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Clinical spectrum of metabolic syndrome among the female population in the UAE

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Abstract

Background: Metabolic Syndrome refers to a group of acknowledged physical and metabolic illnesses that encompass abdominal obesity, low levels of high-density lipoprotein (HDL), hypertension, hypertriglyceridemia, hyperinsulinemia, and glucose intolerance. It demonstrated that metabolic syndrome is associated with various atherosclerotic cardiovascular diseases and is prone to developing type II Diabetes Mellitus. Essential Hypertension is considered an essential component of metabolic syndrome and it is highly prevalent in the UAE. Women's lifestyles regarding diet and exercise habits have changed in recent years. The evidence highlights the correlation between different components of metabolic syndrome and women's lifestyle is lacking in the United Arab Emirates.

Aim of the study: This study elaborates on the association of the different components of metabolic syndrome and socioeconomic factors (age, occupation and race) that affect the health of women in the United Arab Emirates which aid in the development of healthcare interventions and policies required to control the risk factors linked to metabolic syndrome and its complications.

Patients and methods: This study used a record-based descriptive study design which was conducted on 501 female patients reported to the Internal Medicine department in Thumbay University Hospital Ajman from January 2022 till November 2023

Results: Our study showed that levels of triglycerides and blood glucose were correlated with occupation status. Hypertriglyceridemia and hyperglycemia were more prevalent in unemployed individuals compared to employed ($p=0.015$) and ($p=0.049$) respectively, while Hypertension and obesity were more prevalent with increasing age groups ($p<0.05$). Low levels of HDL were more prevalent in patients who came from the East Mediterranean Region and Southeast Asian regions compared to other regions ($p=0.041$).

Conclusion: This retrospective analysis demonstrates the correlation of different components of metabolic syndrome with sociodemographic factors in women living in the United Arab Emirates.

Keywords: Metabolic Syndrome; Hypertension; High-density Lipoprotein; Hypertriglyceridemia; Hyperinsulinemia; Obesity; and cardiovascular disease

1. Introduction

The term "Metabolic Syndrome" currently refers to a collection of recognized physical and metabolic disorders such as hyperinsulinemia, glucose intolerance, hypertension, hypertriglyceridemia, low levels of high-density lipoprotein (HDL), and abdominal obesity.[1]

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Its clinical spectrum represents a multifaceted and varied outlook, with each component interconnected. In this investigation, blood pressure, BMI, HDL, blood glucose, and triglyceride (Tg) levels will be taken into account as indicators to determine whether or not the necessary criteria for diagnosing Metabolic Syndrome are present. MetS has shown to be a significant risk factor for cardiovascular disease (CVD), making it an important and pertinent topic concerning current worldwide lifestyle habits.[2]

In this study, we discussed the clinical spectrum of metabolic syndrome, its frequency, and its association with possible sociodemographic factors.

This research is important as it will provide valuable information on the health status of females in the UAE and contribute to the development of culturally appropriate healthcare policies and interventions. Understanding the specific factors associated with metabolic syndrome in this population will also allow for developing targeted interventions to improve the overall health of hypertensive females in the UAE. Moreover, this research is essential as it will aid in identifying the burden of metabolic syndrome and its associated health complications in the UAE, which will help to reduce the risk of metabolic syndrome and its associated health complications [3]

2. Material and methods

- **Study Design** This research study was a record-based, retrospective descriptive study.
- **Setting** The data was collected from the Internal Medicine Department of Thumbay University Hospital, Ajman. Our study period was 8 months long. We stopped collecting data and began with data analysis on 30th November 2023.
- **Participants** Our study population included all those females over the age of 18 who visited the Internal medicine department in Thumbay University Hospital from January 2022 to November 2023. We excluded minors and pregnant women (due to false markers due to gestation).
- **Variables & Data sources/measurement** Variables were divided into two types; Socio-demographic factors (Age, Nationality & Occupation) & components of MetS (Triglyceride, HDL, Blood Glucose, Systolic and diastolic pressure & BMI). We collected data for each variable from the medical records.
- **Bias** The data is biased as our participants were all visitors of the internal medicine department, highlighting an underlying condition/disease that could have inflated the data.
- **Study Size** We had a study size of 501 patients, which we randomly selected, provided their records were between Jan 2022 & Nov 2023.

