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Prevalence of Metabolic Syndrome & its Components Among University Young Students in South of Gaza, Palestine

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Abstract

Metabolic Syndrome (MetS) is a cluster of cardio-metabolic risk factors including central obesity, insulin resistance, dyslipidemia and hypertension (HTN). It is considered to be a leading cause for cardiovascular disease (CVD) and diabetes mellitus (DM). Also, patients with MetS have high mortality rate. This study aimed to estimate the prevalence of MetS among University College of Science and Technology (UCST) young students using the definition of National Cholesterol Education Program Adult Treatment Panel III (NCEP ATPIII). The study sample was consisting of 200 students (100 males and 100 females). Sociodemographic data, clinical data, life style status and dietary habits of the study population were taken by interview questionnaire. Anthropometric and biochemical evaluation were carried out. Data were analyzed using SPSS version 20. The most prevalent MetS parameters in the total sample were low high density lipoprotein cholesterol (HDL-C) 31.0%, large waist circumference (WC) 14.0%, high Glucose 12.5%, high Triglycerides (TG) 8.5% and high blood pressure (BP) 6.0%. Further, the percentage of female students who had high WC was higher than thus in male students. Based on NCEP ATP III definition, the prevalence of MetS in the total sample was 10.0%, with 8.0% of females and 12.0% males having MetS. There is an evidence for the presence of MetS among UCST students. It also appears that males have high incidence of MetS as compared to females. Early detection, intervention for MetS risk factors & improve dietary habits, healthier life style & promote exercise contributes to reduce the risk of MetS development.

Keywords:

Metabolic syndrome, NCEP ATPIII, Obesity, College students & South of Gaza Strip.

1. Introduction:

MetS is a group of interrelated cardio-metabolic risk factors that embrace insulin resistance, lipid imbalance and HTN (Grundy, et al., 2005). Individuals with metabolic syndrome have considerably elevated risk for developing DM and CVD (Lakka, et al., 2002). In addition, the overall mortality related to CVD is higher among patients with MetS (Trevisan, 1998). MetS is liable for roughly 7% of deaths worldwide, regardless of the cause, and for 17% of those related to CVD. It increases the risk of CVD by 34% and 16% for men

and women, respectively (Reaven, 2010). Around the world, published data on the prevalence of MeS are limited. Studies about MetS have not been widely researched among Arab populations, but the few published studies suggest that it is an increasingly common problem (Al-Lawati, et al., 2003 and Al-Nozha, 2005). According to World Health Organization (WHO), there are several definitions for metabolic syndrome, for instance; the NCEP ATPIII definition and the International Diabetes Federation (IDF) definition (Isomaa, 2003). The

existence of various definitions makes it difficult to compare information from around the world and between different populations (National Cholesterol Education Program (NCEP), 2001). According to the NCEP ATP III MetS is defined as the presence of three or more of any of the following criteria in an individual: High waist circumference (WC), elevated fasting blood glucose (FBG), low high-density lipoprotein cholesterol (HDL-C), elevated triglycerides (TG) and elevated blood pressure (BP) (NCEP, 2001). However, an individual is considered to possess metabolic syndrome if he has any 3 of the subsequent:

- 1 .Abdominal obesity: WC >102 cm in men and > 88 cm in women
- 2 .Hypertriglyceridemia: TG level \geq 150 mg/dl (1.69 mmol/l).
- 3 .Low HDL-C level: < 40 mg/dl (1.04 mmol/l) in men and < 50 mg/dl (1.29 mmol/l) in women.
- 4 .High BP: \geq 130/85 mmHg or use of anti-hypertensive medication.
5. High FBG: \geq 110mg/dl (6.1 mmol/l) or use of hypoglycemic medication.

Taking each component of MetS as a base, the most morbid are raised blood pressure (33%) and low HDL cholesterol (25%) (Reaven, 2010). In the last decade the rates for obesity among the 18 to 29 years old individuals have risen considerably (Mokdad, et al., 2003). Further, there are ethnic disparities in the prevalence of obesity and obesity related risk for chronic diseases in young adults (Wang & Beydoun, 2007). Evaluation of the rates of MetS in young adults among all ethnicities suggest a range from 0.6-13% (Mattsson, et al., 2007 and Dalleck & Kjelland, 2012). College and university students are in a critical transition. It was reported that the first-year college students experience weight gain faster than an average adult (Holm-Denoma, et al., 2008 and Levitsky, et al., 2004). Various studies have reported that the poor health and lifestyle which are followed by university and college students, such as unhealthy diets, lack of physical activity (PA) and sedentary life style, tobacco and alcohol consumption contribute toward increasing the risks for MetS (Fernandes & Lofgren,

2011). To the best of our knowledge, to date no study has been reported to investigate the prevalence rates for MetS among young adults attending college in Palestine. Therefore, this study aimed to estimate the prevalence of MetS among UCST young students using the definition proposed by NCEP ATP III.

