International Day for the Evaluation of Abdominal obesity: rationale and design of a primary care study on the prevalence of abdominal obesity and associated factors in 63 countries

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Sedentary lifestyles and energy-rich diets are driving an increasing prevalence of abdominal obesity, which is associated with cardiovascular risk. Reliable estimates of the worldwide prevalence of abdominal obesity are needed to quantify the associated health risk. The International Day for the Evaluation of Abdominal obesity (IDEA) study is a large, international epidemiological cross-sectional study designed to provide reliable data on the distribution of waist circumference according to region, gender, age, and socio-economic level in 177 345 primary care patients from 63 countries across five continents. Any non-pregnant patient aged 18–80 consulting one of the randomly selected primary care physicians on two pre-defined half days was eligible to participate in the study. The primary objective was to estimate the prevalence of abdominal obesity in primary care, in each participating country. Secondary objectives were to estimate the prevalence of hypertension, type 2 diabetes, dyslipidaemia, and smoking, and to evaluate their associations with abdominal obesity, according to age, gender, and socio-economic level and region. The IDEA study will provide the first global map of the prevalence of abdominal obesity and associated comorbidities in primary care practice.

KEYWORDS
Abdominal obesity; Coronary heart disease; Epidemiology; Primary care; Prevalence; Waist circumference

Introduction

The associations between obesity and an increased risk of the metabolic syndrome, diabetes, and cardiovascular disease are well established.[1–3] However, there is increasing evidence suggesting that abdominal obesity (characterized by intra-abdominal adiposity and high waist circumference) is a stronger predictor than generalized obesity [defined by elevated body mass index (BMI)] of subsequent development of major coronary events,[4–6] vascular mortality,[4] diabetes,[7] and the metabolic syndrome.[8] For example, INTERHEART, a case-control study involving 29 972 participants in 52 countries, showed that the population-attributable risk of a first myocardial infarction associated with the top two tertiles of waist-hip ratio, in comparison to the lowest tertile, was 20.1%.[6] In addition, an analysis from the French Data from an Epidemiological Study on the Insulin Resistance syndrome (D.E.S.I.R.) study suggested that the more adverse cardiometabolic risk profile in men, compared with

women, was largely due to the greater tendency of men to develop abdominal obesity.[9] The prognostic importance of abdominal obesity is recognized by the inclusion of this parameter within the diagnostic criteria of the metabolic syndrome proposed by the US authorities, [10,11] and in the recent criteria proposed by the International Diabetes Federation (IDF),[12] the presence of abdominal obesity is a prerequisite for a diagnosis of the metabolic syndrome according to the IDF criteria.[12]

Surveys have demonstrated a high prevalence of abdominal obesity in western populations. For example, the prevalence of abdominal obesity in the US men (waist circumference >102 cm) and women (waist circumference >88 cm) was 36 and 52%, respectively, in 1999–2000, and had increased from 30 and 46%, respectively, in 1988–1994.[13] In European men and women, abdominal obesity defined according to locally defined waist criteria (using cut-off values between 90 and 102 cm for men and 80 and 92 cm for women) was 8 and 18%, respectively in Greenland,[14] 21 and 24% in Belgium,[15] 8 and 13% in France,[16] 23 and 65% in Spain,[17] and 18 and 39% in Turkey.[18] Even higher rates of abdominal obesity were found in primary care populations. In the recent nationwide Diabetes Cardiovascular Risk Evaluation: Targets and Essential Data for Commitment of Treatment (DETECT) study of 55 518 consecutive German primary care attendees, 43% of male and 53% of female patients met criteria for abdominal obesity (waist circumference ≥102 for men and ≥88 for women).[19] The developing world has not been spared the burden of abdominal obesity, with estimated prevalence rates (men and women) of 21 and 42% in South Korea,[20] 26–41% and 21–54% in different ethnic groups in Singapore,[21] and 35% in women in an urban centre in China.[22] Recent data from Cameroon, Africa, have described a prevalence of abdominal obesity of 18% in men (waist circumference >94 cm) and 66% in women (waist circumference >80 cm).[23] An increasing trend towards urbanization of populations in the developing world is driving increased obesity rates in these nations.[24–27]

Thus, abdominal obesity poses a major and increasing challenge to health worldwide. Although the studies described earlier attest to the potential magnitude of the problem posed by abdominal obesity, reliable data estimates are not available for all countries: many studies have been based on small sample sizes, the methodology and diagnostic criteria for measuring abdominal obesity differ, and few data are available from the primary care setting.

