

# Alcohol Intake by Workers in a Health Care Institution in Bucaramanga, Colombia

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## Abstract

The harmful alcohol intake represents a global problem. Its high consumption has been associated with cardio metabolic risk factors. Evaluating their consumption in health workers is important for the formulation of strategies to promote healthy lifestyles. The objective of this study was to determine the consumption of alcohol and establish the differences of this intake in terms of socio-demographic and cardiovascular characteristics of interest in hospital workers of Bucaramanga, Colombia.

An analytical cross sectional was made (baseline of an intervention study to reduce cardiovascular risk factors). Sociodemographic, anthropometric, biochemical, physical activity, and lifestyles characteristics, as well as alcohol consumption (g / week) were evaluated using a previously validated Frequency Alcohol Questionnaire. Multiple linear regression models were used, adjusting for sex, age, socio-economic level, schooling and marital status.

77.4% (95% CI: 71.2% to 82.8%) of the study participants consumed some type of alcoholic beverage during the month prior to the survey, with an average of 70.0 grams of alcohol per week of 70.0 g. We found a statistically significant difference ( $p = 0.012$ ) of 40.4 grams of alcohol per week (95% CI: 8.9 to 71.8 g / week) consumed among those who have hypertriglyceridemia and those who do not.

In conclusion, the high consumption of grams of alcohol per week is related to a triglyceride level above the normal ranges.

**Keywords:** alcohol drinking, workers, occupational health, triglycerides, cardiovascular abnormalities

## 1. Introduction

The World Health Organization (WHO) has declared the harmful consumption of alcoholic beverages to be a global problem that endangers both the individual and the social development of the population (Panamerican Health Organization, 2014). Alcohol is a psychoactive substance, which in excess affects the central nervous system and some organs, as well as social and labor relationships with peers (Ardila & Herran, 2008). In 2010, per capita alcohol consumption was 6.2 liters for the worldwide population over 15 years of age. This translates into approximately 13.5 grams of alcohol per day (Panamerican Health Organization, 2014). It has been found that approximately 16.0% of drinkers over the age of 15 occasionally consume alcohol (Panamerican Health Organization, 2014). In Latin America and the Caribbean, an average of 8.4 liters of pure alcohol is consumed per year, which is 2.2 liters more than the worldwide average, according to the first report on alcohol published for the region (WHO, 2015). This report ranks Colombia as 12th out of 37 countries in the region, with 6.2 liters per capita annual consumption (WHO, 2015).

In Bucaramanga, Colombia, previous studies have shown that adult men and women consume alcohol at toxic levels every seven days, on average. And over the past decade, the risk of alcoholism in this population has surpassed that of the national population (42% vs. 35%, respectively) (Ministerio de Salud y Protección Social, 2013). In addition, variables such as sex, age, socio-economic level, and enjoying drinking have been associated with alcohol consumption (Herran & Ardila, 2009a; Herran & Ardila, 2009b).

In the global context, alcohol consumption has been both positively and negatively associated with certain public

health events (Haver, Gjestad, Lindberg, & Franck, 2009; Murray et al., 2002; Rehm, Greenfield, & Rogers, 2001; Corrao, Rubbiati, Bagnardi, Zambon, & Poikolainen, 2000). Daily alcohol consumption limits of up to 20 grams for women and 40 grams for men have been shown to present a lower risk to health. And a protective effect has been found on the development of cardiovascular events, with as much as a 25% reduction in coronary events (Rimm, Williams, Fosher, Criqui, & Stamper, 1999).

However, the consumption of alcohol alone, and at toxic levels, is associated with violence and traffic accidents (Herran & Ardila, 2005), and consuming a larger amount of alcohol is negatively related to more than 200 diseases and injuries, including risk of developing cancer of the liver and of the gastrointestinal tract (Panamerican Health Organization, 2014; Morgan, Mandayam, & Jamal, 2004; Gronbaek et al., 1998), impaired lipid metabolism, and increased levels of triglycerides in the blood (Miguel Soca, 2009).

Evidence suggests that a direct relationship exists between alcohol consumption and a high triglyceride concentration. This is explained by the metabolism of alcohol, which occurs mostly in the liver through liver enzymes that are altered when the consumption of alcohol is chronic or excessive. This process interferes with the metabolism of the VLDL apolipoprotein, a lipoprotein which is responsible for transporting triglycerides. Thus, when the liver functions improperly, these triglycerides accumulate in the liver and the blood, since the lipoprotein that transports them is lacking. This has been found to occur when the daily consumption of alcohol exceeds 30 grams, which is equivalent to one glass of alcohol such as cognac and whiskey. In the case of beer or similar beverages, the concentration of triglycerides in blood is not due to the alcohol itself, but rather to the sugar contained in these types of alcoholic beverages. When consumption is excessive, a portion of these sugars is derived from the synthesis of triglycerides, which are deposited in adipose tissue (Miguel Soca, 2009).

Only a few studies have indicated that alcohol consumption significantly affects job performance, which mainly translates into poorer work performance (Ochoa, 2011), higher rates of absenteeism, a higher risk of occupational accidents, and a notable increase in premature deaths, due to both acute and chronic diseases (Chagas, Gaunekar, Patel, Kukalekar, & Fernandes, 2003; Lapham, Gregory, & McMillan, 2003; Lapham, Gregory, & McMillan, 2003).

This study was proposed because of a lack of knowledge about alcohol consumption and its relationship with cardiometabolic risk factors in a population of health sector workers who know the implications of excessive alcohol consumption and who make recommendations regarding moderate consumption. Its aim was to determine alcohol consumption in a population of workers in a health care institution in Bucaramanga, Colombia, and identify the differences in consumption in terms of the sociodemographic and cardiovascular characteristics of interest.

## **2. Methods**

An analytical, cross-sectional study was carried out of workers at a high-complexity health care institution in Colombia, using the baseline from an intervention study to reduce cardiovascular risk factors.

All workers were invited to participate in the study, and those who agreed to participate in the first phase and who had a current contract with the health care institution were included. Pregnant women were excluded from the study.

Data was collected at two appointments. After obtaining written informed consent, participants filled out a self-administered survey at the first appointment, which included data regarding sociodemographics, physical activity, alcohol consumption, smoking, and personal and family history of cardiovascular risk. A second appointment was scheduled, for which participants were asked to wear light clothes, fast for 8 to 10 hours, and to not have performed intense physical activity or ingested alcohol.

During this appointment, a physical examination was conducted, anthropometric measurements and blood pressure were taken, and blood samples were collected.

### *2.1 Variables*

The dependent variable for this study was the consumption of alcohol in grams per week. In addition, the prevalence of alcohol consumption during the month prior to the survey was estimated using the alcohol consumption frequency questionnaire, which was validated for the Colombian population (Herran & Ardila, 2006). This questionnaire was used to evaluate the approximate frequency of alcohol consumption by the subjects over the previous month, by group of alcoholic beverage (beer, brandy, rum, wine, whiskey, others).

This study also analyzed variables such as age, sex, socioeconomic status, monthly income, education level, marital status, social security, profession, family history of first-degree relatives, history of cerebrovascular or

cardiovascular disease before age 60, and history of cancer. Body composition, tobacco consumption, and physical activity were also investigated, and metabolic cardiovascular risk factors were analyzed, including: large waist circumference ( $\geq 90$  cm for men and  $\geq 80$  cm for women) (IDF, 2006), hip-waist index ( $> 0.90$  for men and  $> 0.85$  for women) (Lear, James, & Kumanyika, 2010), body mass index ( $\geq 25$  kg / m<sup>2</sup> for overweight and  $\geq 30$  kg / m<sup>2</sup> for obesity) (WHO, 2000), blood pressure (systolic blood pressure (SBP)  $> 140$  mm Hg or diastolic blood pressure (DBP)  $> 90$  mm Hg) (The National High Blood Pressure Education Program Coordinating Committee, 2003), fasting glucose (diabetes when fasting glucose  $\geq 126$  mg / dl) (ADA, 2014), total cholesterol ( $> 200$  mg / dl) (26), triacylglycerols ( $> 150$  mg / dl) (26), HDL cholesterol ( $<40$  mg / dl for men and  $<50$  mg / dl for women) (26), and LDL cholesterol ( $> 130$  mg / dl) (National Cholesterol Education Program, 2002).

Physical activity was assessed using the short version of the International Physical Activity Questionnaire-IPAQ, which was adapted to the Colombian population. The questionnaire took into account the urban and social context of low- and middle-socioeconomic levels, since these strata represent the largest proportion of the national population (Mantilla & Gómez-Conesa, 2007).

A description of the data collection process for all of the variables has been described in detail previously (Gamboa, et al., 2015). All the data were collected by a team composed of four professional nurses and a nutritionist duly trained in standardized techniques for collecting information.

## 2.2 Statistical Analysis

The data analysis was aimed at determining alcohol consumption (in grams per week) and associated factors. A descriptive analysis of the main characteristics of the study population was carried out. In the case of asymmetric distributions, we decided to use the median and the interquartile range (25-75%), given that these are not as affected by extreme values.

The categorical variables were described as proportions, with their respective 95% confidence intervals (95% CI).

The Mann-Whitney test was applied given that some of the continuous variables were not normally distributed. Fisher's exact test was used for the categorical variables.

Multiple linear regression models (Greenland, 1989) were adjusted for alcohol consumption (g / week) using the sociodemographic and cardiovascular characteristics of interest as the main independent variables, and adjusting by sex, age, socio-economic level, schooling, and marital status. All of the model assumptions (residual normality, linearity, and homoscedasticity) were verified and goodness-of-fit tests were performed.

