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Review Article

Metabolic Risk Factors in low Physical Activity Shoe Workers of Central Mexico

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Abstract

Introduction: The main activity in León Mexico is footwear industry. Many studies have shown that people with low physical activity have increased the risk for developing cardiovascular diseases. There is scanty information about metabolic risk factors in shoe workers.

Purpose: to compare metabolic risk factors in shoe workers according to their physical activity level.

Methods: One hundred and fifty-three shoe workers (49 women and 104 men) participated in this study (Age 36.5 ± 11.1 years). Participants completed the International Physical Activity Questionnaire (IPAQ) large form. They were classified in 3 groups: low physical activity (LPA, n=23), moderate physical activity (MPA, n= 46) and high physical activity (HPA, n=84). Systolic blood pressure (SBP), diastolic blood pressure (DBP), metabolic (glucose, cholesterol, HDL, LDL, triglycerides) and anthropometrics (body weight, high, waist and hip circumferences) were measured.

Results: Fifteen percent of participants were classified as Low-PA (23/153), 30 % as Moderate-PA (46/153) and 54 % as High -PA (84/153). Body mass index (29.8 vs 26.9 and 26.3 Kg/m2 respectively, $p< 0.01$) and waist circumference (94 vs 89 and 86 cm respectively, $p< 0.001$) were higher in Low-PA vs Moderate-PA and High-PA. Cholesterol was higher in LPA vs HPA (181 vs 163 mg/dl, $p<0.04$), triglycerides were higher in LPA vs MPA and HPA (210 vs 163 and 161 mg/dl).

Conclusions: In this young age sample of shoe workers, people with low physical activity have increased anthropometric (BMI and waist circumference) and metabolic (cholesterol and triglycerides) which are related to cardiovascular and metabolic diseases.

What are the new findings?

Shoe workers with low physical activity have increased anthropometric (BMI and waist circumference) and metabolic (cholesterol and triglycerides) which are related to cardiovascular and metabolic diseases.

Introduction

Cardiometabolic diseases are multifactorial and develop over time. An association between physical inactivity and heart disease was described in the Framingham Heart Study. More recently Hamilton et al suggests that there is a 112% greater relative risk associated with a large duration of sedentary behavior for developing type 2 diabetes. Physical inactivity deaths are related to $13·7 billion in productivity losses, and physical inactivity is responsible for 13·4 million DALYs worldwide [1].

The American College of Sports Medicine (ACSM) recommends to maintain health that most adults engage in moderate-intensity cardiorespiratory exercise training or a combination of moderate- and vigorous-intensity exercise (ACSM GUIDELINES). However, the total daily time that people sit, stand, and accumulate non–exercise steps are independent of traditionally recommended moderate-vigorous physical activity. According Hamilton [2] the large amount of sedentary time is associated with risk factors for developing a disease. The probability of a disease can only be reduced significantly with safe

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and non-fatiguing Low Intensity Physical Activity, especially in the most at-risk proportion of the population.
Recent studies in workers have showed an interaction effect with exercise on abdominal obesity; when workers do exercise decreased abdominal obesity risk [3]. A large study in Japanese population has shown a prevalence of no leisure-time exercise exceed 50% in workers [4]. Occupations that require several hours of sitting, low physical activity, and energy expenditure are classified as sedentary occupations [5] as footwear industry.

There is a scanty information referent to shoe workers health. However, the footwear industry is the main activity in León Mexico. Sedentary nature of their work appoints to shoe workers to be the perfect candidate to develop cardiometabolic diseases. The aim of this work is to compare metabolic risk factors in shoe workers according to their physical activity level.

Methods

One hundred and fifty-three shoe workers (49 women and 104 men) participated in this study (Age 36.5 ± 11.1 years). All participants provided written informed consent in accordance with the declaration of Helsinki. This study was approved by the University of Guanajuato Research Ethic Board (CIBIUG-P02-2017).
Participants were cited at 8:00 am in fasting state. Each participant answered a medical and occupational record included physical activity and diet information.
Anthropometrics: participants were measured using light clotting. Measurements like weight (Kg), and height (M) were obtained with clinical scale and stadiometer (Seca mod M-813 and Seca mod M-222 respectively), according to Habicht protocol. Waist circumference was measured using a flexometer (Seca M-813).
Physical activity (PA) was obtained by self-report using the International Physical Activity Questionnaire (IPAQ). Participants were classified in low PA, Medium PA and High PA according MET-minutes/week cut off points suggested by IPAQ guidelines (https://sites.google.com/site/theipaq/).

All participants answered a 3 days Food Frequency Questionnaire, this information was analyzed in a software (Nutrikal VO) to obtain daily kcal, carbohydrates, lipids and proteins (%).
Blood samples were analyzed by spectrophotometry (Spinreact 320-400nm) for glucose, cholesterol, HDL-C, LDL-C and triglycerides. All determinations were done at Clinical Lab of Department of Medical Science University of Guanajuato.