Against this background, the International Day for the Evaluation of Abdominal obesity (IDEA) study was carried out to provide global and region-specific estimates of the prevalence of abdominal obesity in primary care populations, and its associated comorbidities, using consistently applied criteria and methods. Here, we report the rationale and design of the study.

Design of the IDEA study

Objectives

The primary objective of the IDEA study was to estimate the prevalence of abdominal obesity in an unselected population of consecutive patients consulting a randomly selected sample of primary care physicians on two prespecified half-days. Secondary objectives were (i) to estimate the prevalence of cardiovascular risk factors (hypertension, type 2 diabetes, dyslipidaemia, and smoking) and (ii) to study the association between abdominal obesity and these conditions (risk factors).

Organization

The IDEA study is a large, international epidemiological cross-sectional study, conducted in 63 countries across five continents (Figure 1). A Steering Committee of international experts in cardiometabolic care oversaw the study (see Acknowledgements), and their responsibilities included the design of the data collection form, the design of appropriate methodology to ensure a representative sample of primary care physicians and their patients, operational guidelines for communication with physicians and patients, and data quality. Three members of the Steering Committee served as an Executive Steering Committee, and were responsible on behalf of the Steering Committee, for day-to-day operational decisions required during the conduct of the study. National co-ordinators administered the study in individual countries, and were responsible for interactions with individual physicians.

Participants: patients

All patients aged between 18 and 80 consulting their primary care physician on the pre-specified two half-days were asked for informed consent and invited to participate, irrespective of their reason for consultation. Women with known pregnancy were excluded. A booklet given to patients provided easy-to-read information on the study objectives and the background of the study.

Participants: physicians

Random selection of physicians
The IDEA Study was designed to ensure recruitment of a representative sample of patients consulting their primary care physician. To achieve this, a random sample of primary care physicians representing all geographic areas in each participating country was recruited (Figure 2). Within most countries, an exhaustive list of all actively practising primary care physicians was compiled, together with their contact details, location, and type of practice (e.g. office, hospital, etc.). This initial list was split into geographical areas, according to the most commonly-used administrative boundaries used within each country, and a target number of physicians within each area was defined.

Central management of the randomization process in most countries was conducted by experienced specialist commercial research organizations [Intercontinental Marketing Services (IMS) or Centre de Gestion des Données Informatiques Médicales (Cegedim)]. In countries where random selection of physicians was managed by IMS, the list of physicians was grouped and sorted according to geographical location. A random start number for recruitment was defined within the list, and every nth physician on the list from this start point was contacted (the primary contact list). If a physician declined to participate, the next physician on the list was contacted, and then the following one if that physician declined to participate, and so on. The value of n was set to allow sufficient reserve physicians, on the basis of reasonable assumptions regarding willingness to participate. In this way, one contact list was constructed to ensure a random sample of participating physicians. Countries in which physician recruitment was managed by Cegedim employed a randomization procedure based on Floyd's ordered hash table algorithm for simple random sampling,[28,29] to provide a rapid and efficient method for handling large data sets within SAS analysis software.

In some countries (Table 1), the randomization process was managed locally, after implementing stringent quality assurance standards. In China, for example, all patients were seen within the hospital setting, and the randomization process involved selection of three

urban hospitals (one each from primary-care, secondary-care, and tertiary-care hospitals) and one hospital from a rural village or town, and one rural county hospital. Identical standards for quality assurance of databases of local physicians were applied for central and local randomizations to ensure consistency in the recruitment of physicians between countries. Procedures for generating an exhaustive list of primary care physicians, the definition of regions within each country, statistical procedures relating to the randomization, and the generation of lists of participating physicians were supervised by the National Coordinator and the Steering Committee. Standard software packages were used for data entry, data management, and analyses.

Material provided for physicians

Participating physicians were provided with the IDEA study protocol, data collection forms, and a poster for display in their practice designed to provide information for patients about the study. In addition, participating doctors were trained in the measurement of anthropometric variables. Booklets were provided in local languages for physicians, providing practical information necessary for the administration of the study and background information on abdominal obesity, and the associated metabolic and cardiovascular risks (contact H.-U.W. for a copy of this material). Physicians were also provided with a standardized method for waist circumference measurement, as follows: 'Waist will be measured at the midpoint between the lower rib margin and the iliac crest in centimetres. A point mid-way between the lowest rib and the iliac crest will be identified. The metric tape will be held firmly in an horizontal position and will be placed around the waist. It is recommended that the observer sits beside the participant while the readings are taken. The tape should be loose enough to allow the recorder to place one finger between the tape and the subject's body. Subjects will be asked to breathe normally and the time of reading is taken at the end of a normal exhalation, while ensuring that the subject does not contract the abdominal muscles.'