1. Materials and Methods

2.1 Study Population, Sample Size and Sampling

The study was a cross-sectional design, started in May,2016 and finished in September,2016. The study population was consisting of 200 age matched students (100 females and 100 males), aged at least 18 years and randomly selected from departments UCST in Khanyounis. Every subject in the study was given a consent form about the study. This form included the purpose of the research, confidentiality of information, and so on.

2.2 Questionnaire interview

The volunteers were interviewed face to face and the questionnaire was filled by researcher's team. The questionnaire was consisted of four parts: sociodemographic data (name, age, sex, level of university study and so on...), clinical data (family history of disease, suffering from disease, blood pressure (BP) status and so on...), life Style (Smoking status, hookah consumption and physical activity situation) and anthropometric indices (Height (m), weight (Kg) and waist circumference (WC).

2.3 Anthropometric measurements

The WC measurement was made at minimal inspiration to the nearest 0.1 cm, midway between the lowest rib and the superior border of the iliac crest (WHO, 2000).

2.4 Blood Pressure Measuring

Blood Pressure for the study population is measured by mercury sphygmomanometer according to American Heart Association (Pickering et al., 2015).

2.5 Blood sampling and biochemical analysis

Under aseptic technique, about 4 ml of fasting (14-16 hours) venous blood sample were collected from each subject in a plain tube (without anticoagulation) and samples were allowed to clot and the serum was centrifuged at room temperature

by Fuhua 80-1 centrifuge, China at 4000 round/minute for 10 minutes. Serum was stored at -18°C until analyzed. Enzymatic colorimetric determination of serum FBG, TC and TGs was carried out using ELITech clinical kit, France (Trinder, 1969; Allain, et al., 1974 and Fossati, & Prencipe, 1982). in addition, HDL-C was determined by precipitating method using ELITech clinical kit, France (Burstein, et al., 1970). FBG, TC, TGs, and HDL-C were measured by spectrophotometer (Stat Fax-1904 Plus, USA) in the clinical chemistry laboratory of University College of Science and Technology-Khanyounis, whereas LDL-C was calculated using Friedewald formula: [LDL-C = TC - (HDL-C) - TG/5(mg/dl)] (Friedewald et al., 1972). Calculation of colorimetric tests for FBG, TC and TGs were performed by spectrophotometer (Stat Fax-1904 Plus, USA) according to beer's law.

2.6 Data analysis

Obtained data were analyzed using Statistical Package of Social Sciences (SPSS) system (version 20.0). Descriptive statistics, Chi-Square Test and t-Test were applied. A significant result means that the P-value for the hypothesis test is less than 0.05. The confidence intervals (CI) was reported as 95%.

2. Results

3.1 General characteristics of the study population

The finding showed that the mean ± standard deviation (SD) of age among the male group was 19.6±2.9 years whereas, the mean ± SD of age was 18.8±3.1 among female group. However, the t-Test statistical analysis showed that there is no statistically significant difference between the study subjects with respect to mean ± SD of age in years (P=0.104).

Table 1 General information of the study population

| Variables | Males No.=100 (%) | Females No.=100 (%) | P- Value |
|------------------|-------------------------|---------------------------|--------------|
| Age group | | | |
| 18 – 20 years | 69.0% | 57.0% | 0.087 |
| 21 - 23 years | 22.0% | 29.0% | |
| 24 years & more | 9.0% | 14.0% | |

| Address | | | |
|-----------------------|---------------|---------------|----------------|
| Rafah | 25.0% | 18.0% | 0.115 |
| Khanyounis | 71.0% | 82.0% | |
| Medial Camps | 4.0% | 0.0% | |
| Smoking status | | | |
| Smoker | 25.0% | 0.0% | 0.000** |
| Non-Smoker | 75.0% | 100.0% | |
| Life Style | | | |
| Sedentary active | 30.0% | 54.0% | 0.000** |
| Moderately active | 40.0% | 40.0% | |
| Vigorously active | 25.0% | 6.0% | |
| Extremely active | 5.0% | 0.0% | |
| Total | 100.0% | 100.0% | |

As shown in Table 1, there were no statistically differences among the study subjects with respect to age and address (P=0.087 & 0.115 respectively) (Table 1). Regarding the smoking status and type of life style, this study found that 25.0% of male were smokers. In addition, 25% of males Vs. 6 % of females their lifestyle was vigorously active. However, there were a statistically differences among the study subjects with respect to smoking status and type of life style (P=0.000 & 0.000 respectively) (Table 1).

