genetic predisposition for diabetes and have lower thresholds for the environmental risk factors (Ramachandran *et al.*, 2012). As a result, they develop diabetes at a young and middle aged population. The adverse effect of physical inactivity and fatty food are manifested as the increasing rate of over weightness and obesity, even among children. DM is the long term chronic disease that leads to late stage vascular complications and pathogenesis of chronic complications starting 5-10 years before the diabetes is diagnosed. Type 2 Diabetes Mellitus (T2DM) is the commonest form of diabetes constituting 90% of the diabetic population (Daousi *et al.*, 2006; Sharma & Prajapaat, 2015). Therefore, it can remain asymptomatic for many years, majority of patients with diabetic stay undiagnosed and the diagnosis is often made from associated complications and several chronic vascular diseases. Main risks for people with diabetes are that hyperglycemia in micro vascular complications and alteration of dyslipidemia that makes macro vascular complications such as cardiovascular disease, nephropathy, blindness, stroke and disability. T2DM risk is 10-20 times higher in obesity than in normal weight adults. Especially, 90% of newly diagnosed T2DM were obesity and overweight. The evaluation by risk of the BMI shows that 54.4% were overweight and obesity, 19.7% obesity in the Mongolian population (Ministry of Health of Mongolia, 2011). Rising trends in overweight (including obesity) related to age and the prevalence of obesity were higher in female than in male across all age groups.The purpose of the study was to investigate clinical and laboratory characteristics in adults newly diagnosed with type 2 diabetes attending the hospitals.

Materials and methods

This was a cross-sectional study consisting of a total of 150 newly diagnosed T2DM that have been controlled by endocrinologists' of second level hospitals in Ulaanbaatar, Mongolia.The studied patients with newly diagnosed type 2 diabetes were 20-64 years old, had no history in mental health problems, were not treated with insulin, no history of diabetes complication, have not participated in any diabetes studies before, have taken overall information of study, have agreed to participate in the study. Exclusion criteria were pregnancy, breast feeding, age below 20 or over 64, disability, with chronic diabetes complication, more than 5 months since the diagnosis of diabetes, sensitive groups (students, convicts, soldiers) with organ systems complication (liver, renal failure, digestive system) and diabetes chronic complications. This study was followed by principles outlined in the Helsinki Declaration, with an agreement for performing our study conducted with the approval of the Medical ethics committee of the Ministry of Health, Mongolia. Each participant gave written informed consent and the study protocol was approved. The clinical examination included the measurement of weight (in light indoor clothes to the nearest 100gr) and height (without shoes to the nearest 1mm). We used body weight and BFP by Vivente Gold from Hasuco Korea. We evaluated in male BFP under 10% are low, 10-19.9 % are normal, 20-24.9% are high, over 25% very high and in female BFP under 20% are low, 20-29.9 % are normal, 30-34.9% are high, over 35% very high. BMI was calculated by dividing weight in kilograms by the square of height in meters. According to WHO 1995 criteria, BMI ranges under 19 kg/m2 are underweight, 20-24.9 kg/m2 are normal weight and 25-29.9 kg/m2 are overweight, 30 over obese (World Health Organization, 2004). We measured WC midway between the lowers rib and iliac crest to the nearest 1mm by tape measure and if patients have pendulous belly measured in the cord. WC ranges are normal for lower 90 cm in men and 80 cm in women and centrally obese for over than 90 cm for men, and 80 cm for female. We used the Mongolian hypertension clinical guideline, which says that the participants should be examined before having any tea, meal or coffee. The participants had to rest at least 15 minutes before the blood pressure measurement, which is done 2-3 times per participant with OMRON model M5 in a sitting position.

Blood samples were collected in the morning after fasting for at least 8 hours. We measured hemoglobin A1C, (HbA1C) High density lipid (HDL), Low density lipid (LDL) triglyceride (TG) by a fully automatic analyzer Clindiag FA-300 from Belgium using the enzymatic method. Fasting blood glucose (FBG) was measured by standard methods using a glucometer Accu-check active, Roche. We evaluated dyslipidemia

by international criteria.

HbA_{1C} (%) level <6,5% good control, HbA1C (%) level <6.5-7.5% mode rate control and HbA1C (%) level <7.5% poor control in reference values were taken into consideration in Mongolian clinical guideline for T2DM. Statistical analyses were performed using the SPSS software. Outcome measures (mean variance, differences between groups are age, gender) were calculated with 95 present confidence intervals (95% CI). *P* value of less than 0.05 was considered to be statistically significant.