Sample size determination

Sample size requirements were determined at the country level. On the assumption that the expected prevalence of abdominal obesity among patients visiting a primary care physician is likely to be about 50%, the number of patients included in primary care practice should be between 1100 and 9600 per country, in order to estimate this prevalence with a precision of 1–3%. Accordingly, the number of physicians required in each country depended on the numbers of patients seen each day. The initial recruitment goal based on these considerations was to enrol at least 123 000 patients under the care of at least 7600 primary care physicians in 63 countries.

Data collection

Data were collected on two pre-specified half-days, between 9 May and 6 July 2005. The same days were used in each country, and were chosen to avoid public holidays, religious festivals, times when patients were likely to be on vacation, etc. The following variables were assessed by use of a standardized data collection form. Waist circumference (cm), height (cm), and body weight (kg) were measured and recorded for all participants. In addition, demographic data were collected on gender, year of birth, highest level of education (less than high school, high school, college/university, or postgraduate), and profession (employed, unemployed or student, retired, or unable to work). Smoking status (never, current, or former) and the presence or absence of known cardiovascular risk factors, defined as existing cardiovascular disease (coronary heart disease, stroke, or prior revascularization), dyslipidaemia, hypertension, or diabetes (type 1 or 2) were also recorded. These data were

reported by the physicians who were not required to provide documentation to validate their diagnostic decisions. A further question recorded whether or not women were post-menopausal, and if so, whether they were receiving hormone replacement therapy.

On-site quality assurance procedures were conducted by qualified personnel, for random selections of 10 patients attending 5% of the study sites. Patient data collection forms were divided into two parts: the main area for data collection and a counterfoil, each of which identified each patient by a unique number. These were separated after completion of data collection for a given patient; the counterfoil was retained at the study site, while the main part of the forms was taken to the central data processing site. Study personnel contacted investigators by telephone and verified the accuracy of material relating to patients' age and gender. Quality control procedures were completed within 5 days of receiving data collection forms from study sites nominated for inclusion in the quality control procedure.

Statistics

All data were processed centrally at a single site designated for this purpose. Data on demography, obesity, central adiposity, and cardiovascular risk factors will be summarized using descriptive statistics. National estimates of the prevalence of abdominal obesity will be given according to criteria proposed for the US (National Cholesterol Education Program/Adult Treatment Panel III),[10] the Asian-Pacific region (World Health Organization/International Association for the Study of Obesity/International Obesity Task Force),[30] and according to the recent criteria for the metabolic syndrome from the IDF.[12] Age and sex standardized prevalences, using the age distribution of the total sample separately for each sex, will allow comparisons of the frequency of abdominal adiposity between countries and regions. Factors associated with abdominal obesity will be explored using multivariate analyses. Statistical analyses will be performed at the 5% significance level, using two-sided tests or two-sided confidence intervals.

Ethics

The study was conducted according to the principles laid down in the 18th World Medical Assembly (Helsinki, 1964) and all subsequent amendments, and in accordance with the guidelines for Good Epidemiology Practice. All countries obtained ethical approval for the study from their local Ethics Committees. Patients provided written informed consent in the presence of the physician. Consent forms were translated into local languages and adapted to comply with local data protection requirements where necessary. No information was recorded that could be used to identify an individual patient.

Physicians and patients in the IDEA study

Table 1 shows the number and proportions of physicians and patients participating in the IDEA study, in each of the 63 countries, by region. On average, of 21 100 eligible physicians contacted, 6407 (30%) participated; doctors' participation rates ranged between 4 and 77%, although physician participation rates below 10% occurred in only four countries. Of 182 970 patients screened, 177 345 patients participated, resulting in a total response rate of 97%. Patient participation rates by region (as defined in Table 1) ranged from 84% of patients screened (Canada) to 99% of patients screened (Latin America and South Asia).

