Prevalence of Metabolic Syndrome in Type 2 Diabetic Patients in Baghdad Teaching Hospital

Omar F. Alazawi*　　　　CABM (Int. Med.).
Ali A. Dyab Allawi**　　　FICMS (Int.Med.),FICM (NEPH).
Saleh A. Saleh **　　　　MBCHB.

Summary:

Background: There is an epidemic of several non communicable diseases and metabolic abnormalities in humans including hypertension, obesity, hyperlipidemia, low high density lipoprotein cholesterol, microalbuminurea, and insulin resistance. These diseases and metabolic abnormalities have been collectively classified as metabolic syndrome and are closely associated with type 2 diabetes and other health problems including death.

objectives: To investigate the prevalence of metabolic syndrome among type 2 diabetic patients in Baghdad teaching hospital,the frequency, and distribution of risk factors according to gender groups in our studied patients with metabolic syndrome in order to have an idea of the commonest possibly treated and prevented risk factors to decrease morbidity and mortality of metabolic syndrome.

Patients and methods: A cross sectional study was done during the period 1st March 2011 till the 1st of March 2012, a sample of 220 patients with diabetes mellitus who accepted to take part in this study was recruited. All patients were subjected to clinical examination and laboratory tests according to the updated ATP111 criteria, in which we measured blood pressure,waist circumference, fasting blood sugar, fasting high density lipoprotein level and fasting triglyceride level, these data were analyzed by Statistical package for social science version 18.

Results: There were 220 patients with mean age of (54.52± 9.5), male to female ratio 1.4, metabolic syndrome was present in 41.8% (92) and 58.2% (128) had no metabolic syndrome . The frequency of positive risk factors in association with metabolic syndrome were, for the waist circumference 114 patients (51.8%), high triglyceride level 65 patients (25.5%), low high density lipoprotein level 10 patients (4.5%), hypertension ≥ 130/85 mmHg 117 patients(53.15%) and fasting blood sugar 220 patients (100%).

Conclusions: The study showed that metabolic syndrome prevalence still an important factor for the morbidity and mortality of Iraqi patient in spite of its low prevalence compared to other similar studies.

Key Words: metabolic syndrome,type 2 diabetes mellitus.

Introduction:

There is an epidemic of several non communicable diseases and metabolic abnormalities in humans including hypertension, obesity, hyperlipidemia, low high density lipoprotein [HDL] cholesterol, microalbuminuria, and insulin resistance(1,2). These non communicable diseases and metabolic abnormalities has been collectively classified as metabolic syndrome (met.s) (3) which is closely associated with type 2 diabetes (DM2) (4) and other health problems that all might finally lead to death (5). Many have blamed unhealthy diet (6) and lack of exercise for the epidemics of type 2 diabetes and metabolic syndrome. Diet and exercise have been been very effective (7) and have not stopped the the cure for metabolic syndrome but have not epidemic to date.

Other investigators have proposed that metabolic syndrome is an inflammatory condition, or the result of increased cortisol production. (8-11).There are many definitions of metabolic syndrome , According to World Health Organization (WHO), the symptoms of metabolic syndrome are, High insulin levels means an increasing fasting blood glucose or post meal glucose, Abdominal obesity in which the waist to hip ratio is greater than 0.9 and the body mass index is at least 30 kg/m2 with a waist measurement over 37 inches, Triglyceride level of at least 150 mg/dl or HDL cholesterol lower than 35 mg/dl, and the Blood pressure of 140/90 or above.(12) Because of its critical and central role in the development of metabolic syndrome, DM2 and many cardiovascular disorders, will be a critical component of care in shortcoming future. Treating metabolic syndrome can prevent or ameliorate cardiovascular disease and type 2 diabetes(13,14,15)

There is debate regarding whether obesity or insulin resistance is the cause of the metabolic syndrome or if they are consequences of a more far-reaching metabolic derangement .Some have pointed to a variety of causes including increased uric acid levels caused by dietary fructose (16,17,18).

Aims of the study.