Metabolic risk factors criteria were used according International Diabetes Federation: Obesity (>/= 94cm men, >/= 80cm women), Plus (2/4): High Triglycerides (TG): >/= 150 mg/dL, or specific treatment. Low Cholesterol HDL: < 40 mg/dL in men or < 50 mg/dL in women, or specific treatment. Elevated blood pressure: systolic BP >/= 130 o diastolic BP >/= 85 mm Hg, or specific treatment. Fasting Glucose >/= 100 mg/dL or T2D diabetes type 2.

Statistical analysis: A Comparative analysis was conducted using ANOVA tests and post hoc LSD to determine statistical significance ($p \leq 0.05$).

Results

Fifteen percent was classified as Low-PA, 30 percent as Moderate-PA and 55 percent as High-PA. Table 1 summarized the metabolic differences among groups. Body mass index, waist circumference and triglycerides were higher in Low-PA vs Moderate-PA and High-PA. Cholesterol was higher in Low-PA vs High-PA (Table 1).

LPA: low physical activity, MPA: moderate physical activity, HPA: high physical activity, SBP: Systolic blood pressure, DBP: diastolic blood pressure, c-HDL cholesterol high density, c-LDL: cholesterol low density, TG: triglycerides, BMI: body mass index and Met Sx: metabolic syndrome, ns: non significative

The diet among groups was analyze and no difference was found on energy consumption (Low-PA= 2350.4 Cal/day, Moderate-PA= 2493.1Cal/day and High-PA =2407.1Cal/day) neither macronutrients.
Overall frequency of Metabolic syndrome (MetSx) was 26%, there is a borderline difference (X2=5.6, p=0.058) by high proportion of metabolic syndrome in the group of Low-PA (39%) vs Moderate-PA and High-PA (30% and 20% respectively). Employees reported 9 (8-11) hours/workday.

Discussion

The main findings in the present study were anthropometric alterations in shoe workers with low physical activity. The data is important because the 3 groups did not show differences in

Table 1: Clinical and metabolic characteristics.

	LPA (n= 23)	MPA (n=46)	HPA (n= 84)	p
Age (years)	41.8 ± 12.9	39.3 ±13.5	36.5 ± 11.1	ns
BMI (Kg/M2)	29.8 ± 7.2	26.9 ± 4.4	26.3 ± 5.1	<0.01
Waist circumference (cm)	96.4 ± 15.0	89.03 ± 13.19	86.9 ± 11.1	<0.01
Systolic BP (mmHg)	122.3 ± 18.0	121.2 ± 15.2	117.1 ± 11.7	ns
Diastolic BP(mmHg)	75.4 ± 12.4	77.5 ± 11.6	73.2 ± 8.6	ns
Glucose (mg/dl)	98.5 ± 22.1	98.5 ± 24.4	95.9 ± 24.2	ns
Cholesterol (mg/dl)	181.2 ± 54.9	167.3 ±36.9	197.1 ± 37.7	<0.04
c-HDL (mg/dl)	47.1 ± 12.4	45.2 ± 14.2	46.2 ± 14.5	ns
c-LDL (mg/dl)	92.04 ± 32.1	89.4 ± 29.9	89.8 ± 31.5	ns
TG (mg/dl)	210.4 ± 185.2	163.3 ± 96.4	161.3 ± 119.6	<0.01

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caloric intake. According Pate et al shoe workers could be classified as sedentary occupations because require several hours of sitting [5]. There is strong evidence that proves that low levels of PA are associated to metabolic disease. For example, manufacturing workers have larger waist circumferences than those in the other occupations [6]. Previously has been demonstrated that low levels of PA were inversely related to the risk of overweight/obesity in men [7]. Similar to our results Ryde et al found that employees with high levels of sitting time were 2.7 times more likely to have WC ≥94 cm (men) and ≥80 cm (women), and 9.0 times more likely to have BMI ≥30 than those with lower sitting time [8]. The frequency of MetSx found in this sample is higher than 12.6% and 9.6% reported in construction workers and clerks/professionals [9].

It is important to promote the inclusion of programs of wellness in workplace in order to increase the health status. Previous studies have shown a positive association between employee wellness programs and the use of preventive care services [10]. Employees after health promotion interventions improved health and had productivity outcomes [11].

In conclusion, in this young age sample of shoe workers, people with low physical activity have increased anthropometric (BMI and waist circumference) and metabolic (cholesterol and triglycerides) risk factor for developing cardiovascular and metabolic diseases. These results may provide a baseline to initiate programs of wellness for organizations.

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