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Full Length Research Paper

Metabolic Syndrome in Teaching hospital Western Province of Saudi Arabia

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Abstract

In Saudi Arabia, one of the most emerging pandemic diseases is Metabolic Syndrome (MS), associated with obesity, cardiovascular Disease (CVD) and diabetes. A large proportion of the general population represents theworking environment, which serve as an important place for prevention, control and management of chronic diseases. The objective of the present study is to examine the incidence of MS and its components among patients working in the university of King Abdulaziz, In the hospital which is a Teaching Hospital of Western Province in Saudi Arabia, and the patients attending the hospital from the community and to evaluate the incidence on the basis of age and gender. Present study is based on the cross-sectional study of 117 patients attending a teaching hospital of Western Province of Saudi Arabia.MS was explained and diagnosed as reported by National Cholesterol Education Program Adult Treatment panel III modified criteriawhich includes BMI, waist, Fasting Plasma Glucose (FPG), HDL, and blood pressure. The prevalence of MS was 24.2% in the present study, while the components with more than three were found to be higher in male (29%) than female (21.9%). However, thereafter prevalence was more in female than male and increased with age.The most widespread MS components in all patients were increasedtriglycerides (2.1mmol/L±1.3); BMI (32.3kg/m^2±9.3), Systolic BP (141.4mm/Hg±19.7); HDL (1.2mmol/L±0.3);Fasting blood sugar(10.8mmol/L±8.9);Diastolic BP (75.5mm/Hg±11.3); and T. Cholesterol (4.8mmol/L±1.0).Male (Odds ratio 0.217, P=0.008) with any age (Odds ratio=0.916,P=0.002), a Saudi national (Odds ratio=0.278, P=0.029) with normal (Odds ratio=0.087, P=0.001) are associated significantly with metabolic syndrome.Consequently there is significant difference in metabolic syndrome between age,sex, nationality, and Obesity.In the age group of 40-49 and 60-69,prevalence of waist circumference is higher and in the age group of < 40 and 60-69, triglycerides are higher. The prevalence of MS was higher in male than female (≥3 components) while the prevalence increased with age. On the basis of age and gender, current report helpsto estimate the prevalenceof MS and its components among employees working in Teaching Hospital of Western Province and the community.Therefore, there is anecessity to create an awareness programsto prevent CVDs and diabetes in workplace and the community.

Keywords: Metabolic syndrome, Obesity, Hyperglycemia, Hypertension, Cardiovascular diseases

INTRODUCTION

The cardiovascular diseases (CVD) risks has been doubled in individuals diagnosed with Metabolic Syndrome (MS), (Després and Lemieux, 2006; Gami et al., 2007; Grundy, 2006; Grundy, 2007) while the risk type of diabetes is increased fivefold in the presence of MS (Ford, 2005). Both diabetes and CVD poses huge economic burden to any country due to its chronic complications, especially diabetic people medical costs are 2.4 times than without diabetes while CVD alone contribute to 19.2% of the direct and indirect (Scholze et al., 2010). The burden of these diseases is more prevalent in developing countries; especially published

epidemiological studies of Saudi Arabia reported apotential growth in diabetes by the reason of a parallel increase in obesity rates (Elhadd et al., 2007). In Saudi Arabia currently, 23% of the healthcare expenditure while 17% of direct medical costs spent for diabetes. Hence, in order to mitigate the escalating frequency of diabetes, there is a need for effective intervention, focusing on the diabetic prevention as well as its macro and micro vascular complications. Previous studies have targeted successfully high risk individuals such as MS, pre-diabetes, impaired glucose tolerance to prevent diabetes (Eriksson and Lindgärde, 1991; Knowler et al., 2002; Pan et al., 1997; Tuomilehto et al., 2001) and CVD (Papadakis and Moroz, 2012). Therefore, there is a necessity to find MS individuals to address multiple risk factors and reduce diseaseburden. However, MS has been classified under different definitions thereby their prevalence rate ranged from 21% (Al-zaharani and Bissada, 2003) to 57% (Al-Nozha et al., 2005).

