Diabetes, Metabolic Syndrome and Obesity: Targets and Therapy

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ORIGINAL RESEARCH

Awareness of Abdominal Adiposity as a Cardiometabolic Risk Factor (The 5A Study): Mexico

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Background: The Awareness of Abdominal Adiposity as a Cardiometabolic Risk Factor Study assesses the prevalence of cardiometabolic risk factors in adults with abdominal obesity (waist circumference ≥90 cm in men and ≥80 cm in women) and evaluates how physicians manage these patients.

Methods: This is an observational cross-sectional study. Internists, cardiologists, and endocrinologists contributed patients to the study. A standardized questionnaire was completed and registered demographics, anthropometric measurements, lab results from the medical files, and any treatment utilized to manage dyslipidemia, arterial hypertension, diabetes, and cardiovascular disease.

Results: A total of 1312 patients was included. The mean age was 49.3 ± 14.6 years and 834 (63.6%) were female. The primary reason for the physician consultation was treatment of obesity (47.5%), followed by management of arterial hypertension (27.7%), diabetes (18.3%), dyslipidemia (14.2%), and cardiovascular disease (7.1%). The majority of patients identified excess body weight as a health problem (81.4%). However, patients had lost a mean of 4.3 ± 3.5 kg. Only 63.4% of patients with arterial hypertension were on drug therapy. Few of them had reached target values for diastolic (24.1%) and systolic/diastolic (13.3%) pressure. Less than half of the patients with dyslipidemia were receiving lipid-lowering medication. Only 32.2% were at their target low-density lipoprotein cholesterol levels. In patients with type 2 diabetes, mean fasting plasma glucose level (8.9 ± 3.4 mmol/L) was above the threshold recommended by current guidelines.

Conclusions: The study describes the medical care given to individuals with abdominal obesity during daily clinical practice by general practitioners, cardiologists, and endocrinologists in urban Mexico. Our data confirm that a large proportion of patients are undertreated. Only a small percentage of patients with obesity-related comorbidities reach treatment targets. Interventions proven to be effective in the prevention of chronic complications have in general not been implemented.

Keywords: abdominal obesity, waist circumference, dyslipidemia, type 2 diabetes, pattern of care

Introduction

The importance of abdominal adiposity as a marker for chronic nontransmissible diseases is well established.[1] Increased waist circumference is a component of several diagnostic criteria for the metabolic syndrome.[2–4] This clinical parameter is considered a standard of care for the adult population.

Until recently, the evidence supporting the importance of abdominal adiposity has been derived from studies in European and North American populations.[5]

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The thresholds used in Caucasians lack sensitivity for the detection of type 2 diabetes and lipid disorders in non-Caucasian subjects.[6] Multiple papers in Asian, Hispanic, and other ethnic groups provide conflicting results regarding the diagnostic proficiency of waist circumference.[7–9] Despite this, the majority accept that this variable is a useful marker for the identification of several chronic diseases.[10]

Few papers have evaluated the pattern of care received by patients with abdominal obesity.[11] The aim of this study is to document the pattern of care received by subjects with abdominal adiposity under the management of cardiologists, endocrinologists, and primary care physicians.

Patients and methods

The Awareness of Abdominal Adiposity as a Cardiometabolic Risk Factor Study is a survey designed to assess the prevalence of cardiometabolic risk factors in a cohort of subjects with increased waist circumference. In addition, the study aims to evaluate how physicians manage these patients. Data were collected prospectively from adults in eight countries (Argentina, Chile, Colombia, Egypt, Lebanon, Mexico, Saudi Arabia, South Africa). Here, we report the results of the patients studied in Mexico.

The participating hospitals and clinics provided a list of the active specialists in their outpatient clinics. Internists (n = 32), cardiologists (n = 42), and endocrinologists (n = 41) were randomly selected from this list and invited to participate in the study. All physicians had previously participated in clinical trials. They were asked to invite the first patient scheduled for consultation that fulfilled the inclusion/exclusion criteria during a one-month period. Only one patient could be included per consulting day.

This is an observational study. The inclusion criteria of the study were outpatients ≥18 years old with abdominal obesity (defined by a waist circumference ≥90 cm for men and ≥80 cm for women as recommended by the International Diabetes Federation[4]). The exclusion criteria included participation in other clinical studies, a life expectancy less than a year, conditions causing an increased abdominal circumference not related to excess adiposity (eg, ascitis, pregnancy), recent admission to a hospital, difficulty understanding the questionnaire, or unwillingness to participate.

A standardized questionnaire was completed. The questionnaire consisted of two sections: one filled in by the physician and the other answered by the patient. It included documentation of demographics, anthropometric measurements (ie, weight, height, waist, hip and neck circumference, and body mass index), lab results from the medical file, and any treatment utilized to manage dyslipidemia, arterial hypertension, diabetes, and cardiovascular diseases. In addition, concomitant medications, smoking habits, and alcohol consumption were also included. Anthropometric measurements were done using standardized procedures. Blood pressure was measured in a seated position. The mean of two readings obtained after a resting period of at least 10 minutes between measurements was used for the analyses.

High blood pressure was defined as a value ≥140/90 mmHg or use of antihypertensive medication. The diagnostic threshold was lowered to ≥130/80 in patients with type 2 diabetes. Dyslipidemia was defined as any of the following abnormalities: low-density lipoprotein cholesterol (LDL-c) ≥2.6 mmol/L, total cholesterol ≥5.2 mmol/L, triglycerides ≥1.6 mmol/L, or high-density lipoprotein cholesterol (HDL-c) ≤ 1.1 mmol/L in males and ≤1.3 mmol/L in females. Type 2 diabetes was diagnosed using the American Diabetes Association's criteria.[12]

The human research ethics committee of the participating institutions approved the study, and informed consent was obtained from all subjects.

Statistical analyses

The number of patients to be included in each physician group (cardiology, endocrinology, or primary care physician/internists) was 384. As a result, 1200 patients were expected to be studied in each country. Normally distributed data, determined using the Kolmogorov–Smirnov test, were expressed as means and standard deviation (±SD), whereas variables with a skewed distribution were reported as median (min–max). McNemar's Chi Square, Student's paired *t*-test or Wilcoxon's test was used as appropriate for comparison between the basal characteristics and the information at follow-up visits. Kruskal–Wallis analysis was used to evaluate significant differences between specialties. Logistic regression analyses was used to identified independent factors associated with dyslipidemia, hypertension, fasting plasma glucose, type 2 diabetes, cardiovascular diseases, and two or more of these cardiovascular risk factors. All analyses were performed with SAS (v 8.2; SAS Institute, Inc, Cary, NC).

