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Review Article

Waist Circumference as a Predictor Metabolic Syndrome among Rural Women, Minia, Egypt

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Abstract

Objectives: To assess burden and determinants of Metabolic Syndrome among rural females.

Methodology: This is cross sectional community based study, which was carried out among 124 females, aged ≥ 35 years old in a rural area "El-Burgaia" Minia district. An interview questionnaire included socio demographic data, underlying risk factors. Waist circumference, blood pressure were measured. Fasting blood glucose, fasting lipid profile was done. Metabolic Syndrome was assessed according to the guidelines of National Cholesterol Education Program, Adult Treatment Panels III (NCEP-ATP III, 2006).

Results: Nearly one-quarter of rural females participated in the study has metabolic syndrome and about 73% of them were sedentary. Central obesity was significantly higher among females with metabolic syndrome than normal ones (102.6±10.8 vs. 91.5±12.3 respectively) (p=0.001). There was significant increase in total cholesterol and LDL among females with metabolic syndrome (208.1±31.9 and 129.6±31.4) than normal females (186.1±28.5 and 128.7 ±49.6) respectively. The most significant factors predicting metabolic syndrome were overweight and obesity (OR=3.4, P=0.001) followed by increasing age (OR=1.4, P=0.002).

Conclusion: Central obesity, sedentary life style, hypelipidemia predominates among rural females participated in this study which make them at higher risk for a long list of non communicable diseases among which is metabolic syndrome.

Keywords: Metabolic syndrome; Women; Minia; Egypt

Introduction

By the dawn of the third millennium, non communicable diseases are sweeping the entire globe, with an increasing trend in Middle East countries where, the transition imposes more constraints to deal with the double burden of communicable and Non Communicable Diseases (NCDs). By 2020, it is expected that NCDs will be responsible for seven out of every 10 deaths in developing countries [1]. In this era of globalization, health systems in Africa face challenges posed by health transition, a double burden of communicable and Non-Communicable Diseases (NCDs), in addition to triple burden of accidents, the WHO predicts that NCDs deaths will increase by 17% over the next decade, with the greatest increase in the African region (27%) [2].

Important complications for Metabolic Syndrome are increasing the risk of cardiovascular disease, diabetes mellitus and chronic kidney disease [3].

The concept of Metabolic Syndrome was introduced in 2001 by the National Cholesterol Education Program (NCEP) into its guidelines to reduce cardiovascular risk. The NCEP Adult Treatment Panel (ATP) III criteria somewhat overlaps the WHO criteria and a diagnosis is based on having at least three out of five of the following: Waist Circumference (WC) > 40 inches in men or >35 inches in women, triglycerides ≥ 150 mg/dl, HDL cholesterol <50 mg/dl in women and <40 mg/dl in men, blood pressure ≥ 135/85 mmHg and fasting serum glucose of ≥ 110 mg/dl [4].

Globally, over the last 3 decades, the prevalence of metabolic syndrome has been increasing in all populations, the significance of 'Metabolic Syndrome' was stemming from the ability in helping to identify subjects at high risk of developing type 2 diabetes and Cardiovascular Disease (CVD), subjects having metabolic syndrome have a 2–3 fold risk of cardiovascular disease and a fivefold risk of developing type 2 diabetes It is estimated that nearly 20-25 per cent of the world's adult population has the metabolic syndrome and they are twice as likely to die from a heart attack and three times likely to suffer from a heart attack or stroke compared with people without the syndrome [5]. The clustering of components of metabolic abnormalities occurring in an individual make a substantial additional cardiovascular risk over and above the sum of the risk associated with each abnormality [6].

Large proportion of patients with coronary disease have metabolic syndrome, each component of MS is individually associated with an increased risk of cardiovascular disease; however, whether MS leads to greater cardiovascular risk than the sum of its components remains a matter of debate, it has been suggested that the number of MS components may be more useful in predicting cardiovascular disease than MS itself, since cardiovascular risk increases as the number of

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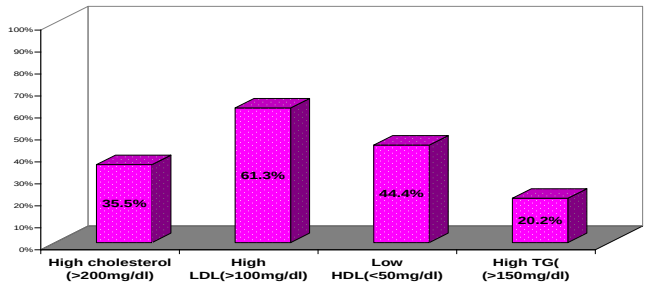

Figure 1: Prevalence of Dyslipidemia among the studied females (n=124).

