



Impact of smoking and physical inactivity on self-rated health in women in Colombia

Dario Mendoza-Romero^a, Adriana Urbina^{c,*}, Amparo Cristancho-Montenegro^b, Airton Rombaldi^d

^a Programa de Terapia Respiratoria, Fundación Universitaria del Área Andina, Carrera 14A #70A-34, Bogotá, Colombia

^b Programa de Terapia Respiratoria, Fundación Universitaria del Área Andina, Carrera 14A #70A-34, Bogotá 111221, Colombia

^c Ciencias Biomédicas, Escuela de Medicina y Ciencias de la Salud, Universidad del Rosario, Carrera 26 #63B-48, Bogotá, Colombia

^d Escola de Educação Física, Universidade Federal de Pelotas, R. Luís de Camões, 625 - Três Vendas, Pelotas, RS 96055-630, Brazil

ARTICLE INFO

Keywords:

Smoking

Physical inactivity

Self-perceived health status

ABSTRACT

The aim of this study was to assess the association between poor and fair self-rated health, smoking, and leisure-time physical inactivity in Colombian women. A cross-sectional study using the data from the 2010 Colombian National Demographics and Health (ENDS) and Nutritional Situation (ENSIN) Surveys was conducted. Multivariate logistic analysis for self-perceived health status in 12,431 women aged 13–49 years old and 8224 women aged 18–64 years old were performed. Independent variables included smoking, leisure-time physical inactivity, anthropometric and socio-demographic information. Current smoking and leisure-time physical inactivity were associated with poor and fair self-rated health status (OR 1.78, CI 1.41, 2.25; OR 1.30, CI 1.03, 1.62; respectively). Other significantly associated variables were age (OR 1.68, CI 1.46, 1.92 for 30–49 years; OR 2.32, CI 1.96, 2.74 for 50–64 years), socio-economic strata (OR 7.24, CI 3.81, 13.76 for strata 1–3), educational level (OR 1.70 to 2.77 compared to technical or university), obesity (OR 0.81, CI 0.70, 0.93 for normal body mass index), geographical region (OR 0.67, CI 0.53, 0.85 for Bogotá, compared to Amazon and Orinoco regions), and no affiliation to health system (OR 1.22, CI 1.03, 1.44). Smoking and leisure-time physical inactivity were significantly associated with poor and fair self-rated health in Colombian women. Promoting leisure-time physical activity and implementing smoking cessation strategies specifically in female population, mainly from low to medium strata are suggested to improve their self-perceived health status and control chronic non-communicable diseases.

1. Introduction

Chronic noncommunicable diseases (CNCDs) are the leading cause of morbidity and mortality worldwide, mostly in low- and middle-income countries, and in recent decades the risk in women has increased (World Health Organization, 2008a). Low-active adults have a 20 to 30% increase in mortality, compared to those who practice at least 150 min per week of moderate to vigorous physical activity (World Health Organization, 2014). It has been estimated that a physical inactivity prevalence exposure of 52.3% was associated to a population attributable risk of 20.1% for CNCDs in adults over 45 years (Lobelo et al., 2006) in Bogotá, Colombia. Globally, women are more inactive than men (Hallal et al., 2012), and although they smoke less than men, women are more susceptible to the effect of tobacco (Holmen et al., 2002), 5% of their mortality is attributed to tobacco and 14% to CNCDs

(World Health Organization, 2014).

In Colombia, the prevalence of tobacco consumption in the last month has decreased from 21.4% in 1993 to 12.85% in 2007 (Macias et al., 2014). This country ratified in 2008 the World Health Organization (WHO) framework convention on tobacco control (Ministerio de la Protección Social, 2008), and in 2009 adopted a national smoke-free law (República de Colombia, 2009), before many low and medium-income countries (Uang et al., 2017; World Health Organization, 2013). However, the more recent data from 2015 showed a prevalence of 13% (7.4% in women and 18.8% in men) (Ministerio de Justicia y del Derecho - Observatorio de Drogas de Colombia, 2015).

Along with tobacco and physical inactivity, a poor to fair self-perception of health status is associated with mortality in 4–9 years, even when *a priori* information about health and other known risks are considered. Self-perception of health status has been shown to be a

* Corresponding author at: Ciencias Biomédicas, Escuela de Medicina y Ciencias de la Salud, Universidad del Rosario, Carrera 26 #63B-48, 111221 Bogotá, Colombia.

E-mail addresses: dmendoza16@areandina.edu.co (D. Mendoza-Romero), adriana.urbina@urosario.edu.co (A. Urbina), acristancho@areandina.edu.co (A. Cristancho-Montenegro), rombaldi@ufpel.edu.br (A. Rombaldi).