The study by (Akbar, 2002) reported the prevalence of 56% in men and 57% in women based on the WHO definition. Similarly, the largest epidemiological study reported the prevalence of 40% (Al-Nozha et al., 2005) using NCEP ATP III guidelines. Further, using the same definition, the prevalence of 31.4% (Barrimah et al., 2009) and 35.3% in the whole population was reported in the central region of Saudi Arabia (Al-Daghri et al., 2010). Nevertheless, all these studies are epidemiological based focused on population distribution, but only few have concentrated from the particular population who is more prone to these risk factors. Moreover, an working areacan serve as an important place for prevention, control and management of chronic diseases as previous studies reported that occupation has an influence on CVD risks (Myong et al., 2012; Shafei and Awang, 2011; Salaroli et al., 2013). Thus, targeting these individuals may aid in prevention, while the crucial part is to identify major CVD risk factors for developing and implementing nutrition and health intervention. A recent study, conducted among Healthy National Guard Employees in the city of Jeddah reported the MS prevalence of 21% (Al-zaharani and Bissada, 2003). For instance, Barrimah et al., 2009 reported the prevalence of 31.4% among Qassim University personnel using the definition proposed by NCEP. However, this study specifically focused among adult working males.

In light of risk factors, such as extended work schedules, long working hours, aheavy workload in Saudi Teaching Hospital of Western Province and difference in working condition in comparison to the general population requires more attention. Hence, objective of current research is described MS prevalence and its components among employees working Teaching Hospital of Western Provinceuniversity and the community, and estimate their prevalence according to age and gender.

RESEARCH DESIGN AND METHODS

Study Population

The present study was a cross sectional study of 100 patients who received an annual clinical examination at the Teaching Hospital Western Province of Saudi Arabia. However, only 95 participant's data were included in the analysis as five data were found missing variables, which were excluded during the analysis stage. The institutional ethical committee board and management is approved the protocol of current study. Further before commencing the study the informed consent was obtained from all research participants. An interview with a simple questionnaire which included age, gender, medications and detailed medical history was carried out on these 95 subjects.

Physical Assessment

All measurements were made using trained assistants. According to a standardized measurement procedure (lightly dressed, without shoes) the body weight (weight, kg) is measured by using a Seca 634 digital electronic platform scale (Birmingham, UK) with precision to 0.1 kg. Astadiometer was used to measure the height to the nearest 0.1 cm. Body Mass Index (BMI) was computed based on these two indicators, where by the dividing weight in Kg by height squared in meters. The standard Sphygmomanometer was used to measure the blood pressure on the right upper arm. The measurement was done twice at least five minutes of rest and mean value was determined from two independent measures. Waist Circumference (in cms) was measured midway between the iliac crest and the lower rib margin at the end of normal expiration while the subjects were standing using a non-elastic flexible tape at the smallest position.

Laboratory analysis and measurement

A venous blood sample was taken in the 12-hours fast, to draw a fasting blood sample to describe plasma glucose (FPG) described by using triglycerides (TG-C), the glucose oxidase peroxidise method, total and HDL (HDL-C) cholesterol concentration (VitalabSelectra 2, Merck Germany)

Definition of Metabolic Syndrome

The metabolic syndrome cut-off points and inclusion criteria varied across the different definition of the MS[22]. In the present study, metabolic syndrome is defined by using NCEP ATP III guidelines.Based on five major components,the metabolic syndrome was diagnosed such as: (i) Hypertriglyceridemia TG ≧150 mg/ dL; (ii)

Waist circumference ≧102 cm for men and ≧88 cm for women (iii) Blood pressure Systolic - BP ≧130 mmHg; diastolic BP ≧85 mmHg (iv) HDL-C mem = <40 mg/dL and women = < 50 (v) FPG ≧110 mg/dL. The definition suggested by the Adult Treatment Panel III (ATP III) of the National Cholesterol Education Program.

Statistical Analysis

By using Statistical Package, Data is analysed for the Social Scientists for Windows, 21.0 (IBM, Corp). Independent sample t-test was used to compare the means, while Chi-square (χ^2) was usedto compare categorical variables.Statistical Analysis is described the relationshipwithin MS and other demographic variables, Conditional forward and backward binary logistic regression was used. P<0.05 was considered significant.