Results

Participating physicians

A total of 105 physicians participated in the study. They were primary care/internists (n = 32, 28.7%), cardiologists (n = 42, 36.5%), or diabetologists/endocrinologists (n = 41, 35.7%). Their mean age was 48.4 ± 8.9 years and 74% (n = 84) were male. The age ($P = 0.89$), time in practice ($P = 0.76$), the num-

ber of patients seen per month ($P = 0.07$), and the number of patients seen for obesity/overweight ($P = 0.93$) per month did not differ significantly between groups (Table 1).

Patients

A total of 1312 patients was included. The mean age was 49.3 ± 14.6 years and 834 (63.6%) were female. Of the study sample, 384 (29.3% of the study sample), 428 (32.6%), and 500 (38.1%) patients consulted the internists or primary care physicians, cardiologists, and endocrinologists/diabetologists respectively (Table 2).

The primary reason given by the patients for the physician consultation was treatment of obesity (n = 623, 47.5%), followed by management of arterial hypertension (n = 363, 27.7%), diabetes (n = 240, 18.3%), dyslipidemia (n = 186, 14.2%), and cardiovascular disease (n = 93, 7.1%). Some (n = 331, 25.4%) gave two or more reasons for consultation. The patient's follow-up under their current physician was greater than five years in 167 (12.8%), less than five years in 653 (50.2%), and 481 (37%) were seen for the first time. Patients requiring treatment of obesity (64%) or diabetes (27%) primarily consulted endocrinologists. Those that consulted cardiologists were seeking therapy for arterial hypertension (56%), dyslipidemia (21%), or cardiovascular disease (17%). Cardiometabolic risk factors rarely occur individually. There was a significant overlap between diabetes, dyslipidemia, and arterial hypertension.

The number of cardiovascular risk factors did not increase significantly with increasing waist circumference (Figure 1). However, in women, the prevalence of diabetes (13%–36%, $P = 0.001$) and hypertension (41.3%–62.2%, $P = 0.01$) was shown to increase with abdominal adiposity.

Prevalence and management of cardiometabolic risk factors

Obesity

The majority of the participants were either overweight or obese. Only 3% of men and 4% of women had a body mass index (BMI) < 25 kg/m^2. The mean BMI for males and females was 31.99 ± 5.01 and 32.66 ± 5.71 kg/m^2, respectively. The prevalence of obesity was higher in women compared to men (65.1% vs 61.2%, $P = 0.05$). Ten percent of participants had a BMI ≥ 40 kg/m^2. Neck circumference was recorded in 96.1% (n = 1261) of the study sample, respectively. Men had a significantly greater neck circumference compared to women (42.4 ± 3.6 cm vs 37.0 ± 3.4 cm, $P < 0.001$). In contrast, the waist circumference was larger in women (113.2 ± 12.3 vs 110.5 ± 11.3 cm, $P < 0.001$).

Table 1 Basal characteristics of physicians evaluated in the study

Characteristic	All groups (n = 115)	Internists (n = 32)	Cardiologist (n = 42)	Endocrinologist (n = 41)
Age (years)	48.4 ± 8.9	47.2 ± 6.3	48.8 ± 8.5	49.0 ± 10.8
Gender*				
Male	84 (73.7%)	24 (75%)	35 (85.4%)	25 (61%)
Female	30 (26.3%)	8 (25%)	6 (14.6%)	16 (39%)
Time in practice (years)	20.4 ± 9.0	20.6 ± 6.5	20.0 ± 9.9	20.7 ± 9.8
Number of patients seen/month	150 (25–1000)	120 (25–400)	150 (40–400)	160 (40–1000)
Patients seen for overweight/obesity	47 (4–89)	45 (4–85)	47 (12–80)	50 (10–89)
Practice location				
Urban	113 (98.3%)	31 (96.9%)	42 (100%)	40 (97.6%)
Rural	2 (1.7%)	1 (3.1%)	0 (0%)	1 (2.4%)
Type of patients				
Mostly "public"	8 (7.0%)	3 (9.4%)	4 (9.5%)	1 (2.4%)
Mostly "private"	58 (50.4%)	21 (65.6%)	22 (52.4%)	15 (36%)
Mixed	49 (42.6%)	8 (25.0%)	16 (38.1%)	25 (61%)
Medical settings*				
Hospital	24 (21.6%)	5 (15.6%)	12 (29.3%)	7 (18.4%)
Clinic	12 (10.8%)	3 (9.4%)	5 (12.2%)	4 (10.5%)
Practice/office	47 (42.3%)	17 (53.1%)	18 (43.9%)	12 (31.6%)
Hospital + clinic	4 (3.6%)	2 (6.3%)	0 (0.0%)	2 (5.3%)
Hospital + practice/office	19 (17.1%)	5 (15.6%)	6 (14.6%)	8 (21.1%)
Clinic + practice/office	1 (0.9%)	0 (0.0%)	0 (0.0%)	1 (2.6%)
Hospital + clinic + practice/office	4 (3.6%)	0 (0.0%)	0 (0.0%)	4 (10.5%)
Teaching hospital	21 (46.7%)	5 (50.5%)	4 (26.7%)	12 (60.0%)
Hospital (other)	24 (53.3%)	5 (50.0%)	11 (73.3%)	8 (40.0%)

Notes: *N not equal to 115 because of missing information. Data reported in mean ± SD, n (%) or median (min–max).