1. To investigate the frequency of met.s among type 2 diabetic patients in Baghdad teaching hospital.
2. To investigate the frequency and distribution of risk factors in relation to gender groups in the studied patients with

*Baghdad College of Medicine, Baghdad Teaching Hospital.
**Baghdad Teaching Hospital.*

met.s , according to the updated ADULT TREATMENT PANEL(ATP)111 criteria in order to have an idea of the commonest possibly treated and prevented risk factors.

Patients and Method:

A cross sectional study was conducted during the period 1st of March 2011 till the 1st of March 2012, 220 patients with type 2 diabetes mellitus seen in the in-patient and out-patient clinic of Baghdad Teaching Hospital, who accepted to take part in this study, were recruited. Data was collected and recorded in the questioner paper including:The age in years, Gender, Duration of DM2. All patients were subjected to clinical examination, including:

-Waist circumference measurement (cm): The waist circumference was measured by non stretchable tape, the patient was positioned symmetrically in a standing position, and halfway between lower rib and iliac crest we recorded the waist circumference(19).

-Blood pressure (mmHg): The Bp was measured using mercury sphygmomanometer, the centre of the cuff bladder placed over the brachial artery and the lower edge of the cuff is2-3 cm above the point of brachial artery pulsation. Two blood pressure recordings were obtained from the right arm of patients in a sitting position, the arm and heart at same level, after 30 minutes of rest at 5-min intervals, and their mean value was calculated (20).

-And finally blood samples were drawn from the patients after fasting for at least 8 hours(10), and sent for laboratory tests measuring in labs.of Baghdad Teaching Hospital:

❖ Fasting TG (mg/dL).
❖ Fasting HDL (mg/dL).
❖ Fasting Blood Sugar (mg/dL).

If at least three or more of the clinical and/or laboratory results of any patient fall within the following ranges of readings(13).

Clinical identification of the metabolic syndrome according to the updatedATP111 definition(13)

Risk factor	Defining level
Waist circumference	≥40 inches (102 cm) in men ≥35 inches (88 cm) in women
Triglycerides	≥ 150 mg\Dl
HDL-C (high-density lipoprotein cholesterol)	<40 mg/dL in men <50 mg/dL in women
Blood pressure	≥130/≥85 mmHg
Fasting glucose	≥100 mg/Dl

Statistical analysis

Data analysis was computer aided. An expert statistical advice was sought for. Statistical analyses were done using Statistical Package for Social Sciences (SPSS) version 18 computer software. Chi square and Pearson's correlation was used to assess the results.

Results:

On the basis of ATP111 Guidelines, 220 patients with type 2 diabetes were studied, 41.8% (92) of them were found to have met.s and the remaining 58.2% (128) patients had no metabolic syndrome.

The male to female ratio was 1.4:1, no significant difference had been found regarding the gender and metabolic syndrome P.value >0.05.(Table 1).

Table 1.Frequencies and percentages of metabolic syndrome distributed by gender.

Gender		With metabolic Syndrome	Without metabolic Syndrome	Total	P. value
Females	Count	43	48	91	0.22
	% of Total	19.5%	21.8%	41.3%	
Males	Count	49	80	129	
	% of Total	22.3%	36.4%	58.7%	
Total	Count	92	128	220	
	% of Total	41.8%	58.2%	100.0%	

The mean age of all patients was (54.5± 9.5) year with a range of (31 – 79) year (Table 2). The mean duration of Diabetes of all patients was (11.1 ± 3.2) years with a range of (1-21) years. (Table 2)

The mean Waist circumference of all patients (cm) was (95.7 ± 11.8) with a range of (65 – 126 cm). (Table 2)The mean Triglyceride level of all patients (mg\dL) was (134.9 ± 16.8)

with a range of (95 – 174 mg\dL). (Table 2)

The mean HDL level of all patients (mg\dL) was (53.95 ± 7.1) with a range of (34 – 60 mg\dL). (Table 2) The mean Fasting blood sugar of all patient (mg\dL) was (118.8 ± 12.3) with a range of (105 – 145 mg\dL). (Table 2) The percent of patients with blood pressure ≥130/85 mmHg was 53.2% (117patient out of the total 220 patient).(Table 2).