RESULTS

Overall 95 subjects were surveyed in this study (male/female: 31/64). More than half of them were females (67.4%) with a female to male ratio of 2.06:1.Age ranged between 30 to 85years with a mean of 58.1±11.1. The results Showed that 30.5 % of participants were overweight, 52.6% were obese and only 2.1% were underweight. Their age ranged between 30 and 85 years with a mean of 58.08±11.09.

A comparison of means of metabolic syndrome parameters of subjects with male and female shows a statistically significant difference in the total cholesterol (p=0.03) and mean BMI (p=0.04).In spite, no statistically significant difference in the mean waist (p=0.24), triglycerides (p=0.77), HDL (p=0.23), systolic BP (p=0.29), diastolic BP (0.08) and fasting blood sugar (p=0.46) between male and female.

The females had the highest mean waist (104.9±15.6) were as the male patients had the lowest mean waist (100.9±14.7). The BMI meanfor female patient was observed high (33.6±10.2) and e the male had the lowest mean BMI (29.5±6.2).The HDL Cholesterol level was evaluated, the female (1.2±0.3) had highest HDL cholesterolthan males (1.1±0.3).When the mean systalic BP was evaluated, the male (144.5±19.0) had highest systalic BP than females (139.9±20.2). The mean diastolic BP for female was (74.1±10.7) which is observed to be lower when compared to male(78.4±12.3) Mean fasting blood sugar was highest in the female (11.2±10.7) while the lowest mean fasting blood sugar was documented in the male (9.8±3.1). The mean total cholesterol was highest in the female (5.0±0.9), while the male had the lowest (4.5±1.2). There was no difference in mean Triglycerides between male (2.1±1.4) and female (2.1±1.2) (Table 1).

The prevalence of clinical characteristics like waist circumference is (73.7%), Triglycerides (50.5%), HDL (63.2%), Blood pressure (75.8%), fasting blood sugar (100.0%) and Total cholesterol (9.5%) were recorded in study participants (table 2).

Nearly 34% of the research population has at least four components (abnormal value) of metabolic syndrome (Table 3).

Table (4) presents the mean, SD for metabolic syndrome between male and female for different age group. The mean waist was higher in< 40 years (135.0) in male and 110.3 in the female. For the entire metabolic syndrome male seems to be higher compare to female

The formulation of MS criteria prevalence by age group as well as BMI showed that age is an important risk factor of metabolic syndrome. The prevalence of waist circumference is higher in the age group 40-49 and 60-69 and triglycerides it is higher in < 40 and 60-69. Theprevalence of obese is high 94.0% in waist circumference (Table 5).

Table (6) shows the unadjusted odds ratios for some selected risk factors associated with metabolic syndrome among participants. Being a male (Odds ratio 0.217, P=0.008) with any age (Odds ratio=0.916, P=0.002), a Saudi national (Odds ratio=0.278, P=0.029) with normal (Odds ratio=0.087, P=0.001) are associated significantly with metabolic syndrome. Hence, there is significant difference in metabolic syndrome between sex, nationality, age and Obesity.

DISCUSSION

Present study estimates the prevalence of metabolic syndromes.The findings of the current study reveal that the prevalence of MS was 24.2%, while the components with more than three were found to be higher in male (29%) than female (21.9%). However, prevalence was more in a female than male and tends to increased with age. This signifies that high MS prevalence along with its components (age gender, profession) among participants ofteaching hospital western providence of Saudi Arabia. Metabolic syndrome is associated with the risk of developing diabetes, CVD. The MSprevalence in Saudi population is similar to that of the earlier findings (Al-Qahtani et al., 2006; Al-Qahtani and Imtiaz 2005), whereas it is lower when compare to other findings (Akbar, 2002; Barrimah et al., 2009). In Saudi Arabia NCEP-ATP III definitions, is used to find the prevalence of gender dependent metabolic syndrome. The prevalence of waist circumference using this definition creates overall impact on the features ofmetabolic, which is less, in relation to the prevalence of other syndromes. The similar scenario was recorded in previous studies (Cheung et al., 2006; Barros, 2007). In addition, different results have been obtained with various gap of ethnic population, where obesity creates greater impact on the

