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Beneficial association between active travel and metabolic syndrome in Latin-America: A cross-sectional analysis from the Chilean National Health Survey 2009–2010

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ABSTRACT

Background: There is limited evidence on potential health benefits of active travel, independently of leisure-time physical activity (PA), with metabolic syndrome (MetS) in Latin-America.
Objective: To investigate the relationship between active travel and metabolic syndrome (MetS) and its components in a national representative sample of Chilean adults.
Methods: Cross-sectional study of 2864 randomly selected adults' participants enrolled in the 2009–2010 Chilean National Health Survey (CNHS). Self-reported PA was obtained with the validated Global PA Questionnaire and classifying participants into insufficiently active (< 150 min/week) or active (≥ 150 min/week). MetS was diagnosed from the modified Adult Treatment Panel (ATP) III criteria with national-specific abdominal obesity cut points. Multilevel logistic regression analysis was applied to estimate associations of travel PA with MetS and its components at a regional level, adjusted for socio-demographic characteristics and other types of PA.
Results: 46.2% of the sample engaged in 150 min/week of active travel and the prevalence of MetS was 33.7%. Mets was significantly lower among active travel participants. Active travel was associated with lower odds of MetS (OR 0.72; 95%CI 0.61–0.86), triglycerides (OR 0.77; 95%CI 0.64–0.92) and abdominal obesity (OR 0.82; 95%CI 0.69–0.97) after controlling for socio-demographics and other types of PA.
Conclusion: Active travel was negatively associated with MetS, triglycerides and abdominal obesity. Efforts to increase regional active travel should be addressed as a measure to prevent and reduce the prevalence of MetS and disease burden in middle income countries.

1. Introduction

Metabolic syndrome (MetS) refers to a combination of various metabolic and cardiovascular risk factors, which includes abdominal obesity, dyslipidemia, hyperglycemia and hypertension (Alberti et al., 2009). Prevalence of MetS in Latin-America has been steadily increasing due to an 'epidemiological transition', following a similar scenario occurred in developed countries (Cuevas et al., 2011; Márquez-Sandoval et al., 2011). MetS leads to 2 and 5-fold increase in risk for cardiovascular diseases and type-2 diabetes, respectively, thus increasing the risk of mortality (Alberti et al., 2009; Ford, 2005; Mottillo et al., 2010).

Modern lifestyles have installed physical inactivity as a significant threat and an important contributor to the burden of disease (World Health Organization, 2010). Nearly 30% of adults in Chile do not meet the minimum physical activity (PA) requirements (i.e. 150 min/week of moderate intensity) (Ministerio de Salud, G. de C., 2009; World Health Organization, 2010), increasing their chances of acquiring non-communicable diseases and directly promoting the development of many risk factors (Hallal et al., 2012; World Health Organization, 2013). However, recent evidence supports that appropriate amount of PA is inversely associated with MetS (Anne H Y Chu and Moy, 2013a, 2013b;

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Kim and So, 2016); limiting their results to the specific domain of leisure-time PA. Unfortunately, many people cannot engage PA into their daily routine due to the short amount of leisure-time available. Consequently, other types of PA could be included into a daily living routine opportunity (Furie and Desai, 2012). Active travel (i.e. walking or cycling to work) overcomes traditional barriers, increasing PA levels and providing environmental benefits (Hamer and Chida, 2008; Woodcock et al., 2009). Studies have shown protective effects in cardiovascular outcomes related to active travel, however, these results scarce on the generalizability to Latin-American adult's due to differences in racial and ethnic composition, travel policies and built environment (Gordon-Larsen et al., 2009; Hamer and Chida, 2008; Saunders et al., 2013).

Although there is an increasing amount of evidence on the importance of PA levels on metabolic disorders globally, a lack of research on the correlates of PA and travel PA in middle income-countries has been noted. Therefore, the aim of the present study is to examine the association between travel PA and prevalence of MetS and its components at a regional-level, by sociodemographic factors, independently of time spent in leisure and occupational PA in a national representative sample of adults participating in the 2009–2010 Chilean National Health Survey (CNHS).

2. Materials and methods

2.1. Study design and subjects

The 2009–2010 CNHS is a household survey of 5434 non-institutionalized participants ≥ 15 years of age from urban and rural settings who were included using stratified multistage probability sampling (Ministerio de Salud, G. de C., 2009). Data collection were completed by trained interviewers and nurses in two face-to-face home stages (Ministerio de Salud, G. de C., 2009). In the first stage, interviewers obtained information on participants' self-reported health, household characteristics and living conditions. In the second stage, nurses administered questionnaires, measured participant's blood pressure, anthropometrics, and collected blood and urine samples. Overall, 95% of the surveyed participants contributed blood samples (n = 4956) (Ministerio de Salud, G. de C., 2009). The response and refusal percentages were 85 and 12%, respectively, with no replacements used (Ministerio de Salud, G. de C., 2009).

