Metabolic Syndrome Among Rural Women

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Keywords
• Metabolic syndrome
• Women
• Minia
• Egypt

INTRODUCTION

Non communicable diseases show an increasing trend globally including Egypt where, the double burden of communicable and non communicable diseases (NCDs) prevails. By 2020, it is expected that NCDs will be responsible for seven out of every 10 deaths in developing countries [1]. WHO predicts that NCDs deaths will increase by 17% over the next decade, with the greatest increase in the African region (27%) [2].

Metabolic Syndrome is an aggregation of conditions that together increases the risk of cardiovascular disease in individuals that would not otherwise be recognized to be at risk. Additionally, Metabolic Syndrome increases the risk of developing diabetes mellitus and chronic kidney disease and is associated with a number of other disorders. It is a common, affecting approximately 25% of the adult population [3,4].

National Cholesterol Education Program (NCEP) introduced the concept and criteria of Metabolic Syndrome into its guidelines to reduce cardiovascular risk which somewhat overlaps the WHO criteria. The 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 [5].

Individuals having metabolic syndrome have a two- to-three
fold risk of cardiovascular disease and a fivefold risk of developing type 2 diabetes. It is estimated that nearly 20-25% 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 [6]. 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 [7]. Nevertheless, each component of MS is individually associated with an increased risk of cardiovascular disease. The number of MS components may be more useful in predicting cardiovascular disease than MS itself, since cardiovascular risk increases as the number of components increases [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:

- Women aged equal or more than 35 years old.
- Apparent healthy females without sign or symptoms suggestive of coronary artery disease.
- Living in El-Burgaia village, Minia governorate from November 2013 to sixth of April 2014.

Exclusion criteria:

- Women younger than 35 years old,
- Women with previous history of atherosclerotic cardiovascular disease as myocardial infarction, coronary heart disease, and angina pectoris
- Pregnant women
- Women with neoplasms.

A systematic random sample of 200 households from among the 20,000 households in El Burgaia village (rural area in Minia district, Minia governorate) was chosen. 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)

Waist circumference 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 ≥ 94 cm for men and ≥ 88 cm for women according to the IDF recommendations for Mediterranean's [4].

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 (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 (126 mg/dl or above) but Pre diabetes is diagnosed by FPG (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

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
- TG ≥ 1.7 mmol/L (150 mg/dl)
- 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 [5].

**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. Categorical variables were compared using chi square tests to detect differences in baseline characteristics. Means compared using t test. Multiple regression analysis of factors contributed in the occurrence of 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.

**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.

From Table (1) it was found that women who had metabolic syndrome were significantly (55.8 ± 9.1) older than normal women (50.1 ± 10.6) (p=0.007). More than two third (72.7%) of those with metabolic syndrome were significantly (55.8 ± 9.1) older than normal women (47.6 ± 13.9) (p=0.09). Blood pressure was significantly higher among women with metabolic syndrome (141.2 ± 11.5 and 121.3 ± 10.3 for SBP and DBP respectively) than normal women (92.2 ± 9.1 and 79.4 ± 13.7 for SBP and DBP respectively). Mean FBS was higher among those with metabolic syndrome (132.3 ± 52.09) than normal (94.1 ± 13.1) (p=0.001). Regarding lipid profile, there was significant increase in total cholesterol and LDL among women with metabolic syndrome (208.1 ± 31.9 and 129.6 ± 31.4 for cholesterol and LDL respectively).

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.

<table>
<thead>
<tr>
<th>Baseline characteristics</th>
<th>Total N=124</th>
<th>Normal N=91</th>
<th>Metabolic N=33</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age group (years)</td>
<td>51.6 ± 10.4</td>
<td>50.1 ± 10.6</td>
<td>55.8 ± 9.1</td>
<td>0.007*</td>
</tr>
<tr>
<td>BMI</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Under weight</td>
<td>30.2 ± 7.1 2</td>
<td>28.9 ± 6.6</td>
<td>33.9 ± 6.9</td>
<td>0.001*</td>
</tr>
<tr>
<td>• Normal</td>
<td>3(1.6%)</td>
<td>2(2.2%)</td>
<td>0.0(0.0%)</td>
<td></td>
</tr>
<tr>
<td>• Over weight</td>
<td>2(16.6%)</td>
<td>28(30.8%)</td>
<td>4(12.1%)</td>
<td>0.01*</td>
</tr>
<tr>
<td>• Obese</td>
<td>60(48.4%)</td>
<td>36(39.6%)</td>
<td>24(72.7%)</td>
<td></td>
</tr>
<tr>
<td>Waist circumference</td>
<td>94.5 ± 12.8</td>
<td>91.5 ± 12.3</td>
<td>102.6 ± 10.8</td>
<td>0.001*</td>
</tr>
<tr>
<td>Blood pressure</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• SBP</td>
<td>126.6 ± 13.8</td>
<td>121.3 ± 10.3</td>
<td>141.2 ± 11.5</td>
<td>0.001*</td>
</tr>
<tr>
<td>• DBP</td>
<td>82.8 ± 10.2</td>
<td>79.4 ± 13.7</td>
<td>92.2 ± 9.1</td>
<td>0.001*</td>
</tr>
<tr>
<td>FBS</td>
<td>104.3 ± 33.6</td>
<td>94.1 ± 13.1</td>
<td>132.3 ± 52.09</td>
<td>0.01*</td>
</tr>
<tr>
<td>Lipid profile</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Total cholesterol</td>
<td>191.9 ± 30.9</td>
<td>186.1 ± 28.5</td>
<td>208.1 ± 31.9</td>
<td>0.001*</td>
</tr>
<tr>
<td>• TGs</td>
<td>129.4 ± 47.1</td>
<td>128.7 ± 49.6</td>
<td>131.09 ± 39.7</td>
<td>0.8*</td>
</tr>
<tr>
<td>• HDL</td>
<td>48.8 ± 13.5</td>
<td>52.2 ± 11.8</td>
<td>47.6 ± 13.9</td>
<td>0.09*</td>
</tr>
<tr>
<td>• LDL</td>
<td>116.6 ± 31.5</td>
<td>112.3 ± 30.4</td>
<td>129.6 ± 31.4</td>
<td>0.006*</td>
</tr>
</tbody>
</table>

As shown from Table 2, more than one fourth (26.6%) of the studied women had metabolic syndrome. More than two third of them had central obesity in which high waist circumference was the most frequent criterion (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. Table 3 shows 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 women had three, four and five criteria of metabolic syndrome components, respectively.

Figure (1), shows the distribution of women by BMI categories. The prevalence of subject with normal weight, overweight and obesity BMIs were 25.8%, 24.2% and 48.4%, respectively. The above Figure 2 shows that 61.3% of the studied female had high LDL; 44.4% had low HDL; 35.5% had high cholesterol and 20.2% had high TG. From Table (4) it was found that blood pressure was significantly higher among postmenopausal women (128.9 ± 14.6 and 84.2 ± 11.1 for SBP and DBP respectively) than premenopausal women (122.3 ± 11.2 and 80.2 ± 7.8 for SBP and DBP respectively). The prevalence of metabolic syndrome was found to be 32.5% in postmenopausal and 15.9% in premenopausal women.

Table (4) show that the most significant factors predicting metabolic syndrome among the studied females were central obesity (OR=9.3, P=0.001) followed by overweight and obesity (OR=3.5, P=0.02) followed by menopause (OR=2.5, P=0.04*) (Figure 3). The above Figure 4 shows AUC (area under the curve) for waist circumference was higher (0.74 ± 0.04, P=0.001) than BMI (0.71 ± 0.02, P= 0.001) in prediction of metabolic syndrome (Table 5).

**DISCUSSION**

It was observed from this study that the percentage of women who had metabolic syndrome according the (ATP III) definition was about 26.6%. This was in approximate agreement with [13] 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 [14] 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 [15]. 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.

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 [16] 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 [17] 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 [17] 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 [18] 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 [19] 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 women with metabolic syndrome.

![Figure 2](Prevalence of Dyslipidemia among the studied females (n=124).)

![Figure 3](Prevalence of metabolic syndrome in pre and postmenopausal women.)
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 is agreement with [20] 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 [21] 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.

The prevalence of metabolic syndrome was higher among postmenopausal (32.5%) than premenopausal women (15.9%) which was in agreement with [22] Sapkota et al., 2015 who found that a significantly higher level of systolic blood pressure was observed among postmenopausal women than premenopausal women (p= <0.001). The decline in the estrogen/androgen ratio dilutes the vaso-relaxant effects of estrogens on the vessel wall and promotes the production of vaso-constrictive factors such as endothelin; hypertension often clusters with other risk factors such as overweight, elevated insulin resistance, diabetes and lipid abnormalities [22].

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From the study, it was found that WC (AUC= 0.74 ± 0.04) was superior to BMI (0.71 ± 0.02) in prediction of metabolic syndrome which was in agreement with [23] 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 hypolipidemia 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.

**LIMITATION OF THE STUDY**

Smoking among rural women is not well documented and not easily to be self-reported due to the prevailing deeply rooted traditions and perceptions towards the female smoker being socially unacceptable practice. So, all smoking history was confined only to passive smoking. No queries about Alcohol consumption was done as it was inappropriate to ask about it being religiously condemned.

**REFERENCES**