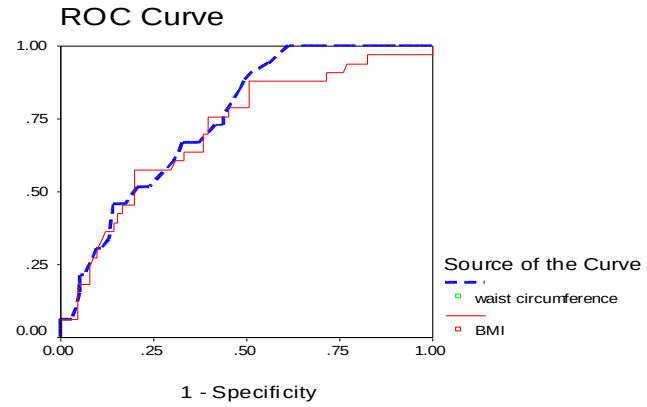

Figure 2: ROC curve of WC, BMI in prediction of metabolic syndrome.

components increases [7].

The International Diabetes Federation estimates that 25% of the world's adult population has Metabolic Syndrome [8].

Justifications

Identifying the risk factors associated with Metabolic Syndrome is thus important if primary prevention programs for diabetes mellitus and CVD are to be planned in the future. The identification of risk factors especially modifiable ones would be an integral and vital part of public health policies. The clustering of these risk factors in metabolic syndrome may also provide the primary care physician an integrative view of linking conditions together so as to treat these high risk subjects much earlier. Once these high risk subjects are identified, interventions in such primary prevention programs could be initiated and culturally adapted needs in such a program would be observed and documented for future health policy planning.

Research design and methods

Study design- Cross sectional community based study: Administrative and ethical consideration: An approval was taken from the local council of El-Burgaia village to interview the participants. The study was approved by the ethical committee of the Faculty of Medicine, El-Minia University. Prior to data collection, informed consent was obtained from all participants after supplying comprehensive information about the nature of the study and the procedural details of the blood sugar and serum lipid profile investigations.

Study population: Inclusion criteria: The participants were recruited based on inclusion criteria that females only aged equal or more than 35 years old. Apparent healthy females without sign or symptoms suggestive of coronary artery disease. Participants were living in El-Burgaia village, Minia governorate from November 2013 to sixth of April 2014. Exclusion criteria: females aged less than 35 years old, female with previous history of atherosclerotic cardiovascular disease as myocardial infarction, coronary heart disease, and angina pectoris) and the female had history of pregnancy or neoplasm.

We generated a systematic random sample of 200 households from among the 20.000 households in El Burgaia village, a rural area in Minia district, Minia governorate. Here the samples were taken after ensuring that each of the four main lanes from the central landmark of the village had an equal opportunity to be represented in the sample selection. Total 124 females were found and full fill the criteria of inclusion and exclusion.

Collection of data: Data were collected by Interviews with participated females and each questionnaire was filled by the investigator, the questionnaire was including, demographic data as name, age, and residence, smoking history, history of physical activity and medical history.

Waist circumference (in centimeters): was measured by using non stretchable measuring tape at the midway between the 12th rib and the iliac crest, the person stand with abdomen relaxed, arms at sides, and feet together [9]. Central obesity was diagnosed for waist circumference ≥ 94cm for men and ≥ 88 cm for women according to the IDF recommendations for Mediterranean's [8].

Measurement of blood pressure

Arterial pressure is measured *via* a sphygmomanometer, which used the height of a column of mercury to reflect the circulating pressure [10].

Diabetes Screening Protocol

Fasting finger prick blood glucose test was determined for each participant in the fasting state on the same day. Those who were not fasting were motivated to report in a fasting state on the next day (fasting was defined as a minimum of 8 hours between the subject's last consumption of any calorie-containing food or drink and the time of the FPG test). Diabetes should be diagnosed BY FPG ≥7.0 mmol/L (126mg/dl or above] but Pre diabetes is diagnosed by IFG (FPG 6.1–6.9 mmol/L) or (100-125 mg/dl) [11].

Screening Lipid Profile

Using a fasting lipid profile to ensure the most precise lipid assessment. This should include total cholesterol, LDL-C, triglycerides, and HDL-C. Blood should be collected after a 12-hour fast (no food or drink, except water). For the most accurate results, wait at least two months after a heart attack, surgery, infection, injury or pregnancy to check lipid profile levels [12].

Finally metabolic syndrome was detected according to national cholesterol education program, adult treatment panels III (NCEP-ATP III), factors are thought to comprise this syndrome:

- Waist circumference ≥ 88 cm or 35 inches (female)
- TG ≥ 1.7 mmol/L (150 mg/dl).

Table 1: The baseline characteristics of studied females (Total subjects, subjects with and without metabolic syndrome), El-Burgaia village, Minia governorate, November 2013 to sixth of March 2014.

