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Prevalence of metabolic syndrome and prediction of diabetes using IDF versus ATPIII criteria in a Middle East population

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ABSTRACT

This study investigates the prevalence and predictive value of metabolic syndrome in Abu Dhabi, using data from the population-based, programme, 'Weqaya'. The Weqaya screen included family history of cardiovascular disease (CVD), CVD risk factors, random blood glucose (RBG) and HbA1c. Those not previously diabetic but at high risk of diabetes (RBG $\geq$ 11.1 mmol/l or HbA1c $\geq$ 6.1%) and randomly selected normal subjects were followed-up with fasting glucose, oral glucose tolerance test (OGTT), HbA1c and fasting triglycerides. In 760 subjects, 325 (42.8%) were male with a mean age of 41.9 years (SD 13.8). Using World Health Organisation (WHO) criteria, 149 (20.2%) were newly diagnosed diabetics. Using International Diabetes Foundation (IDF) and Adult Treatment Panel III (ATPIII) criteria, metabolic syndrome was present in 29.0% vs. 31.5% of non-diabetics, 63.4% vs. 64.2% with impaired glucose handling and 78.6% vs. 79.8% with new-onset diabetes using OGTT ($P < .001$). IDF criteria better predicted pre-diabetes and diabetes (OR 3.4 $P < .001$; OR 6.4 $P < .001$, respectively); ATPIII criteria better predicted high CVD risk scores (OR 13.6 $P < .001$). Whilst IDF and APTIII definitions provide similar prevalence rates, they differentially predict prediabetes, diabetes and CVD. This ongoing study will enable the longitudinal investigation of the development of diabetes and cardiovascular events in this population.

1. Introduction

Despite its relatively young population (with a median age of 19 years in Nationals), population health data from Abu Dhabi, which is the largest of the seven emirates in the United Arab Emirates (UAE), shows that diseases of the circulatory system are the leading cause of mortality in the Emirate, accounting for over 24% of deaths in 2009 [1]. In 2005, the WHO reported that the UAE had the second highest prevalence of diabetes [2] in the world and this was re-confirmed by The International Diabetes Atlas. [3] A recently updated version of the International Diabetes Atlas revealed that the prevalence rate of diabetes in the UAE had shifted to 10th highest worldwide [4].

In response to this, and in line with recent recommendations from United Nations, [5] World Health Organisation [6], World Economic Forum [7] and Institute of Medicine [8], the Health Authority Abu Dhabi created the Weqaya Cardiovascular Disease Screening Programme. In the initial phase of the Weqaya Programme, the UAE National population, over the age of 18, was screened for CVD risk factors including diabetes [9]. A subset of this population who were fond to be at higher risk of having diabetes was further investigated for metabolic syndrome.

Although no population-based studies looking into the prevalence of metabolic syndrome have been conducted in the UAE, a study on overweight and obese individuals in Abu Dhabi aged 18–50 years showed a very high prevalence of 40.5% using criteria from the International Diabetes Federation (IDF)

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[10,11]. Another study performed in the neighbouring country of Qatar, comparing the difference in prevalence of metabolic syndrome found that IDF criteria gave a higher rate of metabolic syndrome of 33.7% (versus 26.5% according to Adult Treatment Panel III (ATP III) criteria) [12,13]. A second study conducted in Iran, estimated the prevalence of metabolic syndrome to be 34.7% based on ATPIII criteria and 37.4% based on IDF criteria [14]. In addition, this study provided an ethnic-specific optimal cutoff point for waist circumference in the Middle East [14].

Several other studies conducted in Middle Eastern populations suggest even higher rates of metabolic syndrome with rates in excess of 40% in the normal population [15–17], however neither of these studies, nor those mentioned above, describe the prevalence of metabolic syndrome and its association with diabetes. Furthermore, there is variation according to different methodologies used in these studies, in particular the differing criteria for defining metabolic syndrome according to WHO, ATPIII (NCEP) and IDF. [11,13,18] The IDF criteria were developed with a view to accounting for ethnic differences in body fat composition. However, due to the lack of available data on GCC and other Middle Eastern populations, the IDF criteria recommend European cutoffs for waist circumference for this population.