<https://doi.org/10.1016/j.pmedr.2019.100976>

Received 24 December 2018; Received in revised form 12 August 2019; Accepted 15 August 2019

Available online 17 August 2019

2211-3355/ © 2019 Published by Elsevier Inc. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

useful indicator related to several clinical conditions and a predictor of morbidity and mortality (Franks et al., 2003). Their predictive capacity seems to be related to the perception of health-disease processes, including those that are not yet clinically detectable, risk behaviors, personal and family medical history, socio-demographic and economic conditions (Eriksson et al., 2001). The global assessment of health status ask respondent to rate their overall health with the categories of excellent, very good, good, fair, and poor. Many population-based longitudinal studies have shown that self-ratings of health reliably predict survival in populations even when known health risk factors have been accounted in. In most studies, odds ratios for mortality have been between 1.5 and 3.0 for poor and fair self-rated health compared with good, very good and excellent (Idler and Benyamini, 1997). This indicator of “self-perception of health” has been evaluated in the Colombian population, and women tend to perceive their health as poor and fair more frequently than men (28.3% vs. 22.4%, respectively (Instituto Colombiano de Bienestar Familiar, 2010). The purpose of this study was to evaluate the association between poor and fair self-rated health, smoking and physical inactivity in Colombian women, based on the data reported in the 2010 Colombian National Demographics and Health (ENDS) and Nutritional Situation (ENSIN) Surveys (Instituto Colombiano de Bienestar Familiar, 2010), which were conducted in 50,670 households, 258 municipalities, in 32 departments and the capital city.

2. Methods

2.1. Study design and participants

Cross-sectional study using data from the 2010 ENDS and ENSIN (Instituto Colombiano de Bienestar Familiar, 2010), nationally representative computer-assisted face-to-face household surveys, which were conducted in 50,670 households, 258 municipalities, in 32 departments and the capital city.

Segments were proportional in the municipal capitals and in the rural area. A four-stage probabilistic sample design was carried out: cluster sampling of municipalities in the first stage, urban housing blocks or rural censal radii in the second stage, continuous segments of 12 households in the third stage, and individuals in the final stage (Profamilia, 2011). ENDS included data from self-rated health from 200,357 people aged 0–96 years; ENSIN is a subsample from this (Instituto Colombiano de Bienestar Familiar, 2010) and in the biochemical indicators section included tobacco use information from 12,466 people aged 13–49 years (12,433 women and 33 men); other section of ENSIN included physical activity information from 14,465 people aged 18–64 years, from which 8224 were women.

2.2. Variables

The self-perceived health status was recorded as one of five categories: poor, fair, good, very good, and excellent. For the purposes of this study, this was the dependent variable and it was categorized as a binary outcome in: poor and fair; and good, very good and excellent. Tobacco use was defined only as current smoking. Leisure-time physical activity was determined using the international physical activity questionnaire, long version, (IPAQ) and individuals classified as low were considered physically inactive; subjects classified as moderate and vigorous were considered physically active (“Guidelines for Data Processing and Analysis of the International Physical Activity Questionnaire (IPAQ): Short and Long Forms,” 2005). We only use leisure-time physical activity data to estimate physical inactivity as previous studies conducted in Brazil and Colombia, showed that using occupational and housework data overestimate scores of physical activity levels (Hallal et al., 2010). Body mass index, waist circumference, and the associated cardiovascular disease risk were determined and categorized following the recommendations of the World Health

Organization (World Health Organization, 2008b). According to body mass index, subjects were classified as underweight ($< 18.5 \text{ kg/m}^2$), normal ($18.5\text{--}24.9 \text{ kg/m}^2$), overweight ($25\text{--}29.9 \text{ kg/m}^2$) or obese ($\geq 30 \text{ kg/m}^2$). Abdominal obesity was defined as a waist circumference $> 88 \text{ cm}$. Cardiovascular disease risk was classified in increased, high, and very high, according to body mass index and waist circumference (World Health Organization, 2008b). To control for possible confounding effects, we included basic demographic characteristics, and analysis were stratified by age, geographic region (Atlantic, Oriental, Andean, Pacific, Bogotá, Amazon and Orinoco), marital status, ethnic minority, health system affiliation, and educational level. Socioeconomic position was determined according to the official socioeconomic stratification system in Colombia and grouped in low to middle (strata 1–3), and upper-middle to wealthy (strata 4–6).

2.3. Statistical methods

Since information about tobacco use and physical inactivity (after using International Physical Activity Questionnaire, IPAQ) was in the ENSIN database while that self-perceived health status and the other interest variables were in the ENDS database, the two databases were merged. For the estimation of results and, due to the different selection probabilities throughout the different sampling stages, the required weighting factors were introduced, so that the cumulative weighted sample of the small departments is reduced according to the weight of the department in the national context and the weighted sample of the large ones increases proportionally to the weight of these (Profamilia, 2011).

In a first model, we used an analytic weighted sample of 12,431 women aged 13–49 years, with complete data on self-perceived health status, age, ethnicity, socioeconomic strata, tobacco use, body mass index category, and geographical location. A descriptive analysis of the sample was performed. Self-perceived health status adjusted by the other variables was assessed using Pearson's chi-square test. Association between poor and fair self-perceived health status and current smoking was assessed by crude and adjusted multivariate logistic regression models. Variables with $p < 0.05$ in bivariate crude analysis were entered to the multivariate model applying a forward step-wise method.

