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Abstract

Background: A previous community-based cross-sectional survey conducted in a semi-urban community revealed that 44% of people aged 18+ years manifest dysglycaemia, which appears to echo the national trend. There is lack of studies examining the role of anthropometric indices in people with dysglycaemia.

Aim: We explored the screening ability of anthropometric indices, body mass index (BMI), waist circumference (WC), waist-to-hip ratio (WHR), and waist-to-height ratio (WHtR) to detect dysglycaemia in the adult Omani population based on a community-based survey conducted in 2005. The potential of anthropometric indices to detect the presence of glycaemic disorder could aid in detection, prevention and health education.

Methods: A total of 480 male and 795 female subjects aged 18+ years were included in this study. The prevalence of dysglycaemia was analysed using the American Diabetic Association criteria. Logistic regression approach and Receiver-Operating Characteristic (ROC) curve analysis was performed.

Results: The analysis revealed that mean values of age, BMI, WC, WHR and WHtR increased significantly from normoglycemic to pre-diabetic and further to diabetic in both sexes (P

Conclusion: Among the anthropometric indices we investigated, WHtR was the best predictor of dysglycaemia among Omani adults aged > 25 years.

Key words: Anthropometric measurements, Dysglycemia, Diabetes, ROC Curve

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Introduction

Oman has been internationally praised for the fulfilment of most of the Millennium Development Goals 2015 (1), however, along with the challenge of communicable diseases, there is an increasing challenge from noncommunicable diseases, and diabetes appears to be prominent, precipitated by rapid urbanisation and rising standards of living (2,3). According to 2000 data from the Ministry of Health, the prevalence of diabetes was 11.6%, rising to 12.3% in 2010 (4,5). Approximately 29% of the Omani population was classed as overweight and 9% as obese (6). In a population-based national survey 22% of those surveyed were overweight or obese (7). Obesity and overweight are recognised as independent risk factors for the development of diabetes and dysglycaemia (8,9). In a 2010 community-based cross-sectional study, 35% of the Omani men were prediabetic; advanced age and being overweight were identified as strong contributing factors (10).

Within the emerging epidemic of dysglycaemia, more studies are needed to identify anthropometric characteristic that would have a direct bearing on dysglycaemia. In the available literature, various phenotypical indicators have been linked to the presence of dysglycaemia. In Western population, body mass index (BMI) has been associated with the presence of

dysglycaemia (11). The World Health Organization has provided guidelines for using BMI to assess dysglycaemia with a cut off value of 25 kg/m2 (12). It is not clear whether this is applicable to the Omani population. Waist circumference (WC) and waist-to-hip ratio (WHR) have also been suggested as indicators of intra-abdominal fat. Some studies have suggested that WC and WHR are better predictors of dysglycaemia than BMI (13–15). There is also a dissenting view suggesting the relationship between WHR and dysglycaemia is poor. Some preliminary data suggest that WHR correlates more weakly with glucose tolerance; sex is also a significant confounding factor (16). A few studies have reported that waist-to-height-ratio (WHtR) is a better screening tool than other anthropometric indices, with a cut off value of 0.5 (17,18). Against such a conflicting background, more studies are needed to determine the correlation between anthropometric measures and dysglycaemia. This would help to detect dysglycaemia cases early among apparently healthy people, and, in turn, mitigate morbidity and mortality. This study aims to explore the screening capacity of anthropometric indices to adequately detect dysglycaemia in adult Omani population.

Methods

Survey

In this study, we used the data from a cross-sectional, community-based survey carried out on 1275 Omani adults, aged ≥ 18 years, residing in a semi-urban satellite town of Bidbid, which is situated 30 km west of the capital, Muscat, during September 2004 to February 2005.

The following exclusion criteria were used: participants with diabetics who were taking medication or insulin for the disease; pregnant women or mothers within 3 months postpartum; and people with conditions that were likely to interfere with research procedures, e.g. inability to communicate with staff or having a persistent and intransigent illnesses.

Sample design and participants

A sample size of 1500 subjects was determined based on the estimated prevalence of prediabetes (36%) (10) and diabetes (12.3%) (4), a nonresponse rate of 10%, an error margin of 5% with 95% confidence interval. We adopted a 2-stage random cluster sampling design. The first stage was the random selection of census enumeration areas, where each area comprised 100 households as defined by the Ministry of National Economy. Out of 100 census enumeration areas, 20 were randomly selected using a random number allocation method. A sampling frame of 6150 subjects was developed by conducting a census among the 20 randomly selected areas. The name, family name, sex, age, household and locality of all eligible subjects was recorded on field maps. In the second stage, 1500 subjects were randomly selected from the sampling frame using computer generated random numbers. All persons aged ≥ 18 years in the selected households were invited to participate in the study. Of these, 1275 completed the structured pre-tested questionnaire, an overall response rate of 85%.

Anthropometric and laboratory measurements

Blood glucose (both fasting and post-prandial, 2 hours following ingestion of 75 g glucose) was collected from the venous blood at sodium fluoride potassium oxalate tubes and tested at the laboratory after separating plasma on the same day, using Hitachi 911 automated clinical chemistry analysers (Boehringer–Mannheim). The reagents used were supplied by the same manufacturer. Glycaemic status according to the American Diabetes Association (ADA) criteria was used: