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# Association between television viewing and obesity in Peruvian women

## ABSTRACT

**OBJECTIVE:** To assess the association between frequency of television viewing, overweight and obesity in a nationally representative sample of Peruvian women.

**METHODS:** Secondary analysis of the Demographic and Health Survey 2008 including women aged from 15 to 49 years old. The outcome variables were obesity (body mass index  $\geq 30$  kg/m<sup>2</sup>) and overweight (body mass index  $\geq 25$  but  $< 30$  kg/m<sup>2</sup>) whereas the exposure variable was frequency of television viewing (never, occasionally, almost every day). Logistic regression taking into account the multistage study design and adjusting for potential confounders was used. Results were presented as adjusted odds ratios (aOR) with 95% confidence intervals (95%CI).

**RESULTS:** A total of 21,712 women were included in the analysis. The prevalence of overweight was 34.7% (95%CI 33.8%;35.7%), and obesity prevalence was 14.3% (95%CI 13.6%;15.1%). Compared to women who never watched television, those who reported watching television occasionally and almost daily were more likely to be obese: aOR 1.7 (95%CI 1.3;-2.3) and aOR 2.6 (95%CI 2.0;3.5), respectively. The magnitude of this association was lower for overweight: aOR 1.2 (95CI 1.3;2.3) and aOR 1.6 (95%CI 1.1;1.4), respectively. The strength of the association was greater in urban areas.

**CONCLUSIONS:** Frequency of television viewing was associated with overweight and obesity in Peruvian women and the strength of this association varied by area of residence. These findings can provide input to strategies for obesity prevention in the Peruvian context.

**DESCRIPTORS:** Women. Obesity, epidemiology. Sedentary Lifestyle. Television, utilization. Health Surveys.

## INTRODUCTION

Several chronic conditions including obesity have significantly increased in recent years, especially in developing countries.<sup>19</sup> At the same time there has been an increase in cardiovascular deaths in Peru.<sup>10</sup> Certain activities such as television viewing for several hours may contribute to a sedentary lifestyle with increased caloric intake and low levels of physical activity predisposing to overweight and obesity, which in turn contributes to the development of chronic non-communicable diseases (NCDs).<sup>13</sup>

The association between frequency of television viewing and obesity has been described in previous studies in adults,<sup>9</sup> adolescents,<sup>23</sup> and children.<sup>7</sup> Moreover, frequent television viewing during childhood and adolescence predicts the onset of obesity in adulthood.<sup>8,24</sup> This sedentary activity is associated with cardiovascular diseases including obesity, metabolic syndrome, and type 2 diabetes

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mellitus.<sup>4,9</sup> A prospective study carried out in British adults found an independent association between frequency of television viewing and mortality from all causes including those from cardiovascular diseases.<sup>25</sup>

In the light of the epidemiological<sup>10</sup> and nutritional transition<sup>17</sup> that Peruvian society is experiencing, it is crucial to better understand potential risk factors associated with high rates of obesity. Thus, the present study aimed to assess the association between frequency of television viewing and obesity in women.

## METHODS

Cross-sectional study that analyzed secondary data from the Peruvian National Demographic and Health Survey (DHS) conducted by the National Institute of Statistics and Informatics in 2008 (ENDES Línea de Base). This survey is regularly conducted as part of the DHS global program. It has a multistage, self-weighted design using random sampling of areas and a representative population at the national level.

According to the World Bank, Peru is an upper-middle income country with an estimated population of 29 million people. About 80% of the population lives in urban areas, and about 30% are below the poverty line. The official language is Spanish, but there are other native languages spoken in Peru such as Quechua and Aymara, among others, especially spoken in Andean and jungle areas.<sup>a</sup>

The DHS is a national survey conducted in urban and rural areas of 24 departments in Peru. The DHS 2008 comprised women aged between 15 and 49 years. A total of 1,097 clusters were selected comprising 29,196 households. There was collected sociodemographic and health information, including anthropometric measurements. In rural areas, primary sampling units were villages with 500 to 2,000 inhabitants. In urban areas, primary sampling units were blocks or groups of blocks that together consisted on average of 120 households. The secondary units of analysis for both rural and urban areas were private households, which were part of their corresponding primary sampling units.