Table2. Clinical parameters of all patients (n=220)

	Mean ±SD	Range
Age (year)	54.52± 9.5	31 – 79
Duration of Diabetes (year)	11.1 ± 3.2	1 – 21
Waist (cm)	95.7 ± 11.8	65 – 126
Triglycerides mg\dL	134.9 ± 16.8	95 – 174
HDL mg\dL	53.95 ± 7.1	34 – 60
Fasting blood sugar mg\dL	118.8 ± 12.3	105 – 145
Blood pressure ≥ 130/85 mmHg	220/117 (53.2)%	

The frequency of the positive risk factors in the sample according to gender were as follows; (Table 3). The frequency of the waist risk factor, 51.9% (114patients) total, males 30.5% (67 patients) and females 21.4% (47 patients). The frequency of the high Triglyceride level risk factor, 25.5% (65 patients) total, males 15.5% (34 patients) and females 10.0% (22 patients).

The frequency of the low HDL level risk factor, 4.5% (10 patients) total, males 0.9% (2 patients) and females 3.6% (8 patients). The frequency of Blood pressure ≥130/85 mmHg was 53.17% (117 patients) total, males 32.72% (72 patients) and males 20.45% (45 patients). The frequency of the high FBS level risk factor, 100% (220 patients) total, males 58.6% (129 patients) and females 41.4% (91 patients).

Table3. Frequencies of positive Risk factors present in patients distributed by gender

Risk Factor		Gender		Total
		Female	Male	
High Waist circumference (cm)	Count	47	67	114
	% of Total	21.4%	30.5%	51.9%
High triglycerides mg\dl	Count	22	34	56
	% of Total	10.0%	15.5%	25.5%
Low HDL mg\dl	Count	8	2	10
	% of Total	3.6%	0.9%	4.5%
High Blood pressure	Count	45	72	117
	% of Total	20.45.%	32.72%	53.17%
High Fasting Blood sugar mg\dl	Count	91	129	220
	% of Total	41.4%	58.6%	100%

The frequencies of risk factors for met.s in the study, according to the updated ATPIII criteria is shown in (Figure 1), we had 220 patients, all of whom have DM2 (FBS greater than 100mg/dl), the column (1) shows that 35 patients had only DM2 i.e. only one risk factor, the column (2) shows that 93 patients had DM2 with another risk factor i.e. only two risk factors, both (total of 128 patients) didn't fulfill the criteria of the updated ATP111. The remaining 92 patients had 3 or more risk factors and fulfilled the required criteria, in the column (3) 73 patients had 3 risk factors, in the column (4) 18 patients had 4 risk factors, and only 1 patient had all the 5 risk factor, in the column (5).
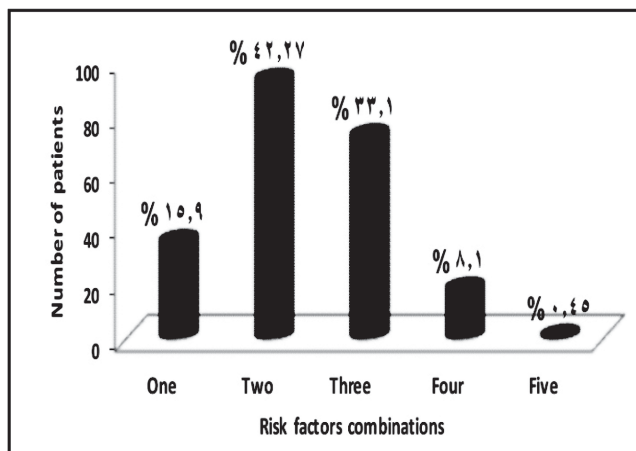
Figure 1. Frequencies of different combination of risk factors of all patients (N=220)

By comparing the clinical parameters of male patients, there was a significant association between the resence of metabolic syndrome and waist circumference (p value 0.042), age (p value 0.038), Blood pressure (p value 0.008) and triglyceride (p value 0.033.)