3.2 Percentage of NCEP-ATP MetS criteria by gender

Table 2 Percentage of MetS criteria by gender

| Variable | Males No.=100 (%) | Females No.=100 (%) | Total No.=200 (%) | P- value |
|------------------|-------------------------|---------------------------|-------------------------|-------------|
| Low HDL-C | 30.0% | 33.0% | 31.0% | 0.648 |
| High TGs | 9.0% | 8.0% | 8.5% | 0.800 |
| High FBG | 14.0% | 11.0% | 12.5% | 0.520 |
| Large WC | 9.0% | 19.0% | 14.0% | 0.011 |
| High BP | 7.0% | 5.0% | 6.0% | 0.552 |

Table 2 shows the most prevalent MetS parameters in the total sample, which were low HDL-C (31.0%), large WC (14.0%), high Glucose (12.5%), high TG (8.5%) and high BP (6.0%). It is important to note that despite the higher prevalence, no statistical difference was observed between males and females for HDL-C values (P=0.648). on the other hand, more females had high WC than males. However, statistical significance was observed between the genders for the distribution of high WC (P=0.011)

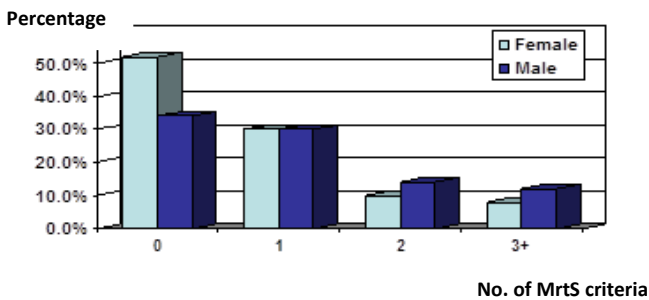


Figure 1: Number of MetS criteria by gender

Based on NCEP ATP III definition, the prevalence of MetS in the total sample was 10.0%, with 8.0% of females and 12.0% males having MetS. A total of 30.0% of the sample had at least one metabolic dysfunction and 12.0% of the sample had at least two metabolic dysfunctions. Approximately 1.5% of the total population had four MetS criteria present (figure 1). Student's BMI status have an important role in predicting the risk for MetS, as 57.8% of the subjects with normal BMI (<25 kg/m²) and 28.5% overweight subjects (BMI > 25–30 kg/m²) had no criteria for MetS, However, only 20.0% obese subjects (BMI ≥ of 30 kg/m²) indicated no criteria for MetS. On the other hand, 32.0% of obese subjects had three or more criteria for MetS, a much higher prevalence than found among subjects in the overweight or normal categories (20.0% and 3.6% respectively)

3.4 Relation of MetS with dietary intake and eating habits of the study participants

Table 3 Relation of MetS with dietary intake and eating habits of the study participants

| Variables | Study Participants | | P-Value |
|---|--------------------|--------------------|--------------|
| | MetS freq. (%) | Non MetS freq. (%) | |
| No. of Meals in dietary system/day | | | |
| 1 meal | 2 (1.0%) | 21 (10.5%) | 0.712 |
| 2 meals | 8 (4.0%) | 72 (36.0%) | |
| > 2 meals | 10 (5.0%) | 87 (43.5%) | |
| Iftar meal intake | | | |
| Always | 7 (3.5%) | 52 (26.0%) | 0.346 |
| Sometimes | 11 (5.5%) | 84 (42%) | |
| Rarely | 2 (1%) | 44 (22%) | |
| Having snacks between main meals | | | 0.936 |