Table 1. Comparison of metabolic syndrome components between genders

	All (n=95)	Male (n=31)	Female (n=64)	P-value
Waist	103.6±15.3	100.9±14.7	104.9±15.6	0.237
BMI	32.3±9.3	29.5±6.2	33.6±10.2	**0.038****
Triglycerides	2.1±1.3	2.1±1.4	2.1±1.2	0.777
HDL	1.2±0.3	1.1±0.3	1.2±0.3	0.234
Systalic BP	141.4±19.7	144.5±19.0	139.9±20.0	0.292
Diastolic BP	75.5±11.3	78.4±12.3	74.1±10.7	0.081
Fasting blood sugar	10.8±8.9	9.8±3.1	11.2±10.7	0.460
T Cholesterol	4.8±1.0	4.5±1.2	5.0±0.9	**0.028****

***P<0.01; ** P<0.05**

Table 2. Prevalence of some Clinical Characteristics among Study Participants

Characteristics	Number (Percent)
Waist Circumference –NCEP ATP III (>102cm for male and >88 cm for female)	70 (73.7)
Waist Circumference – IDF (>94 for male, >80 for female	81 (85.3)
Triglycerides (>=1.69mmol/l)	48 (50.5)
High density lipoprotein (< 1.04 mmol/l for male and < 1.29mmol/l for female)	60 (63.2)
Blood Pressure (BP)	72 (75.8)
Fasting blood sugar (>6.1 mmol)	95 (100.0)
Total Cholesterol (>=6.19)	9 (9.5)

Table 3. Age adjusted prevalence of one or more abnormalities of the metabolic syndrome

	% (95% CI) Male	Female	Total
n	31	64	95
Metabolic abnormalities (n)			
≥ 1		1.6 (0.0-4.7)	1.1 (0.0-3.2)
≥ 2	35.5 (19.4-51.6)	12.5 (4.7-21.9)	20.0 (12.6-28.4)
≥ 3	29.0 (12.9-45.2)	21.9 (12.5-32.8)	24.2 (15.8-32.6)
≥ 4	29.0 (12.9-45.2)	35.9 (25.0-48.4)	33.7 (25.3-43.2)
5	6.5 (0.0-16.1)	28.1 (17.2-39.1)	21.1 (13.7-29.5

Table 4. Mean values, SD of subjects with components of metabolic syndrome and BMI by age group and sex among 31 male and 64 female

	Age group									
	<40 Yrs		**40 - 49 Yrs**		**50 - 59 Yrs**		**60 - 69 Yrs**		**70+ Yrs**	
	Mean	**SD**	**Mean**	**SD**	**Mean**	**SD**	**Mean**	**SD**	**Mean**	**SD**
Male										
Waist	135.0		111.0	19.8	102.8	14.7	99.8	15.0	94.3	7.3
BMI	46.6		32.2	6.8	30.7	6.0	28.9	5.6	26.5	4.0
Triglycerides	5.4		2.4	0.5	1.9	1.3	1.8	1.3	2.1	1.6
HDL	1.2		1.0	0.2	1.3	0.4	1.1	0.2	1.0	0.2
systalic BP	140.0		130.0	0.0	149.5	13.5	143.2	20.4	146.5	24.0
diastalic BP	80.0		75.0	7.1	80.2	11.1	77.8	13.7	78.6	14.2
Female										
Waist	110.3	39.3	100.2	10.2	105.2	15.6	107.1	11.1	101.0	32.9
BMI	30.5	23.9	32.6	5.5	32.9	7.2	36.3	12.7	30.4	15.4
Triglycerides	2.5	1.4	1.8	1.0	2.4	1.5	2.1	1.1	1.2	0.3
HDL	1.0	0.3	1.2	0.2	1.2	0.4	1.2	0.2	1.5	0.7
systalic BP	137.3	6.4	143.8	22.3	139.4	21.0	142.3	18.3	116.0	8.5
diastalic BP	73.3	15.3	73.8	11.9	77.2	9.1	73.1	9.5	56.3	8.1