Only subjects who were aged 18 years and older with MetS data were considered for this study (n = 3109). Subjects were excluded if they reported a history of myocardial infarction, stroke or deep vein thrombosis (n = 204). Additionally, subjects with > 16 h/day on any PA domain (n = 4) and with no information on the covariates were also excluded (n = 37), leading to a total sample of 2864 participants.

The CNHS was funded by the Chilean Ministry of Health. The study protocol was approved by the ethics research committee of the faculty of medicine at the Pontificia Universidad Católica de Chile. Inform consent was obtained from all participants.

2.2. Socio-demographic

Participants were classified into; low (< 8 school years), intermediate (8–12 school years) and high (> 12 school years) groups, according to their highest educational level successfully attained; region of residence was defined according to participants regions location into North (I–IV and XV), Central (V–VIII and XIII) and South (IX–XII and XIV); and age was classified into groups (18–29; 30–44; 45–64 and 65 + years).

2.3. Evaluation of physical activity

The GPAQ was developed by the World Health Organization (WHO) as a tool for surveillance of population levels of PA (Bull et al., 2009). For the 2009–2010 CNHS an interviewer assessed PA participation using GPAQ version 2. Duration, frequency and intensity of PA in three different domains; occupational (at work), travel (active commuting) and leisure-time (recreational), were obtained from this questionnaire (World Health Organization, 2009).

Travel PA is defined as a way participants travel to and from places (either walking or cycling) and is classified as a moderate intensity activity (> 4METs), while leisure and occupational PA are considered moderate-vigorous PA (MVPA) intensities (World Health Organization, 2009). Total moderate and MVPA minutes per week (min/week) were calculated from travel, leisure and occupational PA domains separately, respectively. Participants were then classified as insufficiently active (< 150 min/week) or active (≥ 150 min/week) for every domain according to WHO's PA recommendations (World Health Organization, 2010).

2.4. Definition of metabolic syndrome

MetS was defined by the presence of at least 3 of the following 5 conditions (Alberti et al., 2009): blood pressure ≥ 130/85 mmHg, central obesity, HDL cholesterol < 40 mg/dL (< 1.03 mmol/L) in males and < 50 mg/dL (< 1.29 mmol/L) in females, fasting plasma glucose (FPG) ≥ 100 mg/dL (≥ 5.6 mmol/L) and/or Triglycerides level: ≥ 150 mg/dL (≥ 1.7 mmol/L). Central obesity defined as waist circumference varies upon ethnicity, considering Chile's cut points as ≥ 88 cm and ≥ 83 cm, for males and females, respectively (Arteaga Llona, 2009).

2.5. Statistical analysis

Descriptive statistics are presented as adjusted means with standard deviations (SD) for quantitative variables or frequency (percentages) for categorical variables. Chi-squared tests for categorical variables and t-test for parametric variables were carried to analyze sociodemographic differences and PA between presence and absence of MetS.

Multilevel logistic regression was used to estimate the magnitude of the association between travel PA and MetS at a regional level. For this analysis, insufficiently active travel participants (≤ 150 min/week) were used as a reference group. First, a partially adjusted model analyzed age groups, sex and educational level. Then a fully adjusted also included leisure-time and occupational PA. Body Mass Index (BMI) was initially included in the analysis, but it was strongly collinear with waist circumference, so it was removed.

Also, a multilevel logistic regression was performed analyzing separately the association between travel PA and every MetS component at a regional level (blood pressure, fasting plasma glucose, waist circumference, HDL cholesterol and triglycerides), in a partially and a fully adjusted model.

Likelihood ratio tests were performed to determine whether interactions existed between sex or age and travel PA in terms of MetS or its components.

All of the analyses were performed using Stata v. 12 (StataCorp LP). Significance level was set at 5% (p < 0.05) and complex sample design was used.

3. Results

The mean age of the individuals included in this study was 45.2 ± 17.6 years; 60.8% were women, and 54.9% had between 8 and 12 years of education. Moreover, 40.7% of the subjects lived in the central region and 46.2% were classified as active (≥ 150 min/week) according to travel PA. Additionally, 33.7% of the sample had MetS. Sample characteristics are presented in Table 1. Those who were excluded were older (mean 68.6 years), had higher MetS (55%), were less active (30% Travel PA ≥ 150 min/week) and had lower educational