There was no significant association between the presence of metabolic syndrome and the duration of diabetes in years (p value 0.61), HDL mg\dL (p value 0.56) and FBS mg/dl (p value 0.95). (Table 4)

Table 4. Comparison of Clinical Parameters in male patient, with and without Metabolic Syndrome (n=129

Clinical Parameter	Metabolic syndrome Present (n=49)		Metabolic syndrome Absent (n=80)		P .value
	Mean ± SD	Range	Mean ± SD	Range	
Age (year)	56.7 ± 9.1	32 – 77	53.6 ± 8.4	37 - 79	0.038
Duration of Diabetes (year)	10.9 ± 3.2	1 – 17	11.2 ± 3.1	3 – 21	0.61
Waist (cm)	104.67 ± 8.9	87 – 126	101.65 ± 9.2	77 – 124	0.042
Triglycerides mg\dL	13.5 ± 16.4	109 – 174	134.2 ± 17.2	103 – 168	0.033
HDL mg\dL	53.59 ± 6.9	35 – 60	52.46 ± 7.4	34 – 60	0.39
Fasting blood sugar mg\dL	119.2 ± 12.4	105 – 144	118.8 ± 12.7	105 – 144	0.95
Blood pressure	34 (69.4%)		38 (47.5%)		0.008

By comparing the clinical parameters of female patients, there was significant association between the presence of metabolic syndrome and the waist circumference (p value 0.027), age (p value 0.004), Blood pressure (p value .001) and triglyceride (p value 0.013).

There was no significant association between the presence of metabolic syndrome and duration of diabetes in years (p value 0.53), HDL mg\dL (p value 0.08) and FBS mg/dl (p value 0.11). (Table 5)

Table 5. Comparison of Clinical Parameters in female patients, with and without Metabolic Syndrome   (n=91)

Clinical Parameter	Metabolic syndrome Present (n=43)		Metabolic syndrome Absent (n=48)		P. value
	Mean ± SD	Range	Mean ± SD	Range	
Age (year)	51.7±11.5	31 – 79	54.8 ± 9.4	32 – 75	0.004
Duration of Diabetes (year)	10.6 ± 3.8	2 – 16	11.3 ± 3.1	3 – 18	0.53
Waist (cm)	90.33 ± 8.8	68 – 107	86.1 ± 9.2	65 – 107	0.027
Triglycerides mg\dL	143.4 ±1 6.5	95 – 161	135.2 ± 17.3	97 – 158	0.013
HDL mg\Dl	55.54 ± 6.17	43 – 60	54.5 ± 6.17	44 – 60	0.42
Fasting blood sugar mg\dL	116.3 ± 9.7	105 - 143	120.7 ± 13.5	105 – 145	0.11
Blood pressure	28(65.12%)		17(35.4%)		0.001

Discussion:

In this cross-sectional study of 220 type 2 diabetes patients, we have found the prevalence of met.s (according to updated ATP III Criteria) to be 41.8% (92 patients), The prevalence between males 22.3%(49) and females 19.5%(43) showed no significant difference and the male to female ratio was 1.4:1 . The prevalence of met.s in our study was 41.8% (92 patients), it was in disagreement with a study done in Iraq/ Basrah in 2002 which showed the prevalence of met.s. in type 2 diabetes patient to be 86% (82.7% of males and 94.5% of females) (21), this large difference could be explained by many factors including; population studied with selection bias, different ethnic groups in Al-Basrah than in Baghdad (22),life style differences, dietary habits and health care availability. Another study from Uyo - South Nigeria in 2008 involving 240 patients that showed high prevalence of met s which was found to be 62.5%., which was in disagreement with our study. (23)Our study was also in disagreement with other studies that showed lower prevalence of met.s as; The prevalence of the metabolic syndrome in south Indian was estimated to be 25.8%, in the general population, based on more than one criteria to define met.s.(24) The Prevalence of met.s. in type 2 diabetes patients in Aden governorate study(25) in 2005-2006 was 32.2 % (139out of 460 patient), 25% males and 37% females.The mentioned differences in the prevalence of met.s of the above studies from our study can be contributed to ethnic variations, different lifestyles, different dietary habits and medical care availability, cost and performance .The prevalence of met.s in our study (41.8%) was comparable with the studies:

 In Shanghai (26), one thousand thirty-nine (1039) patients with type 2 diabetes over 30 years of age were studied in 2008, prevalence of met.s according to IDF criteria was 50%. In Iran (27), two hundred (200) patients with type 2 diabetes were studied in 2011, the prevalence of metabolic syndrome according to (ATP-III) guidelines was 51.50%. These slight differences from our study can be explained to be due to number of patients involved (in Shanghai study (26), life style differences in each country, dietary habits and health care availability.