| | | | |
|--------------------------------------|-------------------|--------------------|--------------|
| Always | 6 (3.0%) | 50 (25.0%) | |
| Sometimes | 11 (5.5%) | 94 (47.0%) | |
| Rarely | 3 (1.5%) | 36 (18%) | |
| Coffee and tea drinking/week | | | |
| Non | 4 (2.0%) | 31 (15.5%) | 0.829 |
| 1-3 Cups | 9 (4.5%) | 93 (46.5%) | |
| 4-7 Cups | 3 (1.5%) | 32 (16.0%) | |
| > 7 Cups | 4 (2.0%) | 24 (12.0%) | |
| Milk drinking/week | | | |
| Non | 17 (8.5%) | 129 (64.5%) | 0.150 |
| 1-3 Cups | 1 (0.5%) | 43 (21.5%) | |
| > 3 Cups | 2 (1.0%) | 8 (4.0%) | |
| Fruits & vegetables /week | | | |
| Everyday | 14 (7.0%) | 94 (47.0%) | 0.471 |
| Sometimes | 6 (3.0%) | 86 (43.0%) | |
| Meats consumption/week | | | |
| Non | 1 (0.5%) | 14 (7.0%) | 0.969 |
| Everyday | 2 (1.0%) | 17 (8.5%) | |
| 3 times | 9 (4.5%) | 83 (41.5%) | |
| Once | 8 (4.0%) | 66 (33.0%) | |
| Fasting food consumption/week | | | |
| Non | 4 (2.0%) | 25 (12.5%) | 0.014 |
| 1-3 meals | 6 (3.0%) | 109 (54.5%) | |
| 4-7 meals | 6 (3.0%) | 30 (15.0%) | |
| > 7 meals | 4 (2.0%) | 16 (8.0%) | |
| Drinking of soft drinks/week | | | |
| Never | 0 (0.0%) | 28 (14.0%) | 0.256 |
| Everyday | 8 (4.0%) | 61 (30.5%) | |
| Sometimes | 12 (6.0%) | 91 (45.5%) | |
| Total (%) | 20 (10.0%) | 180 (90.0%) | |

Table 3 reveals the relation between MetS with dietary intake and eating habits of the study participants. thus, according to Chi-Square test, there was a statistically significant relation between MetS and the consumption of fasting food per week (p=0.014). In contrast, there were no statistically significant relation between MetS with any one of each variables of dietary intake and eating habits (P≤0.05).

3. Discussion

This study is one of the first comprehensive studies with the largest sample size estimates the prevalence of MetS among college students in Gaza Strip and reporting the prevalence of metabolic risks integrating clinical and biochemical parameters in a

student population attending the University Collage of Science and Technology. According to NCEP ATP III criteria, the overall prevalence of MetS in the total sample was 10%, and this prevalence are considerably lower than some previously reported studies in around the world (Barrimah, et al., 2009 and Ervin, 2009). Low occurrence rate for MetS which reported in the present finding could be due to well life style and healthy dietary behavior which were followed by students of UCST during their daily life which in turn lead to decreasing the occurrence of MetS criteria among them. On the other hand, the finding of this study agreed with majority of studies that reported low prevalence of MetS criteria (less than 10.0%) among college students (Huang, et al., 2007; Fernandes & Lofgren, 2011 and Dalleck & Kjelland, 2012). The most prevalent MetS parameters in the total sample was low HDL-C 31.0%, which is quite common in college students. A study conducted by Dalleck and Kjelland to assess the prevalence of MetS and MetS risk factors in college-aged students have reported an occurrence rate of 47.3% for low HDL-C in their study sample (Dalleck & Kjelland, 2012). The difference in the MetS prevalence between the genders was not as large as ($P=0.648$) found in the longitudinal study (2003 to 2006) which reported by Ervin in USA (Ervin, 2009). According to the present findings, males were more likely to be more hypertensive, hyperglycemic and hypertriglyceridemic than females and these differences reach a statistically significance ($p\leq 0.05$). Similar result was found by Huang, et al. (2007) who reported that males were more hypertensive, and hypertriglyceridemic than females. In the present study and according to NCEP definition, the prevalence of individuals with one and two MetS criteria are 30.0% and 12.0% respectively and this percentages are considerably higher than majority of previously reported studies (Huang, et al., 2007 and Fernandes & Lofgren, 2011). Regarding to the relation of MetS with dietary intake and eating habits of the study participants, after controlling for their confounding effects, all studied dietary intake and eating habits except fasting food consumption/week were not found to be significantly associated with MetS. This may be due to low occurrence rate for MetS which reported in the present finding (10.0%). These results support the study done by Pamela, et al., (2008) which

suggested that no associations were observed between incident MetS and a prudent dietary pattern or intakes of whole grains, refined grains, fruits and vegetables, nuts, coffee, or sweetened beverages (Pamela, et al., 2008). In contrast, the results of the current study were not in agreement with the study that showed that dietary pattern characterized by a high consumption of fish and a low consumption of sugar, sweets and cold meat, is connected with lower risk of metabolic obesity normal weight as well as with the lower risk of low HDL cholesterol concentration and increased glucose concentration (Suliga, et al., 2015).