Table 2 Basal characteristics of patients

Characteristic	All group (n = 1312)	Patients treated by internists/general practitioners (n = 384)	Patients treated by cardiologist (n = 428)	Patients treated by endocrinologist/ diabetologist (n = 500)
Age (years)	49.3 ± 14.6	48.0 ± 14.6	54.2 ± 14.0	46.0 ± 14.1
Gender				
Male	478 (36.4%)	130 (33.9%)	197 (46.0%)	151 (30.2%)
Female	834 (63.6%)	254 (66.1%)	231 (54.0%)	349 (69.8%)
Ethnicity				
Mexican mestizo	1130 (86.1%)	310 (80.7%)	373 (87.1%)	447 (89.4%)
Caucasian	141 (10.7%)	54 (14.1%)	51 (11.9%)	36 (7.2%)
Other	41 (3.2%)	20 (5.3%)	4 (0.8%)	17 (3.4%)
Follow-up				
First time	481 (37.0)	145 (38.0)	163 (38.6)	173 (34.8)
≤5 years	653 (50.2)	180 (47.1)	197 (46.7)	276 (55.5)
>5 years	167 (12.8)	57 (14.9)	62 (14.7)	48 (9.7)
Primary reason for the visit				
Obesity	623 (47.5)	174 (45.3)	129 (30.1)	320 (64.0)
Hypertension	363 (27.7)	93 (24.2)	240 (56.1)	30 (6.0)
Diabetes	240 (18.3)	55 (14.3)	52 (12.1)	133 (26.6)
Cardiovascular disease	93 (7.1)	8 (2.1)	74 (17.3)	11 (2.2)
Dyslipidemia	186 (14.2)	60 (15.6)	90 (21.0)	36 (7.2)
Other	271 (20.7)	126 (32.8)	55 (12.9)	90 (18.0)
Cardiovascular risk factors	1.5 ± 1.1	1.2 ± 1.1	1.9 ± 1.0	1.5 ± 1.2
None	294 (22.4)	129 (33.6)	43 (10.0)	122 (24.4)
1 risk factor	380 (29.0)	120 (31.3)	96 (22.4)	164 (32.8)
2 risk factors	341 (26.0)	70 (18.2)	182 (42.5)	89 (17.8)
>2 risk factors	297 (22.6)	65 (16.9)	107 (25.0)	125 (25.0)
Systolic blood pressure (mmHg)	126.8 ± 16.4	125.7 ± 14.9	132.3 ± 17.2	122.8 ± 15.4
Diastolic blood pressure (mmHg)	79.8 ± 9.8	79.0 ± 8.7	82.0 ± 10.2	78.4 ± 10.0
Hypertension	703 (53.6)	162 (42.2)	321 (75.0)	220 (44.0)
Cases without diabetes and systolic blood pressure <140 mmHg	763 (80.1)	245 (84.2)	224 (68.5)	294 (88.0)
Cases without diabetes and diastolic blood pressure <90 mmHg	765 (80.4)	249 (85.6)	223 (68.2)	293 (87.7)
Type 2 diabetes	324 (24.7)	72 (18.8)	97 (22.7)	155 (31.0)
Treatment	299 (92.6)	68 (94.4)	83 (86.5)	148 (95.5)
Biguanides	228 (76.3)	50 (73.5)	52 (62.7)	126 (85.1)
Sulfonylureas	139 (46.5)	40 (58.8)	44 (53.0)	55 (37.2)
Insulin	44 (14.7)	10 (14.7)	9 (10.8)	25 (16.9)
Thiazolinediones	32 (10.7)	15 (22.1)	6 (7.2)	11 (7.4)
Other	18 (6.0)	5 (7.4)	3 (3.6)	10 (6.8)
Microvascular complications	69 (21.6)	19 (26.4)	17 (17.9)	33 (21.6)
Retinopathy	19 (27.5)	9 (47.4)	6 (35.3)	4 (12.1)
Nephropathy	16 (23.2)	5 (26.3)	3 (17.6)	8 (24.2)
Neuropathy	49 (71.0)	11 (57.9)	12 (70.6)	26 (78.8)
HbA1c in patients with diabetes (%)				
<7	146 (58.4)	26 (51.0)	14 (40.0)	106 (64.6)
7–8	46 (18.4)	14 (27.5)	9 (25.7)	23 (14.0)
>8	58 (23.2)	11 (21.8)	12 (34.3)	35 (21.3)
Cases with diabetes and systolic blood pressure <130 mmHg	138 (43.0)	24 (33.3)	31 (33.0)	83 (53.5)
Cases with diabetes and diastolic blood pressure <80 mmHg	88 (27.4)	23 (31.9)	22 (23.4)	43 (27.7)
Total cholesterol (mmol/L)	5.2 ± 1.3	5.1 ± 1.3	5.4 ± 1.5	5.1 ± 1.2
Cases <5.2 mmol/L	464 (55.6)	108 (54)	134 (49.3)	222 (61.3)
LDL-c (mmol/L)	3.1 ± 0.9	3.2 ± 0.9	3.3 ± 0.9	2.9 ± 0.9
Cases <2.6 mmol/L	162 (30.6)	29 (25.4)	49 (26.8)	84 (36.1)

(*Continued*)

Table 2 (*Continued*)

Characteristic	All group (n = 1312)	Patients treated by internists/general practitioners (n = 384)	Patients treated by cardiologist (n = 428)	Patients treated by endocrinologist/ diabetologist (n = 500)
HDL-c (mmol/L)	1.1 ± 0.3	1.1 ± 0.3	1.1 ± 0.3	1.1 ± 0.4
Normal males (≥1.1 mmol/L)	103 (44.8)	28 (54.9)	43 (47.8)	32 (36.0)
Normal females (≥1.3 mmol/L)	102 (32.8)	18 (31.6)	30 (31.3)	54 (34.2)
Triglycerides (mmol/L)	1.8 (0.4–22.5)	1.7 (0.4–10.9)	1.9 (0.4–22.4)	1.6 (0.4–14.8)
Cases <1.6 mmol/L	346 (44.7)	79 (44.4)	96 (38.2)	171 (49.6)
Dyslipidemia	792 (60.4)	194 (50.5)	286 (66.8)	312 (62.4)
Treatment	345 (29.7)	74 (22.6)	165 (42.5)	106 (23.7)
Statins	264 (76.5)	55 (74.3)	135 (81.8)	74 (69.8)
Fibrates	116 (33.6)	28 (37.8)	43 (26.1)	45 (42.5)
Ezetimibe	60 (17.4)	13 (17.6)	30 (18.2)	17 (16.0)
Other	9 (2.6)	3 (4.1)	2 (1.2)	4 (3.8)
Cardiovascular disease	184 (14.0)	31 (8.1)	101 (23.6)	52 (10.4)
Treatment	596 (48)	133 (38)	304 (72.9)	159 (33.5)
ARBs	234 (39.3)	62 (46.6)	121 (39.8)	51 (32.1)
Diuretics	190 (31.9)	39 (29.3)	107 (35.2)	44 (27.7)
Beta blockers	224 (37.6)	37 (27.8)	139 (45.7)	48 (30.2)
CCB	164 (27.5)	28 (21.1)	97 (31.9)	39 (24.5)
Use of weight control treatment	157 (12.1)	48 (13.0)	24 (5.6)	85 (17.1)
Orlistat	32 (20.4)	14 (29.2)	9 (37.5)	9 (10.6)
Sibutramine	70 (44.6)	24 (50.0)	7 (29.2)	39 (45.9)
Other	61 (38.9)	16 (33.3)	2 (8.3)	43 (50.6)

Notes: Data reported as mean ± SD, n (%), or median (min–max). Total cholesterol (n = 834); LDL-c (n = 540); HDL-c (n = 541); triglycerides (n = 774); glycated hemoglobin (HbA1c, n = 250); systolic and diastolic blood pressure (n = 1273), without (n = 952) and with diabetes (n = 321); fasting plasma glucose (n = 872), with (n = 302) and without (n = 570) diabetes, without diabetes or pre-diabetes (n = 510).

Abbreviations: ARBs, angiotensin II receptor blocker; ACEI, angiotensin converting enzyme inhibitor; CCB, calcium channel blocker; HDL-c, high-density lipoprotein cholesterol; LDL-c, low-density lipoprotein cholesterol.

Excess body weight was identified as a health problem by the majority of patients (81.4%). More than half (65.2%) had sought medical attention for this problem on at least one occasion. About half (48.4%) had made significant efforts to lose weight during the previous three months. This feature was more common among patients seeing an endocrinologist ($P = 0.002$). No difference in weight loss occurred between specialist groups.

The majority of the patients (89%) had the intention to follow a dietary program with or without the advice of their physician. The endocrinologist asked patients to follow a dietary program more often than other specialists (79.6% vs 61.9%, $P < 0.001$). The endocrinologists prescribed the dietary program themselves to about half their patients and requested the participation of a nutritionist in 33.2% of cases. The other health professionals were less likely to give dietary advice or seek the advice of a nutritionist (Table 3).

The majority of patients (84%) were asked to increase their level of physical activity. The physicians themselves prescribed the physical activity program in close to 40% of patients from all three physician groups. No differences were observed between groups, in the percentage of patients exercising and the duration of physical activity at baseline. Weight control drugs were used by a small percentage of the patients (12.1%); sibutramine (5.4%) was most popular, followed by orlistat (2.5%). Less than one-quarter of the patients on weight control medication had been on it for more than three months; this percentage did not vary between specialist groups.

High blood pressure

The prevalence of high blood pressure was 63.4% (n = 703). The agreement between physician-diagnosis and patients recalled for arterial hypertension was moderate (kappa = 0.62). High blood pressure was diagnosed 5.9 ± 7.2 years before inclusion into the study. Patients under the care of the cardiologists had significantly higher systolic and diastolic pressures ($P < 0.001$, Table 2). Only 63.4% of patients with high blood pressure were receiving drug therapy. At the time of evaluation, few of them had reached target values for diastolic (24.1%) and systolic/diastolic (13.3%) pressure. The most frequent antihypertensive drugs were angiotensin II receptor