RESULTS

Among the 150 participants 43.6% (65) were men, more than half of the participants were women 56.7% (85). The mean age was 48.8±8.6 years. About 31.7% of the participants had a family history of diabetes and 38.16% were currently smoker, 12% ex-smokers, 49.8% non-smokers. From the total participants 34% were taking antihypertensive medication. The weight and BFP were statistically significantt between gender (p<0.05). BMI, WC, BP did not constitute any significant difference between men and women (p=0.123) (Table1).

Table 1: Clinical characteristics of study participants

Clinical characteristics	Total	95% CI	Male	Female
	mean±SD		mean±SD	mean±SD
Age (years)	48.8±8.6	(27-66)	47.1±9.4	50.6±7.8
Height (cm)	164.0±6.5	(145-180)	169.6±6.5	159.1±6.5
Weight (kg)	84.0±17.0	(43.2-167)	89.2±19.1*	78.7±15.0*
BMI (kg/м^2)	30.2±6.4	(17.8-61.6)	29.7±7.3	30.7±5.4
WC (cm)	102.1±12.8	(75-140)	103.3±12.8	100.9±12.7
BFP (%)	32.8±4.8	(13.4-45.9)	28.0±5.5*	37.5±4.1*
Systolic BP(mm/Hg)	130.3±17.6	(90-180)	127.8±15.8	132.9±19.4
Diastolic BP (mm/Hg)	86.5±13.6	(60-130)	85.2±12.5	87.7±14.6

We defined obesity in newly diagnosed T2DM adult's by BMI, WC and PBF. Both genders comprised of BMI obesity that was 82.1%, visceral obesity was 92.2% by WC and obesity was 100% by PBF among participants (Figure 1).

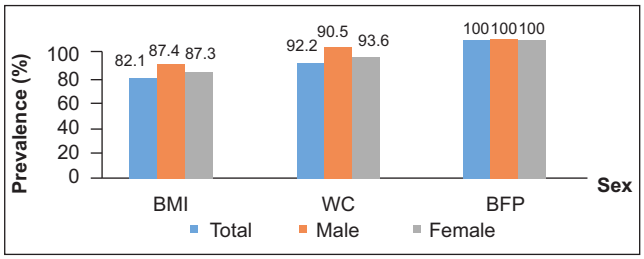

Figure 1: BMI, WC, and BPF To identified obesity by body fat percent (%)

Figure 2 presents the study participant's BFP, BMI and WC correlation. There were significant correction between BFP and BMI (r=0.505, p<0.001), WC (r=0.279, p<0.001).

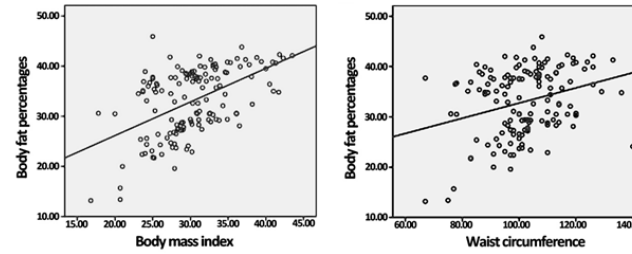

Figure 2: Correlation between BFP, BMI and WC

Table 2 shows that participant's laboratory characteristics. FBG mean was 10.1±3.9 mmol/l, HbA_{1c} mean10.3±1.5%, TG mean was 1.9±0.9mmol/l, LDL 3.9±1.7 mmol/l and was significantly higher than normal in healthy adults (p=0.001), but there were no significant TG (p=0.235).

T*able 2: Laboratory characteristics of the participants*

Characteristics	Total	95% CI	Male	Female
	Mean±SD		Mean±SD	Mean±SD
FBG (mmol/l)	10.1±3.9	(4.0-28.9)	9.9±3.6	10.2±4.1
HbA_{1c} (%)	10.3±1.5	(6.4-13.9)	10.2±1.6	10.3±1.4
Total cholestrol(mmol/l)	3.8±1.2	(2-7.6)	4.0±1.1	3.6±1.2
TG (mmol/l)	1.9±0.9	(0.4-8.6)	2.0±1.0*	1.7±0.7†
HDL(mmol/l)	1.4±0.5	(0.1-3.2)	1.4±0.4	1.4±0.5
LDL(mmol/l))	3.9±1.7	(0.9-9.4)	4.0±1.5	3.7±1.8

Total cholestrol mean was 3.8±1.2 mmol/l and HDL mean 1.4±0.5mmol/l. However, the total cholesterol, HDL level was normal. From above results, TG was statistically different between genders (p<0.05) (Table 2).