This study seeks to investigate the impact of utilising different criteria on the prevalence and predictive value of metabolic syndrome in Abu Dhabi, using data from the population-based, cardiovascular screening programme, 'Weqaya'.

2. Methods

The Weqaya Screening Programme was commenced in April 2008 for UAE Nationals (≥18 years) residing in Abu Dhabi, and is conditional for enrolment into the government's health insurance plan ''Thiqa''. Sreening details are described elsewhere. [9] This was a population-based clinical screening programme, the data from 2008 to 2010 were used with a cross-sectional study design [9].

A network of 25 existing walk-in clinics was designated as Weqaya screening centres. Screening staff in these clinics were trained to conduct the screening and were provided with written protocols. A standardised nurse-administered screening form for the collection of data was developed and used by all participating clinics. Completed forms were collated in hard copy and submitted to a central office for data entry using a standardised methodology.

Individuals were consented for inclusion in screening, participation in research and future contact, in line with the principles of the Abu Dhabi Medical Research Council which regulates human health research in Abu Dhabi. [1]

Initial screening for the Weqaya programme included demographics, self-reported indicators including past or current smoking (of cigarettes, pipes, shisha or cigars), history of diabetes, hypertension, dyslipidaemia and cardiovascular events and family history of premature cardiovascular disease. Anthropometric measures included measures for waist–hip ratio (WHR), body mass index (BMI) and a single arterial blood pressure (BP) reading; blood testing included random glucose, low density lipoprotein (LDL) and high density lipoprotein (HDL) cholesterol and glycosylated haemoglobin (HbA1c). [9]

The first consecutive subjects who were either suspected to be at higher risk of having diabetes (HbA1c ≥ 6.1% or random glucose ≥ 11.1 mmol/l) or had another reason to re-visit the clinic e.g. for further phlebotomy, were invited back for further investigation for diabetes and had the full set of investigations required for the investigation of metabolic syndrome. Subjects with pre-existing diabetes were excluded from follow-up. Follow-up subjects were asked to fast for 12 h prior to the appointment and were questioned on duration since their last intake of food or drink. Further investigation was undertaken for fasting triglyceride, fasting glucose level, oral glucose tolerance testing (OGTT) using a 75 mg glucose load in line with WHO guidelines [16] and HbA1c level. HbA1c was measured on whole blood using laboratory methods that employ the Cobas Integra Instrument in line with the National Glycohemoglobin Standardization Program (NGSP), standardised to the Diabetes Control and Complications Trial reference assay [19].

Metabolic syndrome was defined using IDF and ATPIII definitions [11,13]. The IDF criteria define metabolic syndrome as the presence of central obesity plus two other risk factors as in Table 1. Central Obesity is defined using waist circumference with ethnicity specific values which for the Middle East are European values until region specific data become available. The ATPIII definition for metabolic syndrome is the presence of 3 out of 5 risk factors as listed in Table 1; the main difference is that ATPIII uses a higher threshold for waist circumference threshold.

Table 1 – Criteria for defining metabolic syndrome using IDF and ATPIII classifications.

Risk factor	IDF	ATPIII
Definition	Central obesity (or BMI > 30 kg/m^2) + two other risk factors	3 out of 5 risk factors
Central obesity	>94 cm in males >80 cm for females	>102 cm in males >88 cm in females
Fasting triglyceride	>150 mg/dL (1.7 mmol/l), or on specific treatment for this lipid abnormality	>150 mg/dL
HDL cholesterol	<40 mg/dL (1.03 mmol/l) in males <50 mg/dL (1.29 mmol/l) in females	<40 mg/dL (1.03 mmol/l) in males <50 mg/dL (1.29 mmol/l) in females
Fasting plasma glucose	>100 mg/dL (5.6 mmol/l), or previously diagnosed type 2 diabetes	>110 mg/dL (6.1 mmol/l)
Blood pressure	>130/85 mmHg, or treatment of previously diagnosed hypertension	>130/85 mmHg