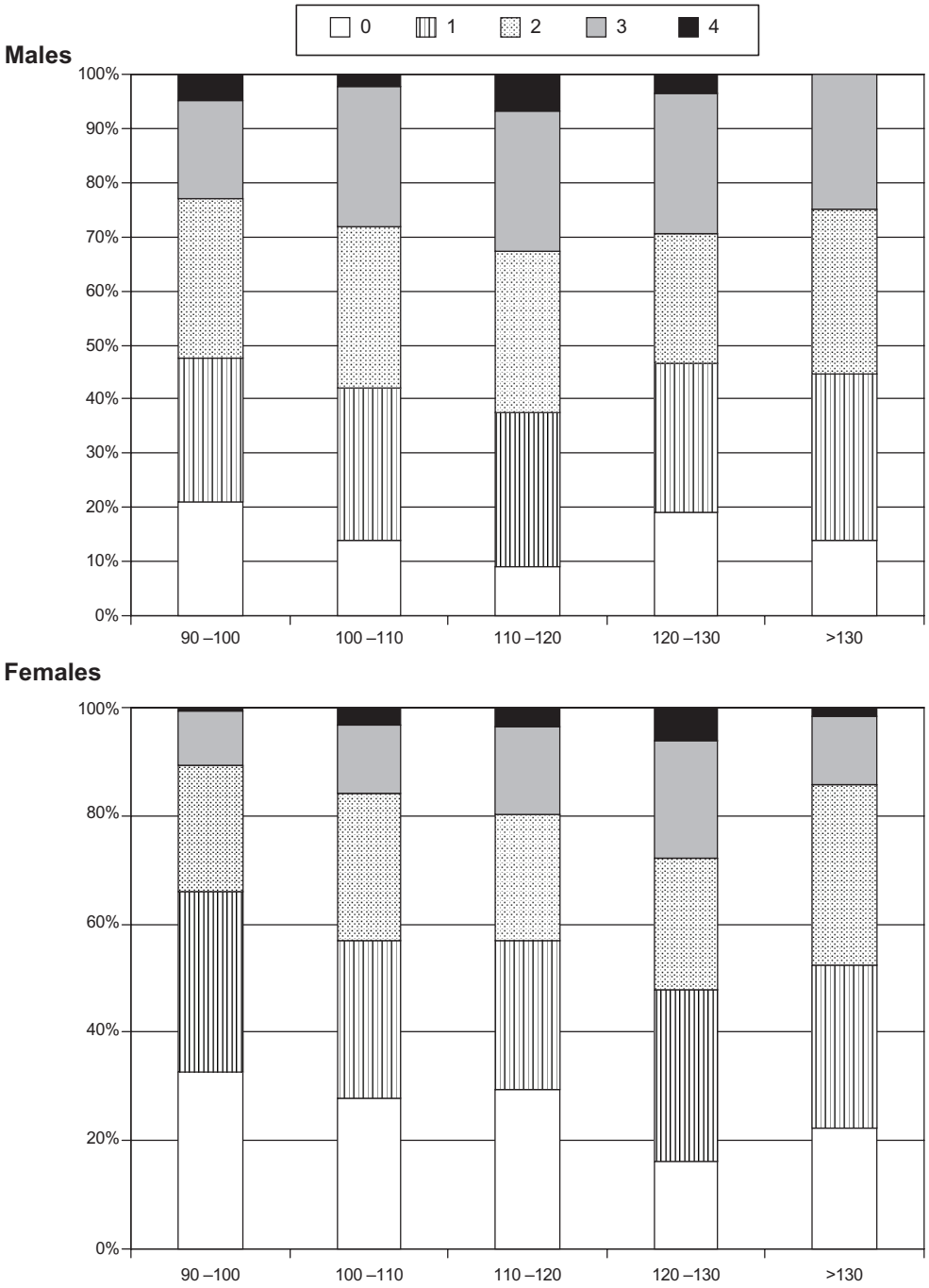

Figure 1 Number of cardiometabolic risk factors (dyslipidemia, hypertension, type 2 diabetes, and cardiovascular disease) at different waist circumference strata in men and women.

blockers, diuretics, beta-blockers, and calcium channel blockers. Their use did not differ between specialists.

Dyslipidemia

The prevalence of dyslipidemia was 60.4% (n = 703) (Table 2). The agreement between physician-diagnosis and patients recalled for dyslipidemia was low (kappa = 0.36). Plasma lipid levels were available in 78% of the patients. The primary care physicians requested lipid measurements less often than the other two groups. Abnormal lipid concentrations were diagnosed 2.2 ± 4.1 years before inclusion into the study. Patients under the care of the cardiologists had significantly higher total cholesterol, LDL-c, and triglyceride concentrations ($P < 0.001$, Table 2). The prevalence of total cholesterol levels ≥5.2 mmol/L was 44.4%; this percentage was significantly greater in patients under the care of the cardiologists (50.7%, $P = 0.009$). The prevalence of hypertriglyceridemia was 55.3%; this abnormality was also more frequent in patients who

Table 3 Summary of the interventions stratified by physician specialty

Indication	N	All group (n = 1312)	Patients treated by internists/general practitioners (n = 384)	Patients treated by cardiologist (n = 428)	Patients treated by endocrinologist/ diabetologist (n = 500)
Physical activity (PA)					
Patients asked to increase PA	1070	899 (84.0)	271 (86.0)	272 (81.7)	356 (84.4)
Patient's intention to increase PA	170	139 (81.8)	38 (86.4)	50 (82.0)	51 (78.5)
Person responsible for increase PA	1070	974 (100)	296 (100)	302 (100)	376 (100)
Patient him/herself	974	251 (25.8)	82 (27.7)	85 (28.1)	84 (22.3)
Dietician/nutritionist	974	77 (7.9)	21 (7.1)	21 (7.0)	35 (9.3)
General practitioner/internist	974	210 (21.6)	129 (43.6)	33 (10.9)	48 (12.8)
Cardiologist	974	179 (18.4)	15 (5.1)	144 (47.7)	20 (5.3)
Endocrinologist	974	166 (17.0)	18 (6.1)	1 (0.3)	147 (39.1)
Other	974	91 (9.3)	31 (10.5)	18 (6.0)	42 (11.2)
Patient currently practising PA	1070	733 (68.5)	223 (70.8)	214 (64.3)	296 (70.1)
Minutes within last week	733	732 (100)	222 (100)	214 (100)	296 (100)
≤60	732	154 (21.0)	43 (19.4)	49 (22.9)	62 (20.9)
60.1–90	732	85 (11.6)	32 (14.4)	20 (9.3)	33 (11.1)
90.1–120	732	95 (13.0)	26 (11.7)	23 (10.7)	46 (15.5)
>120	732	398 (54.4)	121 (54.5)	122 (57.0)	155 (52.4)
Reason for practising PA	732	732 (100)	222 (100)	214 (100)	296 (100)
To lose weight	732	463 (63.3)	146 (65.8)	120 (56.1)	197 (66.6)
Diabetes	732	158 (21.6)	39 (17.6)	40 (18.7)	79 (26.7)
Dyslipidemia	732	133 (18.2)	38 (17.1)	40 (18.7)	55 (18.6)
Hypertension	732	209 (28.6)	47 (21.2)	93 (43.5)	69 (23.3)
Heart/vascular condition	732	57 (7.8)	13 (5.9)	31 (14.5)	13 (4.4)
Other	732	217 (29.6)	70 (31.5)	59 (27.6)	88 (29.7)
Weight	1070	1070 (100)	315 (100)	333 (100)	422 (100)
Weight problem	1068	869 (81.4)	248 (79.0)	262 (78.9)	359 (85.1)
Health professional consulted	1070	698 (65.2)	187 (59.4)	177 (53.2)	334 (79.1)
Significant effort to lose weight	1062	514 (48.4)	145 (46.6)	140 (42.2)	229 (54.7)
Weight lost (last 3 months)	652	3 (0–32)	3 (0–26)	3 (0–32)	3 (0–20)
Lowest weight (last 6 months)	1010	81.7 ± 17.2	79.1 ± 15.7	83.5 ± 17.8	82.2 ± 17.5
Highest weight (last 6 months)	1029	88.1 ± 18.9	85.4 ± 17.0	88.9 ± 19.6	89.4 ± 19.5
Surgery for reducing weight	1064	11 (1.0)	5 (1.6)	2 (0.6)	4 (1.0)
Diet	1070	1070 (100)	315 (100)	333 (100)	422 (100)
Patients asked to follow a diet	1070	720 (67.3)	195 (61.9)	189 (56.8)	336 (79.6)
Patient's intention to follow a diet	337	300 (89.0)	105 (90.5)	123 (89.1)	72 (86.7)
Patient currently following a diet	1063	722 (67.9)	200 (63.9)	199 (59.9)	323 (77.3)
Reason to follow a diet	1070	722 (100)	200 (100)	199 (100)	323 (100)
To lose weight	722	522 (72.3)	146 (73.0)	128 (64.3)	248 (76.8)
Diabetes	722	190 (26.3)	50 (25.0)	43 (21.6)	97 (30.0)
Dyslipidemia	722	162 (22.4)	43 (21.5)	53 (26.6)	66 (20.4)
Hypertension	722	187 (25.9)	42 (21.0)	85 (42.7)	60 (18.6)
Heart/vascular condition	722	57 (7.9)	7 (3.5)	28 (14.1)	22 (6.8)
Other	722	129 (17.9)	38 (19.0)	29 (14.6)	62 (19.2)
Frequency patient followed diet	722	709 (100)	195 (100)	198 (100)	316 (100)
Always	709	208 (29.3)	49 (25.1)	64 (32.3)	95 (30.1)
Most of the time	709	313 (44.1)	97 (49.7)	72 (36.4)	144 (45.6)
Some of the time	709	127 (17.9)	33 (16.9)	40 (20.2)	54 (17.1)
A little of the time	709	50 (7.1)	14 (7.2)	19 (9.6)	17 (5.4)
Never	709	11 (1.6)	2 (1.0)	3 (1.5)	6 (1.9)

were being attended by the cardiologists (61.8%). Low HDL-c values were found in 55.2% of men and 67.2% of women. Less than half of the patients with dyslipidemia were receiving drug therapy. A greater percentage of the patients under cardiologist care were on lipid-lowering therapy compared to the other two groups (Table 2). Statins were the most frequently used drug (76.5%). The use of lipid-lowering medications did not differ between specialists. Only a small proportion of the patients on lipid-lowering medication were at their LDL-c targets (32.2%).

Type 2 diabetes

The prevalence of type 2 diabetes was 22% (n = 289). The agreement between physician-diagnosis and patients recalled for diabetes was moderate (kappa = 0.87). Type 2 diabetes was diagnosed 6.4 ± 7.4 years before inclusion into the study. Patients attended by endocrinologists had the highest diabetes prevalence (31%, $P < 0.001$, Table 2). The majority of patients (92.6%) were receiving drug therapy. The most frequently used drugs were metformin and sulfonylureas. Insulin was used by 14.7% of the patients with diabetes. The mean fasting plasma glucose level was 8.9 ± 3.4 mmol/L. Half of the patients with diabetes (52.2%) had an AMA = HbA_{1c} measurement. Almost half of the diagnosed cases had an HbA1c < 7%. This percentage was higher in those under endocrinologist care (64.6%, $P < 0.001$). At the time of evaluation, only a few of these patients were at optimal levels of diastolic (27.4%) and systolic (43.0%) pressures. Diabetes related chronic complications were common in the study sample. The most common microvascular complications were sensitive polyneuropathy (71%) followed by retinopathy (27.5%) and nephropathy (23.2%). In addition, 19% had had a cardiovascular complication.

Cardiovascular disease

This category includes all patients who had suffered a myocardial infarction, unstable angina, transient ischemic attack, peripheral artery disease, revascularization, or any other clinical manifestation caused by coronary artery disease. The prevalence of cardiovascular disease was 14.4% (n = 184). The agreement between physician-diagnosis and patients recalled for cardiovascular disease was moderate (kappa = 0.47). Cardiovascular disease was diagnosed 8.4 ± 10.5 years before inclusion into the study. Patients under the care of cardiologists had the highest prevalence (23.6%, $P < 0.001$, Table 2). The majority of patients (72.9%) treated by cardiologists were receiving medication. This was not true for the other two groups (primary care physicians 38%, endocrinologists 33.5%). Few patients were at treatment targets. Only 32.2% had an LDL cholesterol <2.6 mmol/L, 49% were at blood pressure targets, 39.4% had triglycerides <1.6 mmol/L, and 38.6% had the recommended HDL cholesterol concentrations.

The social and medical burden of abdominal obesity

The quality of life of patients was good with a mean score in the EQ-5D survey of 0.8 ± 0.2 points (n = 1070). A small percentage (6.4%) of patients referred to themselves as disabled due to illness and unable to work. No mood abnormalities were reported by 64.1% of patients. However, 38.6% (n = 413) and 4.1% (n = 44) reported moderate or extreme discomfort caused by their illness, respectively (Table 4).

Covariates associated with obesity-related comorbidities

Logistic regression models were constructed to identify variables associated with each of the comorbidities (Table 5). Waist circumference was independently associated with high blood pressure and HbA1c in patients with diabetes. Borderline significance was found for the association of waist circumference and hypertriglyceridemia ($P = 0.077$) and hypoalphalipoproteinemia ($P = 0.056$) respectively. No association was found between waist circumference and fasting glycemia, presence of cardiovascular disease, and the occurrence of two or more cardiometabolic risk factors.

Discussion

Over the past 40 years, excess body weight has become a major health problem in Mexico.[13] However, not every case has comorbidities that affect the quality of life and life expectancy.[14] Health systems worldwide are not prepared to face the ongoing obesity epidemic. Many patients and physicians are not aware of the health risks associated with abdominal obesity.[15] It is a requirement not only to design effective obesity treatment programs but also to have an adequate description of the characteristics of the target population. This information cannot be obtained from population-based surveys or institutional databases because these sources include individuals seeking treatment for various medical conditions or those not looking for therapy at all. Our study describes the medical care given to individuals with abdominal obesity during daily clinical practice by general practitioners, cardiologists, and endocrinologists. It was designed to provide data representative of the pattern of care that patients with abdominal obesity receive in urban Mexico. Our data confirm that a large proportion of patients are undertreated. Only a small percentage of patients with obesity-related comorbidities reach treatment targets. Interventions proven to be effective in the prevention of chronic complications have in general not been implemented.