As the women surveyed for physical inactivity were not the same as those surveyed on smoking, and in order to maintain an adequate sample size in the regression models, it was necessary to perform a separate multivariate model to evaluate the association between poor and fair self-perceived health status and leisure-time physical inactivity using 8224 records from women aged 18–64 years. This second model also included information about educational level, health system affiliation, abdominal obesity, and marital status. The level of significance was established at 0.05 and the information was treated in IBM SPSS software version 23.

3. Results

3.1. Relationship between poor and fair self-perceived health and smoking

First, the association between poor and fair self-perception of health status and current smoking was analyzed in women aged from 13 to 49 years. In this first dataset, global frequency of reporting poor and fair self-rated health was 25.5% and the prevalence of current smoking was 3%. In a first model for the outcome “poor and fair self-perception of health” ($n = 7941$), adjusted OR in low to medium strata was 7.24 (IC 3.81, 13.76) compared to upper-middle wealthy strata. Smoker women showed OR of 1.78 (CI 1.41, 2.25) compared to nonsmoker. Normal body mass index and overweight showed a protective effect with respect to obesity (OR 0.81, CI 0.70, 0.93; and OR 0.84, CI 0.73, 0.97; respectively), as well as women living in Bogotá (OR 0.55, CI 0.42, 0.71), the Andean (OR 0.73, CI 0.63, 0.85) region (not including Bogotá) and the Oriental (OR 0.80, CI 0.67, 0.96) region, in comparison

Table I

Demographic, socioeconomic, and tobacco use characteristics of the sample stratified by self-perceived health status.

Variables		Self-perceived health status (n = 12,431)				p
		Good, very good, and excellent		Poor and fair		
		Frequency	Percentage	Frequency	Percentage	
Age	13–17	3100	33.5	743	23.5	< 0.001
	18–29	3274	35.3	897	28.4	< 0.001
	30–49	2893	31.2	1524	48.2	< 0.001
	Total	9267	100.0	3164	100.0	
Ethnic minority*	Yes	1976	21.3	797	25.2	< 0.001
	No	7291	78.7	2367	74.8	< 0.001
	Total	9267	100.0	3164	100.0	
Socioeconomic strata	1–3	8615	97.1	2941	99.5	< 0.001
	4–6	257	2.9	16	0.5	< 0.001
	Total	8872	100.0	2957	100.0	
Current smoking	Yes	244	2.6	147	4.6	< 0.001
	No	9023	97.4	3017	95.4	< 0.001
	Total	9267	100.0	3164	100.0	
Body mass index category	Underweight	180	3.0	74	3.1	0.801
	Normal	2766	46.1	965	40.9	< 0.001
	Overweight	2069	34.6	805	34.1	0.739
	Obesity	983	16.4	516	21.9	< 0.001
	Total	5998	100.0	2360	100.0	
Geographic region	Atlantic	1982	21.4	733	23.2	0.038
	Oriental	1362	14.7	425	13.4	0.085
	Andean	2367	25.5	708	22.4	< 0.001
	Pacific	1276	13.8	548	17.3	< 0.001
	Bogotá, DC	607	6.6	122	3.9	< 0.001
	Amazon and Orinoco	1673	18.1	628	19.8	0.035
	Total	9267	100.0	3164	100.0	

* Ethnic minority: afro-Colombian, raizal, palenque, indigenous or gipsy.

Table II

Odds ratio (OR) for a poor and fair self-perception of health in women in Colombia according to ENSIN 2010 (n = 7941).

Variables	OR (IC 95%)	
	Crude	Adjusted
Age (years)		
13–17	1	1
18–29	1.14 (1.02–1.27)	0.58 (0.14–2.26)
30–49	2.19 (1.98–2.43)	1.11 (0.28–4.35)
Ethnic minority*		
Yes	1.24 (1.13–1.36)	1.03 (0.91–1.18)
No	1	1
Socioeconomic strata		
1–3	5.48 (3.30–9.10)	7.24 (3.81–13.76)
4–6	1	1
Current smoking		
Yes	1.80 (1.46–2.22)	1.78 (1.41–2.25)
No	1	1
Body mass index category		
Underweight	0.78 (0.58–1.04)	1.07 (0.78–1.45)
Normal	0.66 (0.58–0.75)	0.81 (0.70–0.93)
Overweight	0.74 (0.64–0.84)	0.84 (0.73–0.97)
Obesity	1	1
Geographic region		
Atlantic	0.98 (0.87–1.11)	0.93 (0.79–1.09)
Oriental	0.83 (0.72–0.95)	0.80 (0.67–0.96)
Andean	0.79 (0.70–0.90)	0.73 (0.63–0.85)
Pacific	1.14 (0.99–1.31)	0.96 (0.81–1.14)
Bogotá	0.53 (0.43–0.66)	0.55 (0.42–0.71)
Amazon and Orinoco	1	1

* Ethnic minority: afro-Colombian, raizal, palenque, indigenous or gipsy.

to those from Amazon and Orinoco region of Colombia (Tables I and II).