Baseline characteristics	Total N=124	Normal N=91	Metabolic N=33	P
Age group (years)	51.6±10.4	50.1±10.6	55.8±9.1	0.007#
BMI	30.2±7.1	28.9±6.6	33.9±6.9	
• Under weight	2(1.6%)	2(2.2%)	0.0(0.0%)	0.001#
• Normal	32(25.8%)	28(30.8%)	4(12.1%)	
• Over weight	3(24.2%)	25(27.5%)	5(15.2%)	0.01¤
• Obese	60(48.4%)	36(39.6%)	24(72.7%)	
Waist circumference	94.5±12.8	91.5±12.3	102.6±10.8	0.001#
Blood pressure				
• SBP	126.6±13.8	121.3±10.3	141.2±11.5	0.001#
• DBP	82.8±10.2	79.4±13.7	92.2±9.1	0.001#
FBS	104.3±33.6	94.1±13.1	132.3±52.09	0.01¤
Lipid profile:				
• Total cholesterol	191.9±30.9	186.1±28.5	208.1±31.9	0.001#
• TGs	129.4±47.1	128.7 ±49.6	131.09±39.7	0.8#
• HDL	48.8±13.5	52.2±11.8	47.6±13.9	0.09#
• LDL	116.6±31.5	112.3±30.4	129.6±31.4	0.006#

#t(df) 2.7(122), 4.5(122), 3.7(122), 0.23(122), 1.6(122), 2.7(122), 6,4(122), 9.1(122)and 7.3(122), ¤ Fisher exact(df) 2.9(3).

- HDL-C < 50 mg/dL.
- Blood pressure ≥ 130/85 mmHg (or treated for hypertension)
- Fasting plasma glucose ≥ 6.1 mmol/L (110 mg/dl)

Presence of metabolic syndrome if concomitant presence of 3 or more of these factors [4].

Statistical analysis

Data entry and analysis were all done by using software SPSS (Statistical Package for the Social Sciences) version 16. Quantitative data were presented by mean and standard deviation, while qualitative data were presented by frequency distribution, multiple regression analysis of factors contribution the occurrence f metabolic syndrome was done. The probability of less than 0.05 was used as a cut off point for all significant tests. Graphics were done using Excel 2007 [13-16].

Results

This study included 124 females living in El-Burgaia village, Minia governorate from November 2013 to sixth of March 2014. The age of participants ranged between 35-75 years with mean of 51.69±10.49 year [17,18].

From (Table 1) it was found that females who had metabolic syndrome were significantly (55.8±9.1) older than normal females (50.1±10.6) (p=0.007). More than two third (72.7%) of those with metabolic syndrome were significantly obese compared to 39.6% of normal females (p=0.01). Waist circumference was significantly higher among females with metabolic syndrome (102.6±10.8) than normal (91.5±12.3) (p=0.001). Blood pressure was significantly higher among females with metabolic syndrome (141.2±11.5 and 121.3±10.3 for SBP and DBP respectively) than normal females (92.2±9.1 and 79.4±13.7 for SBP and DBP respectively). Mean FBS was higher among females with metabolic (132.3±52.09) than normal (94.1±13.1) (p=0.001) [19]. Regarding lipid profile, there was significant increase in total cholesterol and LDL among females with metabolic syndrome (208.1±31.9 and 129.6±31.4 for cholesterol and LDL respectively) than normal females (186.1±28.5 and 128.7±49.6 for cholesterol and LDL respectively).

Table 2: Prevalence of metabolic syndrome and the components of metabolic syndrome in the studied women, El-Burgaia village, Minia governorate, November 2013 to sixth of March 2014.

	Total =124 No	%
Metabolic syndrome	33	26.6%
Fasting plasma glucose ≥ 110 mg/dl)	29	23.4%
HDL-C < 50 mg/dL	55	44.4%
TG ≥ 150 mg/dl	25	20.2%
Waist circumference ≥ 88 cm or 35 inches	82	66.1%
Blood pressure ≥ 130/85 mmHg	43	34.7%
Three trait	24	19.4%
Four trait	7	5.6%
Five trait	2	1.6%

Table 3: Multiple regression analysis of factors affecting metabolic syndrome among the studied females, EL-Burgaia village, Minia governorate, November 2013 to sixth of March 2014.