Discussion

The IDEA programme will provide the first worldwide estimates of the prevalence of abdominal obesity in the primary care setting, using consistently applied methodology and criteria. These data will assist greatly in quantifying the magnitude of the threat to individuals and healthcare systems from the increasing prevalence of this condition and its associated comorbidities. The inclusion of waist measurement as well as data necessary to calculate BMI (body weight and height) is an important feature of the design of IDEA, as abdominal obesity characterized by high waist circumference appears to provide prognostic data beyond BMI. The large size of the survey will also allow for exploration of better thresholds for waist circumference with regard to abdominal obesity in men and women of different ages and in different countries. It is important to remember, however, that IDEA will provide reliable estimates of abdominal obesity prevalence and associated cardiometabolic risk factors that are relevant only to users of primary care services. This population is likely to have a higher degree of comorbidity as well as a larger waist circumference than nationally representative samples from the general population in a given country.

Analyses from the Nurses' Health Study showed that increasing waist circumference was associated with an increasing risk of coronary heart disease irrespective of BMI.[5] After multivariate adjustment for BMI, a waist circumference >96.5 cm was associated with a relative risk of coronary heart disease of 3.06 (95% CI 1.54–6.10). A further analysis from this study demonstrated an increased risk of developing diabetes in subjects with abdominal obesity [relative risk for 90th vs. 10th centile for waist circumference of 5.1 (2.9–8.9)].[7] Increased secretion by intra-abdominal adipocytes of a range of bioactive substances, including free fatty acids, pro-inflammatory mediators, together with decreased secretion of adiponectin from these cells, may adversely influence overall cardiometabolic risk either directly or indirectly via promotion of insulin resistance.[31–33]

The measurement of waist circumference is also suitable for use in evaluating patients for cardiovascular interventions in routine clinical practice. The high rate of participation in the study illustrates the readiness of patients to have their waist circumference measured in general practice. For the primary care physician, the simultaneous presence of high waist circumference and an additional cardiovascular risk factor, such as hypertriglyceridaemia or hyperglycaemia will facilitate the identification of patients likely to have the insulin resistance-driven atherogenic triad of elevated ApoB, hyperinsulinaemia, small dense LDL.[34] The data on the prevalence of abdominal obesity and related cardiovascular risk factors from IDEA will serve as a useful educational tool in communicating the value of this simple technique to physicians.

Conclusions

The IDEA study will provide the first global map of the prevalence of abdominal obesity in primary care practice, as indicated by high waist circumference, along with its associated comorbidities. Further, these data will illustrate the importance of abdominal obesity as a risk factor for cardiovascular disease and type 2 diabetes beyond BMI.

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Appendix

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IDEA National Coordinators were as follows. Argentina: CP Lau; Australia: M Nelson; Austria: E Rebhandl; Belgium: G De Backer; Brazil: A Avezum; Bulgaria: S Zaharieva; Canada: A Sharma; Chile: S Kunstmann; China: WU Yang Feng; Colombia: A Ruiz; Czech Republic: V Hainer; Denmark: OL Svendsen; Dominican Republic, Jamaica, Trinidad and Tobago: A Gonzalez Medina; Ecuador: M Pasquel; Egypt: M Ibrahim; Estonia: M Vigimaa; Finland: M Savolainen; France: P Amouyel; Germany: HU Wittchen; Greece: S Raptis and D Kremastinos; Guatemala: MA Rodas; Hong Kong: C-P Lau; Hungary: L Halmy; India: A Misra; Indonesia: S Soegondo; Ireland: V Maher; Israel: Avraham Porath; Italy: M Carrruba; Korea: H-J Yoo; Latvia: A Kalveli and G Bahs; Lithuania: V Kasiulevicius; Malaysia: MZ Morad and R Zambahari; Mexico: AL Esqueda; Morocco: C Abdelkhirane; Norway: T Pedersen; Pakistan: A Jabbar; Peru: R Gamboa; Philippines: ML Abrahan; Poland: K Narkiewicz; Portugal: V Gil; Russia: RG Oganov; Saudi Arabia: M Halawa; Singapore: ES Tai; Slovakia: A Dukát; Slovenia: I Švab; South Africa: M-T van der Merwe; Spain: B Moreno and F Casanueva; Sweden: Å Sjöholm; Switzerland: R Darioli, A Gallino, and G Noll; Taiwan: CJ Chang; Thailand: P Sritara; The Netherlands: FLJ Visseren; Tunisia: A Belhani; Turkey: V Sansoy; UAE, Kuwait, and Qatar: A Binbrek; Ukraine: A Parkhomenko; Venezuela: A Perez Monteverde.

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