Considering that low to medium strata showed the higher OR and had the largest number of subjects, an additional model for the outcome “current smoking” was conducted (n = 7746). This showed that in women from low to medium strata, current smoking was directly

associated with Oriental (OR 1.82, CI 1.14, 2.90), Andean (OR 2.77, CI 1.83, 4.18), Pacific regions (OR 2.22, CI 1.41, 3.50), and Bogotá (OR 2.75, CI 1.63, 4.64) compared to Amazon and Orinoco; and inversely associated with ethnic minority (OR 0.65, CI 0.45, 0.83).

3.2. Relationship between poor and fair self-perceived health and physical inactivity

The association between poor to fair self-perceived health status, and leisure-time physical inactivity was analyzed in 8224 women aged 18–64 years, including other variables as educational level, health system, abdominal obesity, and marital status (Table III). In this dataset, the frequency of reporting poor and fair self-rated health was 31.3% and prevalence of leisure time physical inactivity was 93.7%. In the multivariate model, the report of poor and regular self-perception of health was greater as age increased, and physically inactive women presented a greater OR to perceive their health as poor and fair (OR 1.30, CI 1.03, 1.62). Other risk factors included low educational level, not being affiliated to health system and having a socio-economic stratum from 1 to 3 (Table IV). Precisely, in the women from lower to medium strata, an additional model for the outcome “leisure time physical inactivity” was conducted (n = 7265), which showed direct association with primary (OR 2.08, CI 1.53, 2.81) and secondary educational level (OR 1.27, CI 1.00, 1.60), compared to technical/university/postgraduate; and with living in Bogotá (OR 1.70, CI 1.06, 2.73) compared to Amazon and Orinoco.

4. Discussion

This study evaluated the association between a poor and fair self-rated health, smoking and physical inactivity in Colombian women analyzing the data from the 2010 ENDS and ENSIN Surveys (Instituto Colombiano de Bienestar Familiar, 2010). The prevalence of current smoking in Colombian adult women in 2010 was 3%, prevalence of leisure-time physical inactivity was 93.7%, and frequency of reporting

Table III
Demographic, socioeconomic and physical activity characteristics of the sample stratified by self-perceived health status.

Variables	Self-perceived health status (n = 8224)				p
	Good, very good, and excellent		Poor and fair		
	Frequency	Percentage	Frequency	Percentage	
Age					
18–29	2159	38.2	520	20.2	< 0.001
30–49	2499	44.3	1242	48.2	0.001
50–64	988	17.5	816	31.7	< 0.001
Total	5646	100.0	2578	100.0	
Leisure time physical inactivity					
Yes	5249	93.0	2453	95.2	< 0.001
No	397	7.0	125	4.8	< 0.001
Total	5646	100.0	2578	100.0	
Educational level					
No formal schooling	134	2.4	138	5.4	< 0.001
Primary or lower	1187	21.0	1036	40.2	< 0.001
Secondary	2646	46.9	1088	42.2	< 0.001
Tech/university/postgrad	1679	29.7	316	12.3	< 0.001
Total	5646	100.0	2578	100.0	
Health system affiliation					
Yes	5057	89.6	2297	89.1	0.522
No	589	10.4	281	10.9	0.522
Total	5646	100.0	2578	100.0	
Geographic region					
Atlantic	1189	21.1	581	22.5	0.068
Oriental	859	15.2	358	13.9	0.116
Andean	1590	28.2	738	28.6	0.664
Pacific	766	13.6	406	15.7	0.009
Bogotá	579	10.3	175	6.8	< 0.001
Amazon and Orinoco	663	11.7	320	12.4	0.385
Total	5646	100.0	2578	100.0	
Body mass index category					
Underweight	182	3.2	79	3.1	0.703
Normal	2337	41.4	827	32.1	< 0.001
Overweight	1872	33.2	887	34.4	0.259
Obesity	1008	17.9	672	26.1	< 0.001
Total	5399	95.6	2465	95.6	
Cardiovascular disease risk*					
Abdominal obesity	2187	38.7	715	27.7	< 0.001
High	1312	23.2	563	21.8	0.199
Very high	1738	30.8	1099	42.6	< 0.001
Total	5237	92.8	2377	92.2	
Socioeconomic strata					
1–3	5322	94.3	2520	97.8	< 0.001
4–6	324	5.7	58	2.2	< 0.001
Total	5646	100.0	2578	100.0	
Marital status					
Married/cohabiting	3096	54.8	1524	59.1	< 0.001
Divorced/widowed	1103	19.5	655	25.4	< 0.001
Single	1447	25.6	399	15.5	< 0.001
Total	5646	100.0	2578	100.0	

* Risk for type 2 diabetes mellitus, hypertension, and coronary disease, according to body mass index and waist circumference (World Health Organization, 2008b).

Table IV
Odds ratio (OR) for a poor and fair self-perception of health in women in Colombia according to ENSIN 2010 (n = 8224).