The most common risk factor in our study next to DM2 (character of our sample patients) was hypertension with a prevalence of 53.15% (117 patients), then waist circumference with a prevalence of 51.8% (114 patients),then TG level with a prevalence of 25.5% (65 patients) and lastly HDL level with a prevalence of 4.5% (10 patients) (Table 3). Similar results was found in the Basrah study (21) in regard to the most and least common risk factors, in which hypertension was the most common risk factor and HDL level was the least common risk factor, Also similar results was found in the Uyo study (22), hypertension was also the most common risk factor and HDL level was the least common risk factor .In Aden study (23) similarly hypertension was the most common risk factor.
 In our study no significant difference had been found regarding the gender and metabolic syndrome P .value > 0.05 (Table 1) which is in disagreement with the Basrah study (21), Iran study (27) and Pakistan study (28).

Racial and life style differences, could explain these differences. It was similar to a study done in Nigeria (28) involving 963 patients with DM2 in 2010, that showed prevalence of met.s was similar in both genders except for ages 70-79 where the proportion of men with met.s was found to be almost twice that of females.

Conclusions:

Prevalence of metabolic syndrome was low in the study, and this may be due to the small number of participants .The most common risk factors significantly associated with met.s next to DM2 (character of our sample patients) was hypertension, then waist circumference and lastly high TG level,.There was no significant association of met.s with the duration of diabetes (years), low HDL level and FBS level. There were no significant differences in the prevalence between males and females. The most common combination of risk factors associated with met.s in males was Waist, high level triglycerides and fasting blood sugar, whereas it was Waist, low high density lipoprotein and fasting blood sugar for female patients.Finally even though prevalence of met.s was low, it's still an important factor for the morbidity and mortality of Iraqi patients.

References:
1. Ford ES, Giles WH, Mokdad AH. Increasing prevalence of the metabolic dyndrome Among US adults. Diabetes Care 2004; 27: 2444-49.
2. Duncan GE, Li SM, Zhou XH. Prevalence and trends of a metabolic syndrome phenotype among US adolescents, 1999-2000. Diabetes Care 2004; 27: 2438-43.
3. Ford ES, Giles WH. A comparison of the prevalence of the metabolic syndrome using two proposed definitions. Diabetes Care 2003; 26: 575-81.
4. Lorenzo C, Okoloise M, Williams K, Stern MP, Haffner SM. The metabolic syndrome as a predictor of type 2 diabetes. Diabetes Care 2003; 26: 3153-59.
5. Katzmarzyk PT, Church TS, Janssen I, Ross R, Blair SN. Metabolic syndrome. Obesity, and mortality. Diabetes Care 2005; 28: 391-97.
6. Schulze MB, Hu FB. Dietary approaches to prevent the metabolic syndrome. Diabetes Care 2004; 27: 613-14.
7. McAuley KA, Williams SM, Mann JI, et al. Intensive lifestyle changes are necessary to improve insulin sensitivity. Diabetes Care 2002; 25: 445-52
8. Classen DC, Classen JB. The timing of pediatric immunization and the risk of insulin-dependent diabetes mellitus. Infect Dis Clin Pract 1997; 6: 449-54.
9. Classen JB, Classen DC. Clustering of cases of IDDM occurring 2-4 years after vaccination is consistent with clustering after infections and progression to IDDM in autoantibody positive individuals. J Pediatr Endocrinol Metab 2003; 16: 495-50
10.Aruna Pradhan, MPH. Obesity, Metabolic Syndrome, and Type 2 Diabetes: Inflammatory Basis of Glucose Metabolic Disorders. Nutrition Reviews, Vol. 65, No. 12, December

2007(II): S152–S156.

11.World Health Organization, Diabetes. Fact Sheet #312. September 2006. Available at: http://www.who.int/mediacentre/factsheets/fs312/en/print.html. Accessed October 22, 2007

12. Navjot Singh Tak .The definition of metabolic syndrome .Available at http://EzineArticles.com/5007040

13. Bethesda, Md. National Heart Lung and Blood Institute: Third Report of the Expert Panel on Detection, Evaluation, and Treatment of High Blood Cholesterol In Adults (Adult Treatment Panel III): National Cholesterol Education Program (NCEP), National Institutes of Health; 2001.