HbA_{1c}, LDL were significantly higher than normal in healthy adults (p<0.05), but there were no significant TG (p>0.05). Among total study subject's 21.3% dyslipidemia occurred with 37.6% hypercholesterolemia, 46.86% increased TG, 67.4 % increased 67.4 % LDL and decreased 31.2%. There was statistically significant higher TG and lower HDL among men (p<0.05) (figure 3).

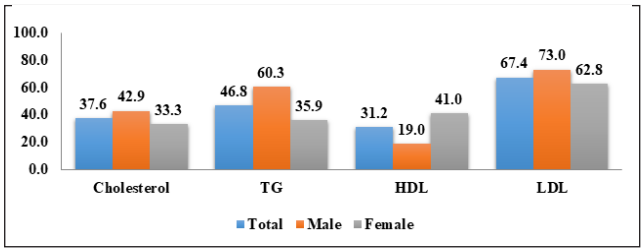

Figure 3: Dyslipidemia in newly diagnosed T2DM (by gender)

Participant's TG was significantly higher than normal level (≥5 mmol/l), they were statistically different between gender (p<0.05) and were higher in men.

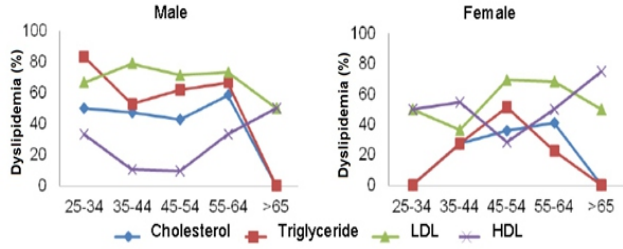

Figure 4: Dyslipidemia in newly diagnosed T2DM (by age)

Figure 4 shows study subject's total cholesterol, TG , LDL and HDL by age group. There are no statistically significant differences between Total cholesterol TG, HDL and LDL and age group (p>0.05) (Figure 4).

DISCUSSION

The data shows that obesity is common in the representative sample of type 2 diabetes patients attending the hospitals. This is similar to the association between obesity and diabetes shown in other studies. The percentage of patients with abdominal obesity was higher than those with general obesity indicating that early detection and control of abdominal obesity might be more important in Asian population (Chan, *et al.*, 2009; Suvd *et al.*, 2002). As a result, they develop diabetes at a younger age and at a lower body mass index and waist circumference when compared with the Western population. Our study's participant's BFP was high with newly diagnosed T2DM.There were significant correlation between BFP and BMI (r=0.505, p<0.0001), WC (r=0.279, p<0.001). Abdominal obesity has been associated with decreased glucose tolerance, in glucose insulin homeostasis, reduced metabolic clearance of insulin and decreased insulin-stimulated glucose disposal. Findings of our study shows majority risk factors for newly diagnosed T2MD were abdominal obesity among Mongolian people. This was similar in a study, where abdominal obesity was the most common condition, followed by hypertension and then prediabetes.The current study's BFP finding among T2DM was similar with the study of India,made by Vikram *et al.*, (2003)(male 29.4±7.1%, female 40.2±6.2%). The consultation concluded that the proportion of Asian people with a high risk of type 2 diabetes and cardiovascular disease is substantial at BMIs lower than the existing WHO (2009) cut-off point for overweight (Anuurad, 2004), evaluated some of the clinical characteristics, fat in the blood among Japanese and Korean people and result of BMI, some cholesterol indicators in blood among Mongolia people higher than Asian people.That study showed that metabolic decomposition is similar with the research result of Zolzaya (2003) and Al-Wakeel (2009) (80% metabolic decomposition, amount of HbA1c higher than 7.5% among 92% of participants). The current study's results of FBG, HbA1c, HDL, LDL and altered dyslipidemia are similar to previous studies in Mongolia. Higher FBG with newly diagnosed T2DM related to diabetic patients were undiagnosed for long time. In China, in 1994, a mean of the FBG was 10.3 mmol/l, HbA1c was 11.1% among newly diagnosed T2DM. However, it was changed into FBG was 9.0 mmol/l HbA1c was 8.6% in 2008 (Kumar *et al.*, 2008). The hyperglycemia was 92% and the dyslipidemia was 91.5% with newly diagnosed T2DM (Shi & Xu, 2010). The results of our study show that hyperglycemia and metabolic syndrome were already known in most patients with newly diagnosed T2DM and because they were not diagnosed with diabetes early. It may mean that the process, in which the diagnosis should me made, is not adequate. However, in our study there were several limitations such as this study is a cross sectional study included 150 subjects and limited to some clinical laboratory characters. Further study is needed for screening for prediabetes and early detection of DM. We need more studies for the intervention in obese population with secondary lifestyle.

CONCLUSION

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