Variables	OR (IC 95%)	
	Crude	Adjusted
Age		
18–29	1	1
30–49	2.06 (1.83–2.32)	1.68 (1.46–1.92)
50–64	3.42 (3.00–3.91)	2.32 (1.96–2.74)
Leisure-time physical inactivity		
Yes	1.48 (1.20–1.82)	1.30 (1.03–1.62)
No	1	1
Educational level		
No formal schooling	5.47 (4.19–7.14)	2.77 (2.06–3.72)
Primary or lower	4.63 (4.00–5.36)	2.70 (2.29–3.19)
Secondary	2.18 (1.90–2.51)	1.70 (1.46–1.98)
Tech/university/postgrad	1	1
Health system affiliation		
Yes	1	1
No	1.05 (0.90–1.22)	1.22 (1.03–1.44)
Geographic region		
Atlantic	1.01 (0.85–1.19)	0.96 (0.80–1.15)
Oriental	0.86 (0.72–1.03)	0.81 (0.66–0.99)
Andean	0.96 (0.82–1.12)	0.90 (0.76–1.08)
Pacific	1.09 (0.91–1.31)	1.07 (0.88–1.31)
Bogotá	0.62 (0.50–0.77)	0.67 (0.53–0.85)
Amazon and Orinoco	1	1
Body mass index category		
Underweight	0.65 (0.49–0.86)	1.28 (0.89–1.82)
Normal	0.53 (0.46–0.60)	0.91 (0.74–1.13)
Overweight	0.71 (0.62–0.80)	0.88 (0.76–1.03)
Obesity	1	1
Cardiovascular disease risk*		
Abdominal obesity	1	1
High	1.31 (1.15–1.49)	1.02 (0.87–1.21)
Very high	1.93 (1.72–2.16)	1.19 (0.97–1.46)
Socioeconomic strata		
1–3	2.64 (1.99–3.51)	1.98 (1.42–2.77)
4–6	1	1
Marital status		
Married/cohabiting	1.78 (1.57–2.02)	1.16 (1.00–1.35)
Divorced/widowed	2.15 (1.85–2.49)	1.07 (0.90–1.28)
Single	1	1

* Risk for type 2 diabetes mellitus, hypertension, and coronary disease, according to body mass index and waist circumference (World Health Organization, 2008b).

poor and fair self-rated health was between 25.5 and 31.3%. This last was significantly associated with current smoking, leisure-time physical inactivity, increased age, low to medium socio-economic strata, low educational level, obesity, geographical region, and no affiliation to health system.

The first model presented here showed conclusively an association of poor and fair self-perceptions of health with current tobacco consumption (OR 1.78, CI 1.41, 2.25) and with low to medium socio-economic level (strata 1–3, OR 7.24, CI 3.81, 13.76). In the surveys presented here, smoking information refers only to current consumption, while other surveys report consumption in the last month, in the last year, or during the life. In Colombia, the most recent data on tobacco consumption come from the 2013 and show a frequency of cigarette consumption during the last month of 7.4% in women and 18.8% in men aged 12–65 years (Ministerio de Justicia y del Derecho - Observatorio de Drogas de Colombia, 2015). The difference respect to this study may be explained because those surveys included a wider age range (up to 65 years) and cigarette consumption could be intermittent, so that consumption in the last month may not be representative of current consumption. However, projections for Colombia based on historical data from 1998 to 2013 have shown a downward trend and an estimated prevalence for current cigarette consumption for 2016 of 3.9% in women and 10.9% in men older than 15 years (Storr et al.,

2008; World Health Organization, 2008a). Additionally, the trend in mortality from lung cancer in Colombia for the period 1983–2007 has shown an average annual percent change (AAPC) of -2 (-2.8 , -1.3) in men and -1.4 (-2.0 , -0.9) in women (Wong et al., 2017).

The tobacco epidemic behaves following a four-stage model. First, consumption increases; second, consumption continues to increase while the mortality attributable to tobacco begins to increase showing a 20 to 30 years delay; third, the prevalence of consumption stabilizes and then decreases while mortality continues to rise until reaching a plateau; and fourth, consumption continues decreasing and mortality starts to decrease (Piñeros et al., 2016). Although this model was initially proposed in 1994 (Lopez et al., 1994), it has been adapted to describe separately the behavior of the epidemic in men and women (Piñeros et al., 2016). Since in Colombia, both prevalence of tobacco consumption and mortality from lung cancer are decreasing, we can consider that in this country the tobacco epidemic is in the fourth stage. A similar situation has been observed in the Americas region in Canada, the United States, Costa Rica and Ecuador. According to the WHO, countries with the highest estimated consumption in South America for 2016 were Chile (33% in men and 24% in women) and Argentina (25 and 14%, respectively), followed by Brazil (16% in men and 9% in women) and Paraguay (17 and 4%, respectively); and then Colombia and Ecuador (9.7 and 1.6%, respectively) (World Health Organization, 2008a).

Although in general terms, the tobacco epidemic affects a smaller proportion of women than men, women seem to be more susceptible to their harmful effects, presenting more severe respiratory symptoms and greater affectation of pulmonary function tests, respect to men for the same level of consumption expressed in packages year (Langhammer et al., 2000). Moreover, animal models have shown that the respiratory epithelium of female rats shows more intense changes in response to acute exposure to tobacco smoke compared to male rats (Hayashi et al., 1978). For these reasons, it is necessary to implement strategies for the prevention and cessation of tobacco consumption specifically in the female population. Moreover, the additional model conducted for “current smoking” suggests that interventions targeted to women from low to medium strata in the Oriental, Andean, Pacific and Bogotá regions should be prioritized.