2.1. Statistical methods

We analyzed the data using SPSS version 28. The results are shown in the form of tables to show; the frequency of the socio-demographic variables, the frequency of the components of MetS, & 3 tables showing the cross-tabulation of each individual socio-demographic factor with the 5 components along with its P-value. We used the Chi-square test to find the association between each individual socio-demographic variable & the components of MetS. The Chi-square test was most suitable as we are comparing independent categorical variables. We had missing data for Triglyceride, HDL, Blood Glucose & Occupation in some cases but were able to tackle it easily enough. We were just looking at each component's frequency as well as association with the sociodemographic factors independently from the other components. Missing data did not impact our research besides reducing the sample size for the individual component.

3. Results

3.1. Frequency Table of Sociodemographic factors affecting MetS

Table 1 This table displays the frequency of sociodemographic factors which affect MetS. Frequencies of participants are listed for their Age, Nationality, and Occupational status. The total number of participants is 501 (Exception: Occupational data missing for 2 participants). 233(46.5%) participants were aged between 18-35 years old and 268(53.5%) participants were above or at the age of 35. 313(62.5%) participants were unemployed (students, housewives) while 188(37.1%) participants were employed. There were 2(0.4%) participants whose occupation status

was missing. 391(78%) participants were from the Eastern Mediterranean region, 47(9.4%) participants from the South–East Asian region and 63(12.6%) participants from other regions.

Table 1 Frequency Table of Sociodemographic factors affecting MetS

Variable		Frequency	%	Total	Missing
Age	18-35	233	46.5%	501	0
	>35	268	53.5%		
Nationality	Eastern Mediterranea n Region	391	78%	501	0
	South-East Asian Region	47	9.4%		
	Others	63	12.6%		
Occupation	Unemployed	313	62.7%	499	2
	Employed	188	37.3%		

3.2. Frequency Table of Components of MetS

Table 2 This table illustrates the frequency of the components of metabolic syndrome that can eventually cause MetS. The frequencies of the participants which are listed are the following: TG (Triglyceride levels). Out of 501 total participants, 237 participants had their triglyceride level stated while others did not. 180(75.9%) participants have triglyceride level <150 and 57(24.1%) participants have triglyceride level >150. 296 participants had their blood glucose level stated while others did not. 107(36.1%) participants have blood glucose level <100 and 189(63.9%) participants have blood glucose level >100. 232 participants had their HDL level stated while others did not. 80(34.5%) participants have HDL level <50 and 152(65.5%) participants have HDL level >50. 403 participants had systole <130(80.4%) while 98(19.6%) participants had systole >130(65.5%). 455 participants had systole <85(90.8%) while 46 participants had systole>130(9.2%). 220(43.9%) participants are obese, 173(34.5%) are overweight, 101(22.2%) have a normal weight and 7(1.4%) participants are underweight.

Table 2 Frequency Table of Components of MetS

Variable		Frequency	%	Total	Missing
TG (Triglyceride	>150	57	24.1%	237	264
	<150	180	75.9%		
Blood Glucose	<100	107	36.1%	296	205
	>100	189	63.9%		
HDL	<50	80	34.5%	232	269
	>50	152	65.5%		
Systole	>130	403	80.4%	501	0
	<130	98	19.6%		
Diastole	>85	455	90.8%	501	0
	<85	46	9.2%		
BMI	Underweight	7	1.4%	501	0
	Normal Weight	101	20.2%		
	Overweight	173	34.5%		
	Obese	220	43.9%		

3.3. Association between Age and Components of Metabolic Syndrome

Table 3 This table shows the association between Age & the components of MetS. We found a significant association between Age & Triglyceride (0.031), Systolic BP (<0.001), Diastolic BP (<0.022) & BMI (<0.001). This shows that women >= 35 have a higher distribution of people in the risk groups for the aforementioned components. We also found no significant association between Age & HDl and Blood Glucose.

