



Metabolic syndrome in Iran: A review

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ABSTRACT

This overview of the prevalence of Metabolic Syndrome (MetS) in Iran considers the reports on regional and ethnic variation, international comparisons, and within specific groups, including children, diabetics and women at different stages of their life-course. The reported impact of lifestyle is also discussed. One particular controversy has been the definition of MetS, and this remains a difficulty across ethnic groups and in children and adolescents. The changes in the criteria being applied to determine the presence of MetS, also makes trends in prevalence difficult to interpret.

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1. Introduction

The prevalence of MetS varies with the criteria used to define it, and with demographic factors such as age, gender, ethnicity and socioeconomic status. Iran is ethnically,¹ geographically and climatically² a highly diverse country, with a total population of approximately 80 million people. The interpretation of epidemiological data, on its changing prevalence in Iran must therefore take this into account. The numerous studies attempting to estimate the prevalence of MetS in different age groups and regions of Iran (see Table 1) are difficult to compare directly, as different criteria for MetS have been applied, the age ranges of those recruited do not fully align, and different sampling strategies have been used. Furthermore, if there have been temporal changes in the prevalence of MetS as suggested by some longitudinal studies, the prevalence rates may not be directly comparable. However, the prevalence of MetS in some regions within Iran is amongst the highest reported globally.

2. The reported general prevalence of metabolic syndrome in adults

2.1. In northern Iran

One of the first cohort studies to determine the prevalence of MetS in a defined urbanised region in Iran was the Tehran Lipid and Glucose Study (TLGS),³ in which the MetS was defined by the presence of three or more of the following components: abdominal obesity, hypertriglyceridemia, low high density lipoprotein-cholesterol (HDL-C), high blood pressure (BP), and high fasting blood glucose (FBG). The age-standardized prevalence was reported as 33.7% and increased with age in both sexes, but was significantly more common in women than in men (42% vs. 24%).

More recently (2009) in an urban population of 2941 adults > 20 years old from Zanjan province, located to the west of Tehran, MetS was defined using National Cholesterol Education Program, Adult Treatment Panel-III (ATP-III) criteria⁴ and was present in 23.7% of subjects (23.1% of men and 24.4% of women).⁵

The prevalence of MetS and its association with body mass index (BMI), socio-demography, and lifestyle habits was investigated in a random sample of 984 women aged 30–50 years old living in Babol in 2009. ATP-III criteria were used to define MetS and its overall prevalence was 31.0%. Abdominal obesity was found in about 76.6% (n = 273) of subjects. Older age, higher waist circumference (WC), higher systolic (SBP) and diastolic (DBP) blood

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Abbreviations			
AHAP	Amirkola Health and Ageing Project	IFG	Impaired fasting glucose
ALT	Alanine aminotransferase	IGT	Impaired glucose tolerance
AST	Aspartate aminotransferase	IHHP	Isfahan Healthy Heart Program
ALP	Alkaline phosphatase	IR	Insulin-resistant
ATPIII	National Cholesterol Education Programme, Adult Treatment Panel-III	IS	Insulin-sensitive
CMetSys	Continuous Metabolic Syndrome risk score	JIS	Joint Interim Societies
DASH	Dietary approaches to stop hypertension	KERCADRS	Kerman Coronary Artery Disease Risk Study
GDM	Gestational diabetes mellitus	LDL-C	Low density lipoprotein-cholesterol
HDL-C	High density lipoprotein-cholesterol	MetS	Metabolic Syndrome
HOMA	Homeostasis model assessment	NAFLD	Non-alcoholic fatty liver disease
IDF-AHA/NHLBI	International Diabetes Federation-American Heart Association/National Heart Lung and Blood Institute	NHANES	National Health and Nutrition Examination Survey
IDF	International Federation of Diabetes	PCOS	Polycystic ovary syndrome
		QUICKI	Quantitative insulin check index
		ROC	Receiver operating characteristic
		SuRNCd	Survey of risk factors of non-communicable diseases
		TLGS	Tehran Lipid and Glucose Study
		WHR	Waist-to-Hip Ratio

Table 1
Studies of the prevalence of metabolic syndrome in adults in Iran.