The study outcomes were obesity and overweight, evaluated using the body mass index (BMI). Both weight and height were measured using standard techniques. Weight measures were taken with light clothing and without shoes, using an electronic balance with 0.1 kg precision. Height was measured using a measuring tape to the nearest 0.1cm. Obesity and overweight were defined according to international standards as BMI  $\geq 30$  kg/m<sup>2</sup> and BMI  $\geq 25$  but

< 30 kg/m<sup>2</sup>; respectively. Normal weight was defined as BMI between 18.5 and 24.9 kg/m<sup>2</sup>.<sup>1</sup>

The exposure of interest was self-reported frequency of television viewing. Following the DHS methodology, respondents were asked: "Do you watch television almost every day, at least once a week, several times a week or never?" Of all respondents, 2.7% answered "at least once a week." Thus, the exposure variable analyzed was divided into three categories: almost every day; occasionally (several times a week and at least once a week); and never.

The covariates used in the analysis were: age (5-year age groups); area of residence (urban or rural); assets index (used as a proxy for socioeconomic status); quartiles of education level (based on years of schooling); and self-reported current smoking (yes/no).

The variables assets index and education level were divided into quartiles separately for both rural and urban areas. The assets index, including owning a television, and therefore the frequency of television viewing, varies by area of residence. Moreover, it has been reported that the prevalence of obesity in Peru varies by area (urban or rural) and socioeconomic status.<sup>20</sup>

For statistical analysis we used Stata version 11 (StataCorp LP, College Station, TX, U.S.). Weighted estimates were obtained taking into account the complex design of the DHS 2008. Thus, both descriptive analyses, and univariate and multivariate models were performed using the *svy* command for complex sample designs.

Proportions were compared using the chi-square test. We used logistic regression analysis to assess the association between frequency of television viewing and obesity and overweight, using those with normal BMI (BMI 18.5 - 25 kg/m<sup>2</sup>) as a reference group.

We calculated crude (OR) and adjusted odds ratios (aOR) and their related 95% confidence intervals (95% CI). The variables area of residence and education level were analyzed as potential effect modifiers based on a previous finding of our research group.<sup>20</sup> Variables that showed no significance were assessed as potential confounders.

The study was approved by the Institutional Ethics Committee of the Universidad Peruana Cayetano Heredia (Protocol number: SIDISI 58833, 2011).

## RESULTS

A total of 31,911 women were included in the national survey; 10,199 (32.0%) were excluded for the following

<sup>a</sup> The World Bank. Peru: Data.[cited 2012 May 14] Available from: <http://data.worldbank.org/country/peru>

reasons: BMI data not available (n = 8,645); pregnancy (n = 1,102); low weight or BMI < 18.5 kg/m<sup>2</sup> (n = 439); and foreign language spoken at home (n = 13). A total of 21,712 women were included in the analysis.

The mean age of respondents was 30.6 years old (SD ± 10.1). The overall prevalence of overweight was 34.7% (95%CI 33.8;35.7) while the prevalence of obesity was 14.3% (95%CI 13.6;15.1). The prevalence of overweight and obesity was 32.2% (95%CI 30.7; 33.8) and 8.5% (95%CI 7.6;9.5) in rural areas and 35.7% (95%CI 34.5;36.8) and 16.5% (95%CI 15.6;17.5) in urban areas, respectively. Table 1 shows the study variables when BMI data was available and when it was not available. Table 2 shows the demographic characteristics of the study population with overweight and obesity.

Of all respondents, 92.1% in urban areas and 41.8% in rural areas reported having a television set at home (p < 0.0001). The highest proportions of obesity were found among women who reported television viewing occasionally and almost every day. The prevalence of obesity was lower in those with lower assets index and higher in those with lower education level (Table 3).

We found an association between frequency of television viewing and both obesity and overweight (Table 3). The magnitude of this association was more pronounced in the estimates of association with obesity and those who reported greater frequency of television viewing (Table 3).

When we assessed whether the strength of association varied according to area of residence, a stronger association with obesity was found in urban (OR = 2.2, 95%CI 1.3;3.5) than rural area (OR = 1.6, 95%CI 1.1;2.4). Similar results were found with overweight in urban and rural areas (OR = 1.8; 95%CI 1.2;2.7 and OR = 1.3, 95%CI 1.1;1.7, respectively). However, these associations were attenuated among the category of those who reported occasional habit of watching television.

## DISCUSSION

This study conducted in Peru, a transitional country with specific geographical and socioeconomic variations, evidenced a strong association between frequency of television viewing and obesity among Peruvian women aged 15 to 49. This association remained after adjusting for potential confounders such as age, area of residence, education level, assets index and self-reported current smoking. Also, the association between frequency of television viewing and obesity was stronger in women living in urban areas.