Variables	OR	95% CI	P
Waist circumference ≥ 88 cm	9.3	2.6-32.8	0.001*
BMI (over weight and obese)	3.5	1.1-11.7	0.02*
Menopause	2.5	1.001-6.4	0.04*
SBP	1.1	1.07-1.2	0.001*
FBG	1.07	1.04-1.1	0.001*
Total cholesterol	1.03	1.004-1.06	0.02*

As shown from (Table 2), more than one fourth (26.6%) of the studied female had metabolic syndrome. More than two third of females had central obesity in which high waist circumference was the most frequent criteria (66.1%). the prevalence of low HDL-cholesterol, high blood pressure, high fasting blood glucose and high triglyceride were shown to be 44.4%, 34.7%, 23.4% and 20.2% respectively. The prevalence of three or more components of the metabolic syndrome. Our results showed that 19.4, 5.6 and 1.6% of the studied females had three, four and five criteria of metabolic syndrome components, respectively (Figures 1,2, Tables 2 and 3).

Discussion

It was observed from this study that the percentage of females who had metabolic syndrome according the (ATP III) definition was about 26.6%. This was in approximate agreement with Bouguerra et al., (2007) who studied Waist circumference cut-off points for identification of abdominal obesity among the Tunisian adult population, and found that the prevalence of MS in Tunisia was 24.3% with a significantly higher prevalence in women than in men and the most important factor was increased WC. Also this was approximate to what had been reported by Kozan et al., (2007) who studied prevalence of the metabolic syndrome among Turkish adults and he found that the prevalence of MS was 33.9%, with a higher prevalence in women (39.6%) than in men. Tabari et al., (2015) who studied Prevalence of Metabolic Syndrome in Baluch Women in Chabahar found that 17.5% of the studied females had metabolic syndrome [20,21].

This study was found that mean age of the studied females who had metabolic syndrome (55.8±9.1) was significantly higher than normal females (50.1±10.6) (OR=1.4), which was in agreement with Hildrum et al., (2007) who studied age-specific prevalence of the

metabolic syndrome and found that the mean age of females with metabolic (60.2±16.2) syndrome was significantly higher than normal females (44.8±16.1).

More than two third (72.7%) of those with metabolic syndrome were significantly obese compared to (39.6%) of normal females (OR=3.4) which was in agreement with Kim et al., (2011) who found that BMI was significantly higher among females with metabolic syndrome (29.5±0.4) than normal females (23.6±0.2).

Waist circumference was significantly higher among females with metabolic syndrome (102.6±10.8) than normal females (91.5±12.3), which approximate what reported by Kim et al., (2011) who found that waist circumference was higher among females with metabolic syndrome (100.9±0.8) than normal females (83.1±0.5).

Blood pressure was significantly higher among females with metabolic syndrome (141.2±11.5 and 121.3±10.3 for SBP and DBP respectively) than normal females (92.2±9.1 and 79.4±13.7 for SBP and DBP respectively) which in approximate agreement with Jover et al., 2011 who studied prevalence of metabolic syndrome and its components and found that hypertension was significantly higher among those with metabolic syndrome (80.5%) than those without (38.2%).

Mean FBS was higher among females with metabolic syndrome (132.3±52.09) than normal (94.1±13.1) which in agreement with Gharipour et al., 2013 who studied predictors of metabolic syndrome in the Iranian population and found that FBS was significantly higher among females with metabolic syndrome (109.8±45.9) than normal females (81.9±11.5).

Regarding lipid profile there was significant increase in total cholesterol and LDL among females with metabolic syndrome (208.1±31.9 and 129.6±31.4 for cholesterol and LDL respectively) than normal females (186.1±28.5 and 128.7 ±49.6 for cholesterol and LDL respectively).

It was observed from the study that nearly two third of females had central obesity in which high waist circumference was the most prevalent component (66.1%), which n agreement with Gierach et al., 2014 who studied BMI, WC and metabolic syndrome and found that abdominal obesity is the most frequently observed component of metabolic syndrome (68.7%) and with Wiesława et al., 2007 who studied central obesity and other components of metabolic syndrome and found that centrally obesity constituted a high percentage (70%) of the studied females.

From the study, it was found that WC (AUC= 0.74±0.04) was superior than BMI (0.71±0.02) in prediction of metabolic syndrome which was in agreement with Gharipour et al., 2013, who found that WC (with the AUC of 0.85) was better indicators of metabolic syndrome compared to BMI (with the AUC of 0.73).

Conclusion

Obesity mainly central obesity, as well as hypelipidemia predominates among rural females participated in this study which make them carry a higher risk and predisposition to a long list of non communicable diseases among which is metabolic syndrome. It is recommended to carry out community awareness and intervention program tackling these risk factors. High prevalence of metabolic syndrome in postmenopausal group is an alarming sign. Prevention through changes in lifestyle, or early detection and treatment of elevated fasting blood glucose, hypertension, and hyperlipidemia are necessary for prevention of cardiovascular diseases in. Health professionals should consider the post-menopausal women as a major target group for prevention of metabolic syndrome, which is an underlying condition of many non-communicable diseases.

Contributors

All authors contributed substantially to the study conception and design, data collection and analysis, and drafting and revision of the article. All approved the final version to be published.

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