Table 5. Prevalence of Metabolic Syndrome Criteria by Age group and BMI

Characteristics	Waist (cms)	Triglycerides	HDL	Blood Pressure	Fast blood sugar
Age groups					
< 40 years	3 (75.0)	3 (75.0)	3 (75.0)	4 (100.0)	4 (100.0)
40-49 years	12 (85.7)	6 (42.9)	12 (85.7)	12 (85.7)	10 (71.4)
50-59 years	26 (78.8)	17 (51.5)	19 (57.6)	22 (66.7)	32 (97.0)
60-69 years	27 (81.8)	18 (54.5)	20 (60.6)	27 (81.8)	31 (93.9)
70+ years	2 (18.2)	4 (36.4)	6 (54.5)	7 (63.6)	9 (81.8)
Obesity (BMI)					
Underweight	1 (50.0)	1 (50.0)	1 (50.0)	1 (50.0)	2 (100.0)
Normal	4 (28.6)	4 (28.6)	6 (42.9)	11 (78.6)	14 (100.0)
Over weight	18 (62.1)	14 (48.3)	20 (69.0)	21 (72.4)	25 (86.2)
Obese	47 (94.0)	29 (58.0)	33 (66.0)	39 (78.0)	45 (90.0)

Table 6: Odds Ratios of Metabolic Syndrome for Selected Socio-demographic & Clinical Characteristics

Characteristics	Odds Ratio (95% CI)	P-value
Sex	0.217 (0.070-0.672)	0.008**
Nationality	0.278 (0.088-0.879)	0.029*
Age		
Underweight	0.087 (0.020-0.376)	0.105
Normal	0.087 (0.005-1.668)	0.001**
Overweight	0.543 (0.125-2.361)	0.416
Obese		

**P<0.01; *P<0.05

metabolic syndrome prevalence, where changing appropriateness criteria in such situation (Gemalmaz et al., 2008; Yoon et al., 2007).

The mean waist was higher in the age group lesser than 40 years (135.0) in male and 110.3 in the female. For all metabolic syndrome included in the present study like a waste, Triglycerides, HDL, blood pressure and the fastingblood sugar male shows the higher rate when compared to that of females. The disparity in gender is attributed towards the age and sex hormones, where the cholesterol mediated metabolism is in sexual dimorphic manner (Wang and Magkos, 2011). All metabolic syndrome increases with age. In the present studyboth males and females between the age group of 30-70 years showed an age-adjusted (39.3%) prevalence of metabolic syndrome (Al-Nozha et al., 2005). This is in line with the previous study findings (Bahijri et al., 2013). Current research, the metabolic syndrome components occur more frequent in males than female. Increased BMI and HDL were recorded in females than males whereas among age groups, HDL values shows to be more or less similar in both genders. Visceral adipose tissues increase the cardiovascular disease (Scott, 2003). There are other factors like dietary factor may also influence the CVD. In general, it is difficult to estimate the metabolic syndrome prevalence in Saudi-Arabian population based on the present study, this is because the participants of the present study represent the employees with higher-income group and the sedentary life style which influences negatively on the metabolic disorder components.

CONCLUSION

In general, the metabolic syndrome prevalence in Saudi Arabia population is likely being less than the estimated prevalence since the age group of the present study is greater than the general population. In addition, the population of the current study was into academic employees with sedentary life style which influences directly on the characteristics of metabolic syndrome. Thus, the present study clearly shows that the participants in the teaching hospital, therefore, have a higher chance of cardiovascular and diabetics disease. To control and prevent metabolic syndrome obesity plays an important role. This is because that there is ahigher chance of developing abnormal metabolism of glucose,

dyslipidema and hypertension among obese than that normal person (World Health Organization, 2000). On the other hand, dietary modified weight reduction along with physical activity effectively improves insulin sensitivity (Torjesen et al., 1997; Ross et al., 2000) and other complications in obese patients. Moreover, the major implication in the metabolic syndrome management should focuson the basic causes like pharmacotherapy, physical activity, and obesity, could be necessary for the therapy of hypertension as well as hyperglycemia (National Institutes of Health, 2001). Recent study revealed that type II diabetics can be prevented by crucial changes in life style and pharmacological aspects (Tuomilehto et al., 2001; Chiasson et al., 2002). Thus, there is a need for the integrated approach for preventing metabolic syndrome.