Obesity is an increasing public health concern in several developing countries,<sup>19</sup> including Peru. An analysis

**Table 1.** Characteristics of respondents according to the availability of body mass index data. Peru, 2008.

Variable	BMI data	BMI data not available	p-value <sup>a</sup>
	%	%	
Frequency of television viewing	n = 23,264	n = 7,940	
Never	8.9	6.6	< 0.005
Occasionally	30.6	27.0	
Almost every day	60.5	66.4	
Assets index	n = 23,252	n = 8,199	
1 <sup>st</sup> (lowest)	19.3	21.0	0.66
2 <sup>nd</sup>	23.0	22.0	
3 <sup>rd</sup>	26.2	26.2	
4 <sup>th</sup> (highest)	31.5	30.9	
Education level	n = 23,252	n = 7,930	
1 <sup>st</sup> (lowest)	28.6	27.9	0.91
2 <sup>nd</sup>	35.1	34.8	
3 <sup>rd</sup>	19.6	20.1	
4 <sup>th</sup> (highest)	16.7	17.2	
Age (years)	n = 23,252	n = 7,930	
15-19	19.0	18.3	0.14
20-24	15.2	15.2	
25-29	15.2	13.7	
30-34	14.4	14.9	
35-39	13.4	13.2	
40-44	12.1	13.5	
45-49	10.8	11.1	
Self-reported current smoking	n = 22,164	n = 7,931	
No	92.4	91.9	0.53
Yes	7.6	8.1	
Area of residence	n = 23,252	n = 8,635	
Urban	72.3	74.8	0.34
Rural	27.7	25.2	

<sup>a</sup> Differences in proportions were determined by the Chi-square test.

BMI: body mass index

of DHS 1996 showed 9.4% prevalence of obesity in Peruvian women.<sup>15</sup> Data from the DHS 2008 showed a 14.3% prevalence of obesity, which is an increase by 52% in obesity rates in Peruvian women. Our study explored the association between frequency of television viewing and obesity, corroborating findings of studies conducted in developed countries.

Previous studies have shown an association between frequency of television viewing and obesity. Tucker<sup>22</sup> reported in the Nurses' Health Study that women who watched television at least four hours a day were twice

**Table 2.** Characteristics of the study population according to nutritional status. Peru, 2008.

Variables	Population <sup>a</sup>		Normal weight	Overweight	Obesity	p-value <sup>b</sup>
	n	%	%	%	%	
	n = 21,712		n = 11,113	n = 7,503	n = 3,096	
Frequency of television viewing						< 0.0001
Never	2,186	8.7	61.1	31.6	7.3	
Occasionally	7,465	30.5	56.3	32.2	11.5	
Almost every day	12,059	60.8	46.8	36.4	16.8	
Assets index						< 0.0001
1 <sup>st</sup> (lowest)	5,428	20.0	55.8	33.2	11.0	
2 <sup>nd</sup>	5,431	22.9	49.1	35.9	15.0	
3 <sup>rd</sup>	5,426	26.1	50.5	34.4	15.1	
4 <sup>th</sup> (highest)	5,427	31.0	49.6	35.1	15.3	
Education level						< 0.0001
1 <sup>st</sup> (lowest)	6,625	28.8	42.8	37.1	20.1	
2 <sup>nd</sup>	7,266	34.8	52.8	34.7	12.5	
3 <sup>rd</sup>	4,028	19.6	55.8	33.2	11.0	
4 <sup>th</sup> (highest)	3,793	16.8	55.4	32.6	12.0	
Age (years)						< 0.0001
15-19	4,043	18.4	78.6	18.9	2.5	
20-24	3,239	14.8	65.6	29.1	5.3	
25-29	3,204	15.1	54.0	35.2	10.8	
30-34	3,113	14.2	44.5	40.6	14.9	
35-39	3,014	13.7	36.5	42.4	21.1	
40-44	2,732	12.5	30.8	42.8	26.4	
45-49	2,367	11.3	30.9	41.5	27.6	
Self-reported current smoking						0.83
No	20,481	92.3	50.9	34.8	14.3	
Yes	1,231	7.7	51.7	33.6	14.7	
Area of residence						< 0.0001
Urban	14,120	72.6	47.8	35.7	16.5	
Rural	7,592	27.4	59.3	32.2	8.5	

<sup>a</sup> The results were obtained in the analysis for complex sample designs and may not depict the 100% due to missing values.

<sup>b</sup> Differences in proportions were determined by chi-square test for trends.

as likely to be obese compared with those who did it less than an hour a day. In a prospective study, Hu et al<sup>9</sup> found that television viewing was independently associated with obesity and type 2 diabetes mellitus. This same study found a trend of obesity increasing proportionally to time (number of hours) spent watching television.<sup>9</sup> Bowman<sup>2</sup> reported that television viewing for more than two hours a day was associated with increased BMI in both men and women. It should be noted that these data come from observational studies in the United States population.