14. Knowler WC, Barrett-Connor E, Fowler SE, et al.: Diabetes Prevention Program Research Group. Reduction in the incidence of type 2 diabetes with lifestyle intervention or metformin.N Engl J Med 2002, 346:393-403.

15. Pan XR, Li GW, Hu YH, Wang JX, Yang WY, An ZX, Hu ZX, Lin J, Xiao JZ, Cao HB, et al.: Effects of diet and exercise in preventing NIDDM in people with impaired glucose tolerance. The Da Qing IGT and Diabetes Study. Diabetes Care 1997, 20:537-544.

16. Tuomilehto J, Lindstrom J, Eriksson JG, Valle TT, Hamalainen H, Ilanne-Parikka P, Keinanen-Kiukaanniemi S, Laakso M, Louheranta A, Rastas M, et al.: Prevention of type 2 diabetes mellitus by changes in lifestyle among subjects with impaired glucose tolerance.N Engl J Med 2001, 344:1343-1350.

17. Chiasson JL, Josse RG, Gomis R, Hanefeld M, Karasik A, Laakso M: STOP-NIDDM Trail Research Group. Acarbose for prevention of type 2 diabetes mellitus: the STOP-NIDDM randomised trial. Lancet 2002, 359:2072-2077.

18. Hallfrisch J (1990). "Metabolic effects of dietary fructose". FASEB J 4 (9): 2652–2660.PMID 2189777.

19. Han, T.; Van Leer, E.; Seidell, J.; Lean, M. (1995). "Waist circumference action levels in the identification of cardiovascular risk factors: prevalence study in a random sample". BMJ (Clinical research ed.) 311 (7017): 1401–1405.

20.Gareth Beevers, Gregory Y H Lip, and Eoin O'Brien. ABC of hypertension Blood pressure measurement Part IIConventional sphygmomanometry: technique of auscultatory blood pressure measurement. BMJ. 2001 April 28; 322(7293): 1043–1047).

21. MansourA.A.The prevalence of metabolic syndrome among patients with type2 diabetes mellitus in Basrah,Department of Medicine, Basrah College of Medicine. Middle East Journal of Family Medicine.

22. Swapnil N Rajpathak; Leena S Gupta; Elizabeth Needham et al. Elevated risk of type 2 diabetes and metabolic syndrome among Asians and south Asians: Results from the 2004 New York City HANES. J. Ethnicity & disease, Vol. 20 (Medline citation).

23. Unadike BC, Akpan NA, Peters EJ, Essien IO, Essien OE. Prevalence of the metabolic syndrome among patients with type 2 diabetes mellitus in Uyo, Nigeria. African Journal of Endocrinology and Metabolism, Vol. 8, No. 1(2009)

24. Deepa M, Farooq S, Datta M,Deepa R, Mohan V. Prevalence of Epidemiology metabolic syndrome using WHO, ATPIII and IDFdefinitions in Asian Indians: the Chennai Urban Rural Study (CURES-34). Diabetes Metab Res Rev 2007;23:127–34.

25 . Abdullah Mohamed Ahmed; Salem Bin Selm. Prevalence of Metabolic Syndrome among Patients with Type 2 Diabetes in Aden Governorate :PhD thesis.

26 . Fukuchi S, Hamaguchi K, Seike M, Himeno K, Sakata T, Yoshimatsu H,evaluation of the International Diabetes Federation definition of metabolic syndrome in Chinese patients older than 30 years and diagnosed with type 2 diabetes mellitus. Metabolism 2006;55:1088–96.

27. Abdoljalal Marjani, Mohammad Mojerloo.The metabolic syndrome in type 2 diabetic subjects, Biochemistry and Metabolic Disorder Research Center, Department of Internal Medicine, Gorgan Faculty of Medicine, Golestan University of Medical Sciences, Iran.

28.Basit A, Shera S. Prevalence of metabolic syndrome in Pakistan. Metabol Syndr Relat Disord 2008;6:171–558.