Table 3 Association between Age and Components of Metabolic Syndrome

Variable		**Age**		**P-value**
		18-35	**>=35**	
TG	<150	62(84.9%)	118(72%)	0.031
	>=150	11(15.1%)	46(28%)	
HDL	>50	46(65.7%)	106(65.4%)	0.967
	=<50	24(34.3%)	56(34.6%)	
Blood Glucose	<100	49(42.2%)	58(32.2%)	0.080
	>=100	67(57.8%)	122(67.8%)	
Systole	<130	202(86.7%)	201(75%)	<0.001
	>=130	31(13.3%)	67(25%)	

3.4. Association between Nationality and Components of Metabolic Syndrome

Table 4 This table shows the association between Nationality & the components of MetS. We found a significant association between Nationality & HDL (0.041). Women from the South-East Asian Region (41.2%) had a higher distribution of women with HDl <=50 compared to those from the Eastern Mediterranean Region (36.8%) and other regions (12%). There was no significant association between Nationality & the other components.

Table 4 Association between Nationality and Components of Metabolic Syndrome

Variable		**Nationality**			**P-value**
		Eastern Mediterranean region	**South-East Asian Region**	**Others**	
TG	<150	152 (77.6%)	11(68.8%)	17(68.0%)	0.451
	>=150	44(22.4%)	5(31.3%)	8(32.0%)	
HDL	>50	120(63.2%)	10(58.8%)	22(88.0%)	0.041
	<=50	70(36.8%)	7(41.2%)	3(12.0%)	
Blood Glucose	<100	85(36.5%)	10(40.0%)	12(31.6%)	0.773
	>=100	148(63.5%)	15(60.0%)	26(68.4%)	
Systole	<130	322(82.4%)	35(74.5%)	46(73.0%)	0.124
	>=130	69(17.6%)	12(25.5%)	17(27.0%)	
Diastole	<85	357(91.3%)	44(93.6%)	54(85.7%)	0.284
	>=85	34(8.7%)	3(6.4%)	9(14.3%)	
BMI	Normal Weight	79(20.5%)	11(23.4%)	14(22.2%)	0.628
	Overweight	129(33.5%)	20(42.6%)	22(34.9%)	
	Obese	177(46%)	16(34%)	27(42.9%)	

3.5. Association between Occupation and Components of Metabolic Syndrome

Table 5 This table shows the association between occupational status & the components of MetS. We found a significant association between Occupational status and TG (0.015) and blood Glucose (0.049). Unemployed women had a higher distribution of these components in their risk groups compared to employed women. There was no significant association between Nationality & the other components.

Table 5 Association between Occupation and Components of Metabolic Syndrome

Variable		Occupation		P-value
		Employed	Unemployed	
TG	<150	76 (84.4%)	103 (70.5%)	0.015
	>=150	14 (15.6%)	43 (29.5%)	
HDL	<=50	30 (34.9%)	50 (34.5%)	0.951
	>50	56 (65.1%)	95 (65.5%)	
Blood Glucose	<100	51 (42.9%)	56 (31.6%)	0.049
	>=100	68 (57.1%)	121 (68.4%)	
Systole	<130	151 (81.2%)	251 (80.2%)	0.787
	>=130	35 (18.8%)	62 (19.8%)	
Diastole	<85	165 (88.7%)	289 (92.3%)	0.172
	>=85	21 (11.3%)	24 (7.7%)	
BMI	Normal Weight	42(22.8%)	62(20.1%)	0.633
	Overweight	65(35.3%)	105(34%)	
	Obese	77(41.8%)	142(46%)	

4. Discussion

Metabolic syndrome (MetS) is a cluster of interconnected health factors that increase the risk of cardiovascular disease, type 2 diabetes, and other chronic conditions. Understanding the influence of sociodemographic factors on MetS prevalence can inform targeted prevention and intervention strategies. This study explored the associations between employment status, age, nationality, and body mass index (BMI) with various MetS components in women.