An earlier study carried out in six cities in Peru reported a positive relationship between television viewing of four hours or more and BMI  $\geq 25$  kg/m<sup>2</sup> (overweight) in women.<sup>11</sup> Other countries undergoing

epidemiological transition, like Brazil,<sup>6</sup> have reported an association between frequency of television viewing and overweight or obesity in women but not in men. Not all studies have found a positive association between obesity and frequency of television viewing. A cross-sectional study conducted in the Iranian population did not find any relationship between BMI and time spent (minutes per week) watching television.<sup>21</sup> This type of evidence presents a challenge and points to the need to explore these associations in specific contexts, hence justifying the importance of conducting the present study.

The mechanism by which television viewing is associated with obesity is not yet clearly established. It might be due to lack of physical activity,<sup>9</sup> and unhealthy

**Table 3.** Crude and adjusted models of the association between frequency of television viewing and obesity/overweight. Peru, 2008.

Frequency of television viewing	Obesity				Overweight			
	Crude		Adjusted <sup>a</sup>		Crude		Adjusted <sup>a</sup>	
	n = 14,209		n = 14,207		n = 18,614		n = 18,611	
	OR	95%CI	OR	95%CI	OR	95%CI	OR	95%CI
Never	1		1		1		1	
Occasionally	1.7	1.3;2.2	1.7	1.3;2.3	1.1	1.0;1.3	1.2	1.1;1.4
Almost every day	3.0	2.3;3.8	2.6	2.0;3.5	1.5	1.3;1.7	1.6	1.4;1.9

<sup>a</sup> Model adjusted for age, area of residence, quartiles of education level, assets index and self-reported current smoking. All estimates were calculated using logistic regression for complex sample designs.

eating (consumption of high sugar-sweetened beverages and processed foods) while watching television,<sup>5</sup> or the effect that television commercials might have on people's behavior patterns with increased consumption of high-energy foods and consequent weight gain.<sup>14</sup> In addition, these effects may vary depending on exposure time and content of television programs. Longitudinal studies have found that television viewing during childhood and adolescence for long periods of time may have an impact on BMI in adulthood.<sup>24</sup> On the other hand, a recent study reported that changes in television viewing time in adults are independently associated with long-term weight gain.<sup>18</sup>

One of the strengths of this population-based study is that the final sample comprised more than 20,000 women nationwide including urban and rural areas, which could provide information to better understand how indirect factors affect physical activity among Peruvian women. However, our study has certain limitations. First, information about BMI was not available in 27% of respondents, which could potentially bias the results of our study. The DHS 2008 comprises a group of surveys conducted from 2004 to 2008 in a nationally representative sample. However, anthropometric measurements were carried out only in 2005, 2007 and 2008, thus explaining missing data on the outcome variable. Although measures were not taken in all waves of this survey, the women sample with available anthropometric data was nationally representative. A comparison of characteristics of respondents with and without BMI data available showed no differences except for the variable assessing frequency of television viewing. However, our study showed results that are consistent with those from other studies.<sup>2,9,11</sup>

A second limitation of this study is that information on frequency of television viewing analyzed in the DHS survey comes from self-reports and is collected as categories, whereas it would have been more objective to collect information on the number of hours that women spent exclusively watching television. Another limitation is the cross-sectional design that does not allow making any inferences on a causal relationship between the variables of interest. Other studies with prospective designs have shown a causal effect of television viewing on obesity in adults.<sup>12</sup> Finally, because the DHS usually does not assess cardiovascular risk factors, we could not explore other variables associated with obesity such as dietary patterns,<sup>5</sup> calorie intake by frequency of television viewing,<sup>2</sup> alcohol consumption,<sup>3</sup> and levels of physical activity,<sup>16</sup> among others.

In conclusion, this study showed a strong association between frequency of television viewing and overweight and obesity among Peruvian women, especially in those of urban areas. Findings of the present study are relevant in assessing the effect of television viewing, and indirectly assessing the sedentary lifestyle, on obesity in the Peruvian context. We found strong evidence of an association that varies according to area of residence, which could impact future intervention strategies. Further studies are needed to explore the effects of television viewing in males, to better understand the mechanisms associating this sedentary activity with increased risk of obesity, and to suggest adequate strategies that can reduce obesity and physical inactivity in the Peruvian population.

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