Date	Region	n	Age (y)	Criteria	Prevalence (%) Total	Male (%)	Female (%)	Urban (%)	Rural (%)
2003 ³	Tehran	10,368	>20		33.7	24	42		
2004 ¹²	Three centres	12,514	>19	ATPIII	23.3	10.7	35.1	24.2	19.5
2007 ²²	Multi-centre	3024	25–64		37.4				
2009 ⁵	Western	2941	>18	ATPIII	23.7	23.1	24.4		
2009 ⁶	Northern Iran	984	30–50	ATPIII		–	31.0		
2007	National survey	–	25–64	IDF	35.95				
2011 ¹⁰⁹					32.96				
2012 ²⁹	North East	1194	>18	ATPIII	29.1	31.1	55.0		
2012 ¹⁶	South East	1802	>19	ATPIII	21	15.4	24.9		
				IDF	24.8	20.0	28.		
				IDF/AHA/NHLBI	23.3	19.7	25.8		
2014 ¹¹	Northern Iran	5826	>18	ATPIII	27.8				
	South East	2243		IDF	26.9				
				ATPIII	12.0				
				IDF	11.8				
2014 ¹⁴	Central	8313	>18	ATPIII	21.9				
2015 ¹⁸	Southern Iran	377	>20	ATPIII	26.8	16.6	36.8		
2015 ¹⁷	Southern Iran	13,304	>20	ATPIII	25.1	18.9	28.4		
				Modified ATPIII	27.7				
				IDF	28.3				
2015 ¹⁵	South East Iran	6000	>18	ATPIII	35.0	31.0	38.0		
				IDF		25.2	42.5		
2015 ¹¹³	North East Iran	9829	35–65	ATPIII	38.8				
2016 ⁹⁰	South West Iran	12,283	20–65	WHO	38.9	36	41.5		
2016 ⁸	Northern Iran	1562	>18	Local criteria	74.3				
2016 ⁷	Northern Iran	5910	40–64	ATPIII		10.9	13.0		
2017 ²⁸	Northern Iran	248	25–70	ATPIII	37.6				
2005	Central Iran	2000	20–74	ATPIII	44.8				
2017 ¹¹²									

ATPIII = National Cholesterol Education Programme, Adult Treatment Panel-III; IDF = International Diabetes Federation; AHA = American Heart Association; NHLBI = National Heart Lung and Blood Institute; NHANES = National Health and Nutrition Examination Survey; WHO = World Health Organization.

pressure, low educational attainment and farming as an occupation were associated with increased risk for MetS.⁶

In 2016, the Shahroud eye cohort study sample comprised of 5190 middle aged individuals (40–64 years) from east of Tehran, was used to assess the prevalence of MetS. This was related to age and gender. The prevalence of MetS was 10.9% in men, 13.0% in women and 12.1% in total. The prevalence increased with age. Using multivariate logistic regression analysis, educational attainment and positive smoking habit, had significant effects on the risk of MetS.⁷

The prevalence of MetS and its components was determined in an elderly population from Amirkola in 2016, using four different

diagnostic criteria.⁸ The study was part of the larger community-based Amirkola Health and Ageing Project (AHAP)⁹ study, and comprised 1562 individuals (55.2% male). Applying an Iranian definition of MetS, 1160 persons (74.3%) had MetS, higher than for the other three definitions. The highest prevalence was observed in females in the age group of 65–74 and the lowest in males in the age group of 85–99 years old.

Amol is near the Caspian Sea, whilst Zahedan is in the southeast, near the border with Pakistan. In 2014, the prevalence of MetS was determined according to two definitions and compared the characteristics of the subjects who met the MetS criteria according to the different definitions. Participants were recruited from family

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