The study found a significant association between unemployment and elevated triglyceride levels, suggesting that economic hardship may contribute to metabolic dysregulation [4]. While no significant difference was observed in HDL cholesterol, blood glucose, or blood pressure between employed and unemployed women, these findings highlight the potential for socioeconomic factors to impact specific aspects of MetS. In comparison with other studies, there was a study carried out at King Saud University in (2014) stating that there was a strong significant correlation between occupation status and metabolic syndrome components [5]. There

was another study carried out by the Hispanic Community Health Study/Study of Latinos (HCHS/SOL) in the UAE in 2018[6]. This study found that the only abdominally obese had a strong significant association with occupational status [6]. Another study was conducted at the Korean Centers for Disease Control and Prevention in South Korea in 2016. This study revealed there was no significant association between the component of metabolic syndrome and occupational status [7].

Age emerged as a significant factor influencing several MetS components. Triglyceride levels were higher in older women (above 35 years) compared to in younger women (18-35 years). Systolic blood pressure also increased with age, indicating a potential for age-related vascular changes. These findings aligned with existing literature on the age-dependent nature of metabolic health. In comparison with other studies, there was a cross-sectional study conducted in Brazil focused on the metabolic syndrome in middle aged and older women in 2022. This study confirmed the age-

related increase in triglycerides, blood pressure, glucose level and BMI. AllP-values were less than 0.001, indicating that it was significant [8].

Another study found that in the age groups (31-40) and (51-60 years), BMI was considerably higher in obese women with metabolic syndrome components than in those without metabolic syndrome [9].

The study explored the relationship between nationality and MetS components across three groups according to WHO classification: Eastern Mediterranean Region (EMR), Southeast Asian Region (SEA), and Others. HDL levels displayed significant variations, with EMR and SEA regions showing a higher frequency of low HDL compared to the "Others" group. This suggests potential differences in lifestyle choices and genetic predispositions across nationalities except for HDL [10][11][12]. While no significant associations were found for other MetS components, nationality remains a complex factor influencing overall health and disease risk.

Nationality doesn't have a direct influence on MetS, but rather serves as an indicator for various other factors & habits which may impact MetS. People from different countries & ethnicities have different diets, eating habits, physical activity levels and health practices all of which will impact the blood pressure levels, blood glucose levels, and the weight/waist circumference; and thus, impact MetS. Country of residence & Ethnicity, thus, might be a better indicator of MetS as expatriates might adopt practices native to their country of residence [13].

As expected, BMI demonstrated a strong positive correlation with obesity, a key component of MetS. Higher BMIs were observed in older women and women from the SEA region, highlighting the interplay between age, nationality, and body composition. This underscores the importance of considering a multifactorial approach to managing MetS risk.

The study emphasizes the interconnected nature of sociodemographic factors and their influence on MetS. Unemployment, age, nationality, and BMI all contribute to a complex interplay that can affect metabolic health[14]. Understanding these relationships is crucial for developing targeted interventions to prevent and manage MetS across diverse populations.

Future research should delve deeper into the mechanisms underlying the observed associations. Investigating specific lifestyle factors, dietary patterns, and genetic variations within different socio-demographic groups can provide valuable insights for personalized prevention strategies. Additionally, longitudinal studies are needed to track the long-term health outcomes and MetS progression in relation to these factors.