REFERENCES

Després JP, Lemieux I (2006). Abdominal obesity and metabolic syndrome. Nature. 444:881–887.

Gami AS1, Witt BJ, Howard DE, Erwin PJ, Gami LA, Somers VK MV (2007). Metabolic syndrome and risk of incident cardiovascular events and death: a systematic review and meta-analysis of longitudinal studies. J Am Coll Cardiol. 49(4):403-14.

Grundy S (2006). Metabolic syndrome: connecting and reconciling cardiovascular and diabetes worlds. J. Am. Coll. Cardiol. 47:1093–100.

Grundy S (2007). Metabolic syndrome: a multiplex cardiovascular risk factor. J Clin Endocrinol Metab. 92(2):399-404.

Ford E (2005). Risks for all-cause mortality, cardiovascular disease, and diabetes associated with the metabolic syndrome: a summary of the evidence. Diabetes Care. 28(7):1769-78.

Scholze J, Alegria E, Ferri C, Langham S, Stevens W, Jeffries D. et al. ? provide others authors names (2010). Epidemiological and economic burden of metabolic syndrome and its consequences in patients with hypertension in Germany, Spain and Italy; a prevalence-based model. BMC Public Health.10(529).

Elhadd T, Al-Amoudi A, Alzahrani A (2007). Epidemiology, clinical and complications profile of diabetes in Saudi Arabia: a review. Ann. Saudi Med. 27(4):241-50.

Eriksson K, Lindgärde F (1991). Prevention of type 2 (non-insulin-dependent) diabetes mellitus by diet and physical exercise. The 6-year Malmö feasibility study. Diabetologia. 34(12):891-8.

Knowler WC, Barrett-Connor E, Fowler SE, Hamman RF, Lachin JM WE, DM N (2002). Reduction in the incidence of type 2 diabetes with lifestyle intervention or metformin. N Engl J Med. 346(6):393-403.

Pan XR, Li GW, Wang WY, An ZX HZ, LJ (1997). Effect of diet and exercise in preventing NIDDM in people with impaired glucose tolerance. The Da Qing IGT and Diabetes Study. Diabetes Care. 0:537-544.

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

Papadakis S, Moroz I (2008). Population-level interventions for coronary heart disease prevention: what have we learned since the North Karelia project. Curr. Opin. Cardiol. 23:452–461.

Al-zaharani MS, Bissada NF BE (2003). Obesity and periodontal disease in young, middle aged and older adults. J. Periodontal. 74:610-5.

Al-Nozha M, Al-Khadra A, Arafah MR, Al-Maatouq MA, Khalil MZ, Khan NB, Al-Mazrou YY et al. ? provide others authors names (2005). Metabolic Syndrome in Saudi Arabia. Saudi Med J. 26(12):1918-1925.

Akbar DH (2002). Metabolic Syndrome Is Common in Saudi Type 2 Diabetic Patients. Diabetes Int.;12(2):47-49.

Al-Nozha M, Al-Khadra A, Arafah MR, Al-Maatouq MA, Khalil MZ et al. ? provide others authors names (2005) Metabolic syndrome in Saudi Arabia. Saudi Med J.;26:1918–1925.

Barrimah IE, A. Mohaimeed FM and HAA-S (2009). Prevalence of Metabolic Syndrome among Qassim University Personnel in Saudi Arabia. Interna- tional J. Heal Sci. 3(2):133-142.

Al-Daghri N, Al-Attas O, Alokail M, Alkharfy K, Sabico S. CG (2010). Decreasing prevalence of the full metabolic syndrome but a persistently high prevalence of dyslipidemia among adult Arabs. PLoS One. 5.

Myong JP, Kim HR, Kyunghee JC, Baker D CB (2012). Disparities of metabolic syndrome prevalence by age, gender and occupation among korean adult workers. Ind Health. 50:115–22.

Shafei MN, Awang AF MW (2011). Prevalence of metabolic syndrome and its associated factors among female nurses in a teaching hospital in North-Eastern state of Malaysia. JPHE. 3(9):394–400.