The frequency of overweight was 35% and obesity 21%, lower than those observed in Mexico (overweight 40% and obesity 30% in adults) (Medina et al., 2013), but close to that reported for all Latin America, where 50% of women suffer from overweight or obesity (World Health Organization, 2018). In contrast, in Eastern Europe the average frequency is 40%, in Asia and Pacific 29%, and in Africa 33% (World Health Organization, 2018). In the first multivariate model, it was observed a protective effect of normal weight and overweight to report poor and fair self-rated health compared with obesity. A previous study in 49 low and middle income countries showed that, taking normal weight as reference, adults with low weight ($< 18 \text{ kg/m}^2$), overweight and obesity reported poor health status more frequently, after adjusting by age and other confounding variables (Wang and Arah, 2015).

It is well known that socio-economic conditions influence the self-perception of health. We found an association between poor to fair self-perception self-rated health and low-medium socio-economic stratum (OR 7.24, CI 3.81, 13.76). This finding is consistent with that previously reported in high- and middle-income countries, and it has been considered as a manifestation of inequity in health in favor of more educated groups with higher incomes (Hosseinpoor et al., 2012). In fact, the second model (Table IV) additionally showed that poor and fair self-rated health was also associated with low schooling (with OR between 1.7 and 2.77 depending on the level of education with respect to the technical/university level), and no affiliation to health system (OR 1.22, CI 1.03, 1.44). A study also conducted in Colombia showed that the prevalence of current smoking was higher in women with low education, while the prevalence of former smoking was higher in women with higher schooling (Macías et al., 2013), suggesting that

strategies for smoking cessation could be more effective as educational level increases. Therefore, interventions for preventing and cessation of smoking should be adapted to educational level of the target population.

Frequency of leisure-time physical inactivity was 94% for Colombian women aged 18–64 years. This is equal to the previously reported in the same national surveys conducted in 2005 (Mendoza Romero and Urbina, 2013), but higher than the frequency reported for Bogotá (46–79%) (Gamez et al., 2000; Gómez et al., 2004), and for the southern region of Brazil (70–89%) (Dias-da-Costa et al., 2005; Rombaldi et al., 2010). There are important differences in the estimation of physical inactivity that depend on whether only leisure-time is considered, or if other domains such as work, home and transportation-related are accounted. An approximate worldwide prevalence of total physical inactivity has been estimated in 34% women and 28% men (Hallal et al., 2012). We rely on the determination of physical inactivity solely based on leisure-time, since it has been reported that the data on home and occupational domains overestimate the level of physical activity (Hallal et al., 2010). Beyond the method used to determine the occurrence of physical inactivity, it is an accepted fact that in general, women are more physically inactive than men (Hallal et al., 2012). Worldwide, the highest prevalence of physical inactivity is reported in Latin America (Guthold et al., 2018), and specifically, the prevalence of leisure-time physical inactivity prevalence in Colombia is the highest reported so far in the region (Dias-da-Costa et al., 2005; Rombaldi et al., 2010). A study conducted in Bogotá estimated that a 53.2% of physical inactivity exposure prevalence was associated to a population attributable risk of 19.3% for coronary artery disease, 24.2% for stroke, 13.8% for arterial hypertension, 21% for diabetes mellitus, 17.9% for colon cancer and 14.2% for breast cancer. It was estimated that 7.6% of all-cause mortality and 20.1% of this six CNCDs mortality could be attributed to physical inactivity. Moreover, an estimated 5% mortality due to these conditions could be prevented if physical inactivity prevalence is reduced by 30% (Lobelo et al., 2006). In this sense, the model conducted for “leisure time physical inactivity” permits to suggest that the interventions to promote leisure time physical activity should be directed specially to women from low to medium strata, with primary or secondary educational level, and living in big cities like Bogotá.

The frequency of poor and fair self-perceptions of health status in Colombian women was 25% in the group of 13 to 49 years and 31% in the group of 18 to 64 years, similar to that reported for 2005 ENDS and ENSIN 2005 (30%) (Mendoza Romero and Urbina, 2013). For comparison purposes, the average frequency for Europe in 2007 was 35% (Baert and De Norre, 2009), and for Brazil in 2003 52.5% (Szwarwald et al., 2005). The results presented here show that the self-report of poor and fair self-rated health was influenced by age, socio-economic and educational level, geographical region, occurrence of overweight or obesity, lack of affiliation to health system, current consumption of tobacco and leisure-time physical inactivity. These findings will allow the design and evaluation of intervention strategies for health promotion and prevention, specifically targeted to women population.

4.1. Limitations and recommendations

Although this study was conducted with data from the 2010 ENDS and ENSIN Surveys, which are representative of the Colombian population, it also has some limitations that must be considered. In these surveys, the information about tobacco consumption was obtained from the female and male population from different age groups, making it impossible to establish comparisons age-matched by sex. In addition, women surveyed about smoking were not the same whom were applied the IPAQ, preventing to integrate these variables in the same model. This made it necessary to develop separate multivariate models that, nevertheless, maintained an adequate sample size and provided complementary information. It is suggested that, for future national surveys, information on tobacco consumption and physical inactivity be

obtained from the same subjects, both men and women.