The study population is representative of patients treated by specialists who are usually involved in the management of abdominal obesity. Precautions were taken to avoid potential selection bias by the physicians. This approach allowed

Table 4 The social and medical burden of abdominal obesity

	N	All group (n = 1312)	Patients treated by internists/general practitioners (n = 384)	Patients treated by cardiologist (n = 428)	Patients treated by endocrinologist/ diabetologist (n = 500)
Smoking habits	1070	1070 (100)	315 (100)	333 (100)	422 (100)
Never smoked	1070	554 (51.8)	170 (54.0)	178 (53.5)	206 (48.9)
Smoked in the past	1070	320 (29.9)	92 (29.2)	107 (32.1)	121 (28.7)
Currently smoking	1070	196 (18.3)	53 (16.8)	48 (14.4)	95 (22.5)
Alcohol consumption (per day)	1070	1063 (100)	314 (100)	328 (100)	421 (100)
None or less than 1 glass	1063	1012 (95.2)	298 (94.9)	308 (93.9)	406 (96.4)
1–2 glasses		38 (3.6)	13 (4.1)	13 (4.0)	12 (2.9)
3 or more glasses		13 (1.2)	3 (0.9)	7 (2.1)	3 (0.7)
Health insurance	1068	1068 (100)	314 (100)	333 (100)	421 (100)
Public	–	418 (39.1)	112 (35.7)	140 (42.0)	166 (39.4)
Private	–	270 (25.3)	101 (32.2)	76 (22.8)	93 (22.1)
Public + private	–	92 (8.6)	29 (9.2)	29 (8.7)	34 (8.1)
None	–	280 (26.2)	72 (22.9)	86 (25.8)	122 (29.0)
Don't know	–	8 (0.7)	0 (0.0)	2 (0.6)	6 (1.4)
Employment status	1066	1066 (100)	313 (100)	331 (100)	422 (100)
Full time job	–	443 (41.6)	133 (42.5)	136 (41.1)	174 (41.2)
Part time job	–	186 (17.4)	62 (19.8)	43 (13.0)	81 (19.2)
Not employed	–	437 (41.0)	118 (37.7)	152 (45.9)	167 (39.6)
Level of education	1068	1068 (100)	315 (100)	332 (100)	421 (100)
None	–	24 (2.2)	7 (2.2)	12 (3.6)	5 (1.2)
Primary level	–	157 (14.7)	33 (10.5)	70 (21.1)	54 (12.8)
Secondary level/high school	–	215 (20.1)	68 (21.6)	73 (22.0)	74 (17.6)
College/university	–	672 (62.9)	207 (65.7)	177 (53.3)	288 (68.4)

us to detect problems in both diagnostic and therapeutic actions. Our survey identified multiple conceptual and logistic challenges in the management of patients with abdominal obesity. Although all patients had abdominal obesity, less than half identified this as the main reason for the medical consultation. Half of the study population (48.4%) mentioned that they had made significant efforts to lose weight over the previous three months. However, the mean weight lost was moderate (4.3 ± 3.5 kg). A small proportion of physicians requested the participation of a nutritionist to provide dietary advice. In many cases, the specialist offered no dietary modification. The majority of patients (84%) were asked to increase their physical activity. However, less than half reported more than 120 minutes of physical activity per week.

Our observations confirm that the treatment of abdominal obesity is complex and unsatisfactory.[16] Modification of lifestyle is a remarkable challenge for adults. Physicians should be highly motivated to create awareness of the disease in patients and their relatives. In addition, they should educate and train patients to modify their dietary habits and to increase physical activity on a long-term basis. Health systems around the world should change their procedures and priorities to effectively face the epidemic in abdominal obesity.[17,18]

Increased waist circumference is a predictor for the presence of obesity-related comorbidities. As a consequence, the treatment of abdominal obesity should not be limited to inducing weight loss. The adequate management of comorbidities is a prime component of therapy. Each of these interventions is effective in reducing the risk of long-term obesity related complications.[19–21] Despite this, current treatment targets are achieved in only a small proportion of cases (Tables 2 and 3). Our results are similar to others reported worldwide.[22] Clinical inertia, lack of awareness in patients and physicians, and limited resources are some of the reasons for this finding.[23] Structured programs designed to improve the quality of care of patients with diabetes and cardiometabolic risks are urgently needed.

Scant information exists regarding the social burden caused by abdominal obesity.[24] The quality of life of patients was good, with a mean score in the EQ-5D survey of 0.8 ± 0.2 points. Despite this, 38.6% and the 4.1% referred to moderate or extreme discomfort caused by their illness, respectively. Thus, abdominal obesity should not be considered as only a medical problem. Social, economic, and psychological phenomena are the underlying factors. Medical personnel should be prepared to help patients overcome the environmental barriers that preclude them from having a healthy lifestyle.

Table 5 Logistic regression analyses to evaluate the association between waist circumference, BMI, age, and gender with the risk factors studied

Parameter	OR (CI 95%)	*P* value
Hypertriglyceridemia		
Female vs male	0.55 (0.41–0.74)	<0.0001
Low HDL-c		
BMI ≥ 30 vs ≤ 27 kg/m^2	3.2 (1.95–5.55)	<0.0001
Female vs male	1.6 (1.12–2.30)	0.009
Hypertension		
WC 100–105 vs 80–85 cm	0.28 (0.13–0.62)	0.0209
WC ≥ 110 vs 80–85 cm	0.23 (0.11–0.50)	<0.0001
Age < 65 vs ≥ 65 years	1.76 (1.29–2.40)	0.0003
Fasting plasma glucose		
WC 100–105 vs 80–85 cm	4.40 (1.27–15.2)	0.0225
WC ≥ 110 vs 80–85 cm	5.74 (1.70–19.3)	<0.0001
Age < 65 vs ≥ 65 years	0.66 (0.45–0.98)	0.0391
Type 2 diabetes		
WC 105–110 vs 80–85 cm	4.43 (1.57–12.5)	0.02
WC ≥ 110 vs 80–85 cm	5.78 (2.07–16.1)	<0.0001
BMI ≥ 30 vs ≤ 27 kg/m^2	0.54 (0.34–0.86)	0.0078
Age < 65 vs ≥ 65 years	0.55 (0.40–0.77)	0.0005
Cardiovascular disease		
Female vs male	0.49 (0.35–0.68)	<0.0001
Two or more risk factors		
WC ≥ 110 vs 80–85 cm	3.81 (1.31–11.05)	0.0024
Age < 65 vs ≥ 65 years	0.36 (0.26–0.50)	<0.0001
Female vs male	0.72 (0.54–0.96)	0.0268

Note: Only significant results are shown.

Abbreviations: BMI, body mass index; WC, waist circumference; HDL-c, high-density lipoprotein cholesterol.