This study sheds light on the complex interplay between employment status, age, nationality, and BMI in shaping the clinical spectrum of MetS in women [13][14]. By acknowledging the influence of these sociodemographic factors, healthcare professionals can tailor preventive and therapeutic approaches to address the specific needs of diverse populations, ultimately promoting healthier metabolic profiles and reducing the burden of chronic diseases associated with MetS.

Limitation

In this study, the lipid profile and the blood glucose level were not routinely done for all patients in series which might affect the prevalence and frequency of those metabolic syndrome components (triglyceride, HDL, and blood glucose) and their association with sociodemographic factors. Waist circumference is considered one of the main components to gauge the presence or absence of metabolic syndrome. In this specific study, the BMI was used as an alternative weight measurement since the waist circumference was not available in the hospital medical records.

- External Validity

While our data was randomly chosen from the medical records (while following the inclusion criteria), it was not diverse. 78% of our participants were from the Middle Eastern/Eastern Mediterranean Region, less than 10% from South-East Asia, and 12.6% from other regions/continents. This could serve as a disrupting factor while trying to generalize the study to the worldwide population. In addition, we collected the data from the internal medicine department, making our data biased as the participants already have pre-existing problems which could affect their health markers.

5. Conclusion

Out of the 501 participants, 24.1% of women had a triglyceride level below 150, and 75.9% had a level over or equal to 150. The HDL level was greater than 50 in 65.5% of cases, whereas it was less than or equal to 50 in 34.5% of cases. The blood glucose level of 36.1% of women was less than 100, whereas the blood glucose level of 63.9% of women was more than or equal to 100. 19.6% had systolic pressure less than 130 80.4% had systolic pressure more than or equal to 130. Only 9.2% of women had diastolic pressure less than 85 while 90.8% of women had diastolic pressure more than or equal to 85.

According to the BMI classification, 1.4% were underweight, 20.2% were in the normal range, 34.5% were overweight and 43.9% were in the obese category.

In summary, the study showed a significant correlation between increasing age and higher triglyceride, systolic and diastolic blood pressure, and BMI levels. There was a significant correlation between HDL and nationality, as well as a strong association between occupation and two components of metabolic syndrome - triglycerides and blood glucose.

Recommendations

People must begin screening for essential health indicators at an early age, especially in communities with a higher risk of vulnerability. Public campaigns should also be carried out to promote awareness about the significance and implications of metabolic syndrome, with a focus on the involvement of sociodemographic factors. Additionally, we would advise making lifestyle modifications because it's crucial to continue eating a nutritious diet, engaging in Regular exercise, visiting the doctor regularly, and monitoring your blood pressure, cholesterol, and sugar levels.

Compliance with ethical standards

Disclosure of conflict of interest

No conflict of interest to be disclosed.

Statement of ethical approval

This study received ethical approval from Gulf Medical University's Institutional Review Board (IRB), which made sure the research followed accepted moral principles. Furthermore, strict protocols were put in place to protect the confidentiality of the data throughout the entire investigation. This included anonymizing participant data to avoid identifying, limiting access to only authorized individuals, and securely storing data. These precautions were taken to protect the confidentiality and integrity of the participants' data both during and after the research procedure.

Statement of informed consent

This study is retrospective, record-based, and uses pre-existing, anonymized data, no consent form was needed. In accordance with ethical principles, informed consent was considered unnecessary because there was no direct interaction with subjects and only de-identified records were examined.

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Author's Short Biography

Abdelrahman Shehata is a medical student at Gulf Medical University who is passionate about general internal medicine and cardiology. He is committed to achieving academic and clinical success and hopes to have a significant influence in the field of medicine. Abdelrahman is always trying to keep up with the latest developments in medicine and is keen to expand his knowledge and skill set through in-depth research and practical experiences. His desire to make a contribution to the healthcare community is demonstrated by his passion for learning and dedication to patient care. He wants to become a well-rounded doctor who thrives in both practice and innovation, with an emphasis on professional development.