5. Conclusions

Both cigarette smoking and physical inactivity were associated with poor and fair self-perceptions of health in women in Colombia. Other factors associated with this outcome were age, low schooling, low to medium socioeconomic status and no affiliation to health system. It is suggested that implementing strategies to reduce physical inactivity and to prevent and cease tobacco use that are targeted specifically to women, mainly from low to medium strata, could be useful for the control of chronic noncommunicable diseases.

Acknowledgments

Thanks to the Instituto Colombiano de Bienestar familiar (ICBF) for the access to 2010 ENSIN database.

Funding

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Declaration of competing interest

The authors declare that there are no conflicts of interest.

References

- Baert, K., De Norre, B., 2009. Perception of Health and Access to Health Care in the EU-25 in 2007.
- Dias-da-Costa, J.S., Hallal, P.C., Wells, J.C., Daltoé, T., Fuchs, S.C., Menezes, A.N.M., Olinto, M.T.A., 2005. Epidemiology of leisure-time physical activity: a population-based study in southern Brazil. *Cad. Saúde Pública* 21, 275–282.
- Eriksson, I., Undén, A.L., Elofsson, S., 2001. Self-rated health. Comparisons between three different measures. Results from a population study. *Int. J. Epidemiol.* 30, 326–333.
- Franks, P., Gold, M.R., Fiscella, K., 2003. Sociodemographics, self-rated health, and mortality in the US. *Soc. Sci. Med.* 1982 (56), 2505–2514.
- Gamez, R., Venegas, A.S., Yepes barón, H., Ardila Pinto, A.M., Rincon Rodriguez, A.T., 2000. Conhecimento, percepção e nível da atividade física dos cidadãos de Santa Fé de Bogotá, 1999. *Rev. Bras. Ciên. e Mov.* 8, 51–71.
- Gómez, L.F., Mateus, J.C., Cabrera, G., 2004. Leisure-time physical activity among women in a neighbourhood in Bogotá, Colombia: prevalence and socio-demographic correlates. *Cad. Saúde Pública* 20, 1103–1109. <https://doi.org/10.1590/S0102-311X2004000400026>.
- Guidelines for Data Processing and Analysis of the International Physical Activity Questionnaire (IPAQ): Short and Long Forms, 2005.
- Guthold, R., Stevens, G.A., Riley, L.M., Bull, F.C., 2018. Worldwide trends in insufficient physical activity from 2001 to 2016: a pooled analysis of 358 population-based surveys with 1.9 million participants. *Lancet Glob. Health* 6, e1077–e1086. [https://doi.org/10.1016/S2214-109X\(18\)30357-7](https://doi.org/10.1016/S2214-109X(18)30357-7).
- Hallal, P.C., Gomez, L.F., Parra, D.C., Lobelo, F., Mosquera, J., Florindo, A.A., Reis, R.S., Pratt, M., Sarmiento, O.L., 2010. Lessons learned after 10 years of IPAQ use in Brazil and Colombia. *J. Phys. Act. Health* 7 (Suppl. 2), S259–S264.
- Hallal, P.C., Andersen, L.B., Bull, F.C., Guthold, R., Haskell, W., Ekelund, U., 2012. Physical activity 1: global physical activity levels: surveillance progress, pitfalls, and prospects. *Lancet* 380, 247–257.
- Hayashi, M., Sornberger, G.C., Huber, G.L., 1978. Differential response in the male and female tracheal epithelium following exposure to tobacco smoke. *Chest* 73, 515–518. <https://doi.org/10.1378/chest.73.4.515>.
- Holmen, T.L., Barrett-connor, E., Clausen, J., Langhammer, A., Holmen, J., Bjermer, L., 2002. Gender differences in the impact of adolescent smoking on lung function and respiratory symptoms. The Nord-Trøndelag Health Study, Norway, 1995–1997. *Respir. Med.* 96, 796–804. <https://doi.org/10.1053/rmed.2002.1350>.
- Hosseinpour, A.R., Stewart Williams, J.A., Itani, L., Chatterji, S., 2012. Socioeconomic inequality in domains of health: results from the World Health Surveys. *BMC Public Health* 12, 198. <https://doi.org/10.1186/1471-2458-12-198>.
- Idler, E.L., Benyamini, Y., 1997. Self-rated health and mortality: a review of twenty-seven community studies. *J. Health Soc. Behav.* 38, 21–37.
- Instituto Colombiano de Bienestar Familiar, 2010. Encuesta Nacional de la Situación Nutricional en Colombia 2010 - ENSIN. (Bogotá, Colombia).
- Langhammer, A., Johnsen, R., Holmen, J., Gulsvik, A., Bjermer, L., 2000. Cigarette smoking gives more respiratory symptoms among women than among men The Nord-Trøndelag Health Study (HUNT). *J. Epidemiol. Community Health* 54, 917–922. <https://doi.org/10.1136/jech.54.12.917>.