4. Conclusions:

Male students were more active in their lifestyle as compared to female students, and this difference is statistically significant ($p\leq 0.05$). Moreover, Male students were more likely to be more hypertensive, hyperglycemic and hypertriglyceridemic than females and these differences reach a statistically significance ($p\leq 0.05$). In addition, the most prevalent MetS parameters in the total sample were low HDL-C (31.0%), large WC (14.0%), high Glucose (12.5%), high TG (8.5%) and high BP (6.0%). The percentage of female students who had high WC was higher than thus in male students ($p\leq 0.05$). Furthermore, Based on NCEP ATP III definition, the prevalence of MetS in the total sample was (10.0%), with (8.0%) of females and (12.0%) males having MetS. Students who consume more fasting food were more likely to develop MetS ($p\leq 0.05$).

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معدل انتشار المتلازمة الأيضية ومكوناتها بين طلاب الجامعات الشباب في جنوب قطاع غزة

الملخص

المتلازمة الأيضية عبارة عن مجموعة من عوامل الاختطار الأيضية والقلبية والتي تتضمن السمنة المركزية ومقاومة ادخال الانسولين إلى الخلايا واعتلال مستويات شحوم الجسم وارتفاع ضغط. يمكن اعتبار المتلازمة الأيضية أحد الأسباب المؤدية إلى أمراض القلب والأوعية الدموية ومرض السكري. يرتفع معدل الوفيات بين المصابين بالمتلازمة الأيضية مقارنة بالأصحاء وخاصة معدل الوفيات المرتبطة بأمراض القلب والأوعية الدموية ومرض السكري.

تهدف هذه الدراسة إلى تقييم معدل انتشار المتلازمة الأيضية بين الطلبة الشباب في الكلية الجامعية للعلوم والتكنولوجيا، خان يونس تبعاً لتعريف برنامج الإرشاد الوطني للكوليسترول/الانحة علاج البالغين -الولايات المتحدة منهجية هذه الدراسة مقطعية وصفية، نُفذت في الفترة الزمنية (مايو - سبتمبر 2016) على ما مجموعه 200 من الطلبة (100 طلاب، 100 طالبات) كلا المجموعتين كانت أعمارهم متقاربة على الأقل 18 عام، أُستخدمت الاستبانات لجمع البيانات الشخصية والجغرافية والسريية ونمط الحياة والعادات الغذائية لكلا المجموعتين، كلا المجموعتين خضعوا لتقييم القياسات الجسمية ولتقدير التراكيز البيوكيميائية للدهون، تم استخدام برنامج الحزمة الإحصائية للعلوم الإنسانية الإصدار 20 في تحليل بيانات الاستبانات ونتائج التحاليل البيوكيميائية. ووجدت الدراسة أن مقاييس متلازمة الايض الأكثر شيوعاً في العينة ككل كانت كالتالي: انخفاض في الكوليسترول مرتفع الكثافة (31.0%) زيادة في محيط الخصر (14.0%) وارتفاع في سكر الدم (12.5%) وارتفاع في الدهون الثلاثية (8.5%) وارتفاع في ضغط الدم (6.0%)، علاوة على ذلك لاحظت الدراسة أن نسبة الطالبات كانت أعلى في محيط الخصر الكبير من الطلاب. كما ووجدت الدراسة أن معدل انتشار متلازمة الايض في العينة الكلية كان (10.0%)، (8.0%) بين الطالبات مقابل (12.0%) بين الطلاب. كما وسجلت الدراسة أن الطلبة الأكثر استهلاكاً للوجبات السريعة أكثر عرضة للإصابة بالمتلازمة الأيضية.

هذه الدراسة قدمت دليل على وجود المتلازمة الأيضية بين طلبة الكلية الجامعية للعلوم والتكنولوجيا. حيث يزداد معدل شيوعها لدى الطلاب مقارنة بالطالبات. الكشف المبكر عن عوامل الاختطار المؤدية للمتلازمة الأيضية والتدخل السريع لعلاجها بالإضافة إلى تحسين السلوكيات الغذائية ونمط الحياة وتشجيع ممارسة الرياضة تسهم في تقليل احتمالية حصول المتلازمة الأيضية بين طلبة الكليات والجامعات.

الكلمات المفتاحية: المتلازمة الأيضية برنامج الإرشاد الوطني للكوليسترول/الانحة علاج البالغين، السمنة، طلبة الكليات، جنوب قطاع غزة.