The cross-sectional design and the lack of a control group without abdominal obesity are the main limitations of this report. Both defects limit our ability to confirm the known linear association that exists between waist circumference and the number and severity of each one of the cardiometabolic risks. Also, the approach used to assess dietary habits and physical activity may have a low sensitivity and significant variability.[25] In addition, information on other features of the metabolic syndrome (eg, fatty liver, chronic kidney disease, polycystic ovarian disease, hyperuricemia, and obstructive sleep apnea) was not registered. Finally, we concentrated on the management of abdominal obesity and its complications. We did not place emphasis on the diabetes-related microvascular complications because abdominal obesity is not a major risk factor for these outcomes.

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Disclosure

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References

1. Villalpando S, Shamah-Levy T, Rojas R, Aguilar-Salinas CA. Trends for Type 2 diabetes and other cardiovascular risk factors in Mexico from 1993–2006. *Salud Pública Méx*. 2010;52(Suppl 1):S72–S79.
2. World Health Organization. Definition, diagnosis and classification of diabetes mellitus and its complications. Part 1: diagnosis and classification of diabetes mellitus. Geneva, Switzerland: Department of Noncommunicable Disease Surveillance; 1999.
3. Expert Panel on Detection, Evaluation, and Treatment of High Blood Cholesterol in Adults Executive Summary of The Third Report of The National Cholesterol Education Program (NCEP) Expert Panel on Detection, Evaluation, and Treatment of High Blood Cholesterol in Adults (Adult Treatment Panel III). *JAMA*. 2001;285(19):2486–2497.
4. Alberti KG, Eckel RH, Grundy SM, et al. Harmonizing the metabolic syndrome. A Joint Interim Statement of the International Diabetes Federation Task Force on Epidemiology and Prevention; National Heart, Lung, and Blood Institute, American Heart Association; World Heart Federation; International Atherosclerosis Society; and International Association for the Study of Obesity. *Circulation*. 2009;120(16):1640–1645.
5. Després JP, Lemieux I, Bergeron J, et al. Abdominal obesity and the metabolic syndrome: contribution to global cardiometabolic risk. *Arteroscler Thromb Vasc Biol*. 2008;28(6):1039–1049.
6. Deurenberg P, Yap M, van Staveren WA. Body mass index and percent body fat: a meta analysis among different ethnic groups. *Int J Obes Relat Metab Disord*. 1998;22(12):1164–1171.
7. Deurenberg P, Yap M, Deurenberg P. Is a re-evaluation of WHO body mass index cut-off values needed? The case of Asian in Singapore. *Nutr Rev*. 2003;61(5 Pt 2):S80–S87.

8. Yusuf S, Hawken S, Ounpuu S, et al. Effect of potentially modifiable risk factors associated with myocardial infarction in 52 countries (the INTERHEART study): case control study. *Lancet*. 2004;364(9438): 937–952.
9. Sanchez-Castillo CP, Velazquez-Monroy O, Berber A, et al. Anthropometric cutoff points for predicting chronic diseases in the Mexican National Health Survey 2000. *Obes Res*. 2003;11(3):442–451.
10. Grundy SM, Cleeman JI, Daniels SR, et al. Diagnosis and management of the metabolic syndrome: and American Heart Association/National Heart, Lung and Blood Institute Scientific Statement. *Circulation*. 2005; 112(17):2735–2752.
11. Després JP, Lemieux I, Prud'homme D. Treatment of obesity: need to focus on high risk abdominally obese patients. *BMJ*. 2001; 322(7288):716–720.
12. American Diabetes Association. Diagnosis criteria for diabetes mellitus. Diagnosis and classification of diabetes mellitus. *Diabetes Care*. 2010; 33(Suppl 1):S62–S69.
13. Barquera S, Campos-Nonato I, Hernández-Barrera L, et al. Obesidad y adiposidad central en adultos mexicanos: resultados de la Encuesta Nacional de Salud y Nutrición 2006. *Salud Publica Mex*. 2009; 51(Suppl 4):S595–S603.
14. Karelis AD, Brochu M, Rabasa-Lhoret R. Can we identify metabolically healthy but obese individuals (MHO)? *Diabetes Metab*. 2004,30(5): 569–572.
15. Bodenheimer T, Wagner E, Grumbach K. Improving primary care for patients with chronic illness. *JAMA*. 2002;288(14):1775–1779.
16. Lau D, Douketis JD, Morrison K, Hramiak I, Sharma A, Ur E; for members of the Obesity Canada Clinical Practice Guidelines Expert Panel. 2006 Canadian clinical practice guidelines on the management and prevention of obesity in adults and children [summary]. *CMAJ*. 2007;176(8 Suppl):S1–S13.
17. World Health Organization. Preventing chronic diseases: WHO global report. First edition. Geneva, Switzerland; 2005.
18. Córdova-Villalobos JA, Barriguete-Meléndez JA, Lara-Esqueda A, et al. Chronic non-communicable diseases in Mexico: epidemiologic synopsis and integral prevention. *Salud Publica Mex*. 2008;50(5):419–427.
19. Heart Protection Study Collaborative Group. MRC/BHF Heart Protection Study of cholesterol lowering with simvastatin in 20536 high-risk individuals: a randomized placebo controlled trial. *Lancet*. 2002; 360(9326):7–22.
20. Heart Outcomes Prevention Evaluation Study Investigators. Effects of ramipril on cardiovascular and microvascular outcomes in people with diabetes mellitus: results of the HOPE study and MICRO-HOPE substudy. *Lancet*. 2000;355(9232):253–259.
21. The CDC Diabetes Cost-effectiveness Group. Cost-effectiveness of intensive glycemic control, intensified hypertension control, and serum cholesterol reduction for type 2 diabetes. *JAMA*. 2002;287(19): 2542–2551.
22. Pan American Health Organization. Regional strategy and plan of action on an integrated approach to the prevention and control of chronic diseases, including diet, physical activity and health. Washington, DC: Pan American Health Organization; 2006.
23. Saydah S, Fradkin J, Cowie C. Poor control of risk factors for vascular disease among adults with previously diagnosed diabetes. *JAMA*. 2004;291(3):335–342.
24. Williams J, Wake M, Hesketh K, Maher E, Waters E. Health-related quality of life of overweight and obese children. *JAMA*. 2005;293(1): 70–76.
25. Ferrari P, Friedenreich C, Matthews CE. The role of measurement error in estimating levels of physical activity. *Am J Epidemiol*. 2007;166(8): 832–840.