- Lobelo, F., Pate, R., Parra, D., Duperly, J., Pratt, M., 2006. Burden of mortality associated to physical inactivity in Bogota, Colombia. *Rev. Salud Pública* 8, 28–41.
- Lopez, A.D., Collishaw, N.E., Piha, T., 1994. A descriptive model of the cigarette epidemic in developed countries. *Tob. Control.* 3, 242. <https://doi.org/10.1136/tc.3.3.242>.
- Macías, F., Malmusi, D., Borrell, C., 2013. Different patterns by age-group and gender of socioeconomic inequalities in smoking in Colombia. *Nicotine Tob. Res. Off. J. Soc. Res. Nicotine Tob.* 15, 1745–1755. <https://doi.org/10.1093/ntr/ntt055>.
- Macias, N., Quezada, A.D., Flores, M., Valencia, M.E., Denova-Gutiérrez, E., Quiterio-Trenado, M., Gallegos-Carrillo, K., Barquera, S., Salmerón, J., 2014. Accuracy of body fat percent and adiposity indicators cut off values to detect metabolic risk factors in a sample of Mexican adults. *BMC Public Health* 14, 341. <https://doi.org/10.1186/1471-2458-14-341>.
- Medina, C., Janssen, I., Campos, I., Barquera, S., 2013. Physical inactivity prevalence and trends among Mexican adults: results from the National Health and Nutrition Survey (ENSANUT) 2006 and 2012. *BMC Public Health* 13, 1063. <https://doi.org/10.1186/1471-2458-13-1063>.
- Mendoza Romero, D., Urbina, A., 2013. Actividad física en el tiempo libre y auto percepción del estado de salud en Colombia. *Apunts Med. Esport* 48, 3–9. <https://doi.org/10.1016/j.apunts.2012.03.001>.
- Ministerio de Justicia y del Derecho - Observatorio de Drogas de Colombia, 2015. Reporte de Drogas de Colombia, 1st ed. (Bogotá).
- Ministerio de la Protección Social, 2008. Resolución 1956 de 2008. Bogotá, Colombia.
- Piñeros, M., Sierra, M.S., Forman, D., 2016. Descriptive epidemiology of lung cancer and current status of tobacco control measures in Central and South America. *Cancer Epidemiol., Supplement: Cancer in Central and South America* 44, S90–S99. <https://doi.org/10.1016/j.canep.2016.03.002>.
- Profamilia, 2011. Encuesta Nacional de Demografía y Salud (ENDS 2010). Bogotá, Colombia.
- República de Colombia, 2009. Ley No. 1335. Bogotá, Colombia.
- Rombaldi, A.J., Menezes, A.M., Azevedo, M.R., Hallal, P.C., 2010. Leisure-time physical activity: association with activity levels in other domains. *J. Phys. Act. Health* 7, 460–464.
- Storr, C.L., Cheng, H., Posada-Villa, J., Aguilar-Gaxiola, S., Anthony, J.C., 2008. Adult smokers in Colombia: who isn't giving it up. *Addict. Behav.* 33, 412–421. <https://doi.org/10.1016/j.addbeh.2007.10.003>.
- Szwarcwald, C.L., Souza-Júnior, P.R.B. de, Esteves, M.A.P., Damacena, G.N., Viacava, F., 2005. Socio-demographic determinants of self-rated health in Brazil. *Cad. Saúde Pública* 21, S54–S64. <https://doi.org/10.1590/S0102-311X2005000700007>.
- Uang, R., Crosbie, E., Glantz, S.A., 2017. Smokefree implementation in Colombia: monitoring, outside funding, and business support. *Salud Publica Mex.* 59, 128–136. <https://doi.org/10.21149/7884>.
- Wang, A., Arah, O.A., 2015. Body mass index and poor self-rated health in 49 low-income and middle-income countries, by sex, 2002–2004. *Prev. Chronic Dis.* 12, E133. <https://doi.org/10.5888/pcd12.150070>.
- Wong, M.C.S., Lao, X.Q., Ho, K.-F., Goggins, W.B., Tse, S.L.A., 2017. Incidence and mortality of lung cancer: global trends and association with socioeconomic status. *Sci. Rep.* 7, 14300. <https://doi.org/10.1038/s41598-017-14513-7>.
- World Health Organization, 2008a. WHO Report on the Global Tobacco Epidemic, 2008: The MPOWER Package. Geneva, Switzerland.
- World Health Organization, 2008b. Waist Circumference and Waist-Hip Ratio: Report of a WHO Expert Consultation. Geneva.
- World Health Organization, 2014. Global Status Report on Noncommunicable Diseases 2014. Geneva, Switzerland.
- World Health Organization, 2018. Obesity among women [WWW document]. WHO glob. health obs. GHO data. http://www.who.int/gho/urban_health/physiological-risk-factors/women_obesity/en/, Accessed date: 12 September 2018.
- World Health Organization, 2013. WHO Report on the Global Tobacco Epidemic, 2013: Enforcing Bans on Tobacco Advertising, Promotion and Sponsorship. Geneva, Switzerland.