Salaroli LB, Saliba RA, Zandonade E, Molina MC BN (2013). Prevalence of metabolic syndrome and related factors in bank employees according to different defining criteria, Vitória/ES, Brazil. Clinics. 68(1):69–74.

Wilfred de Alwis NM DC (2007). Metablic syndrome or what you will: definitions and epidemiology. Diabetes Vasc Dis Res. 4:32-38.

Al-Qahtani D, M. Imtiaz OS and NH (2006). A Comparison of the Prevalence of Metabolic Syndrome in Saudi Adult Females Using Two Definitions. Metab Syndr Relat Disord.;4(3):204-214.

Al-Qahtani DA, Imtiaz ML (2005). Prevalence of Meta- bolic Syndrome in Saudi Adult Soldiers. Saudi Med. J. 26(9):1360-1366.

Cheung B, Ong K, Man Y, L Wong CL and KL (2006). Prevalence of the Metabolic Syndrome in the United States National Health and Nutrition Examination Survey 1999-2002 According to Different Defining Crite- ria. J. Clin. Hypertens. 8(8):562-570.

Barros ACS and H (2007). Impact of Metabolic Syn- drome Definitions on Prevalence Estimates: A Study in a Portuguese Community. Diabetes Vasc Dis Res. 4(4).

Gemalmaz A, Aydin S, O Bafiak GD and AK (2008). Prevalence of the Metabolic Syndrome in a Rural Turkish Population: Comparison and Concordance of Two Diagnostic Criteria. Turkish J Med Sci. 38(2):159-165.

Yoon Y, Lee E, C Park SL and SO (2007). The New Definition of Metabolic Syndrome by the International Diabetes Federation Is Less Likely to Identify Metabolically Abnormal but Non-Obese Individuals than the Defi- nition by the Revised National Cholesterol Education Program: The Korea Nhanes Stu. Int Jour- nal Obes. 31(3):528-534.

Wang X, Magkos F MB (2011). Sex differences in lipid and lipoprotein metabolism: It's not just about sex hormones. J. Clin. Endocrinol. Metab. 96(4):885–93.

Bahijri SM, Al Raddadi RM, H Jambi MAA and GF (2013). The Prevalence of Metabolic Syndrome in an Apparently Healthy, Normotensive and Non-Diabetic Population in Saudi Arabia by Two Definitions: Implications for Local Practice. Open J Endocr Metab Dis. 3(1):18-24. doi:10.4236/ojemd.2013.31003.

Scott CL (2003). Diagnosis, Prevention and Intervention for the Metabolic Syndrome. Am J Cardiol. 92(1):35i-42i.

World Health Organization (2000). In: The World Health Report 2000: Heath System Efficiency. World Health Org,Geneva

Torjesen PA, Birkeland KI, Anderssen SA, Hjermann I, Holme I UP (1997). Lifestyle changes may reverse development of the insulin resistance syndrome: the Oslo Diet and Exercise Study:a randomized trial. Diabetes Care. 20:26–31.

Ross R, Dagnone D, Jones PJ, Smith H, Paddags A, Hudson R JI (2000). Reduction in obesity and related comorbid conditions after diet-induced weight loss or exercise-induced weight loss in men: a randomized, controlled trial. Ann. Intern. Med. 133:92–103.

National Institutes of Health (2001). In: Third Report of the National Cholesterol Education Program (NCEP) Expert Panel on Detection, Evaluation, and Treatment of High Blood Cholesterol in Adults

(Adult Treatment Panel III). Bethesda, MD: National Institutes of Health.
Tuomilehto J, Lindstrom J, Eriksson JG, Valle TT, Hsmslsinen H, Ilanne-Parikka P et al. ? provide others authors names (2001) Prevention of type 2 diabetes mellitus by changes in lifestyle among subjects with impaired glucose tolerance. N Engl J Med. 244:1343-1350.
Chiasson JL, Josse RG, Gomis R, Hanefeld M, Karasik A LM (2002). Acarbose for prevention of type 2 diabetes mellitus: the STOP-NIDDM randomised trial. Lancet. 359:2072–2077.

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