The survey data were entered into a database, in duplicate, and validated using the EpiInfo program, version 6.04d (CDC, EpiInfo, 2001) (CDC, 2001). The analyses were performed using the Stata statistical program, version 12.1 / IC (Statistics Data Analysis, STATA \ ICq 12.1).

## 2.3 Ethical Considerations

This study is classified as minimum risk in accordance with 1993 resolution number 08430 by the Ministry of Health of Colombia, which establishes the scientific, technical, and administrative standards for health research (Ministerio de Salud, 1993). The protocol for this research was approved by the Scientific Technical Committee and the Research Ethics Committee of a health care institution in Colombia. All participants signed informed consent.

## 3. Results

A total of 227 workers were analyzed (the response rate was 87%), 63.4% of which were female. The median age of all of the subjects was 29 years of age, with an interquartile range (IR) of 12 years. A total of 65.2% of the respondents belonged to the middle socioeconomic stratum, while 29.0% belonged to the low and 5.7% to the high stratum. A total of 34.3% of study subjects presented overweight and 9.0% were obese.

Statistically significant differences were found for monthly income, physical activity level during the week prior to the survey, and history of hypertension and dyslipidemia ( $p = 0.009$ ,  $p = 0.000$ ,  $p = 0.004$ , and  $p = 0.003$ , respectively) (Table 1). A greater proportion of women than men earned less than \$1,600,000 Colombian pesos (average value equivalent to \$761.9 USD at the time of the survey [1 USD = \$ 2,100 Colombian Pesos]). The women had a low or moderate level of physical activity during the week prior to the survey, and their personal history of hypertension was greater than the men, while a greater proportion of men had a personal history of dyslipidemias.

Table 1. Overall characteristics of workers in a health care institution in Colombia

Characteristics	All (n=227)	Women (n=144)	Men (n=83)	p Value
	n (%) ó Median [IR]	n (%) ó Median [IR]	n (%) ó Median [IR]	
<b>Sociodemographic Characteristics</b>				
Age (years)	29 [12.0]	30 [11.0]	28 [9.0]	0.105 £
<b>Socioeconomic level</b>				
Low	66 (29.0)	44 (66.6)	22 (33.3)	0.378 ‡
Medium	148 (65.2)	94 (63.5)	54 (36.4)	
High	13 (5.7)	6 (46.1)	7 (53.8)	
<b>Monthly income</b>				
Under \$1,600,000 ¥	153 (67.4)	106 (69.2)	47 (30.7)	<b>0.012 ‡</b>
\$1,600.000 or more	74 (32.6)	38 (51.3)	36 (48.6)	
<b>Highest level of schooling</b>				
Secondary or technical	85 (37.4)	52 (61.1)	33 (38.5)	0.669 ‡
University or postgraduate	142 (62.5)	92 (64.7)	50 (35.2)	
<b>Marital Status</b>				
Single	141 (62.1)	89 (63.1)	52 (36.8)	0.988 ‡
Married or Free Union	78 (34.3)	50 (64.1)	28 (35.9)	
Divorced, Separated or Widowed	8 (3.5)	5 (62.5)	3 (37.5)	
<b>Lifestyle</b>				
<b>Current Smoker</b>				
No	63 (80.7)	30 (47.6)	33 (52.3)	0.774 ‡
Yes	15 (19.2)	6 (40.0)	9 (60.0)	
<b>Physical Activity Level §</b>				
Low	119 (52.4)	89 (74.7)	30 (25.2)	<b>0.000 ‡</b>
Moderate	73 (32.1)	45 (61.6)	28 (38.3)	
High	35 (15.4)	10 (28.5)	25 (71.4)	
<b>Nutritional Status</b>				
Underweight (BMI <18.5 kg/m <sup>2</sup> )	4 (1.8)	3 (75.0)	1 (25.0)	0.093 ‡
Normal Weight (BMI 18.6 to 24.99 kg/m <sup>2</sup> )	121 (54.7)	83 (68.6)	38 (31.4)	
Overweight (BMI 25.00 to 29.99 kg/m <sup>2</sup> )	76 (34.3)	39 (51.3)	37 (48.6)	
Obese (BMI ≥30 kg/m <sup>2</sup> )	20 (9.0)	13 (65.0)	7 (35.0)	
<b>Alcohol Consumption (grams/week)</b>				
None	48 (22.5)	29 (20.2)	19 (39.5)	0.287 ‡
First Tertile (11.8 to 31.7)	64 (38.7)	47 (73.4)	17 (26.5)	
Second Tertile (31.7 to 66.5)	46 (27.8)	32 (69.5)	14 (30.4)	0.506 ‡
Third Tertile (66.7 to 370.8)	55 (33.3)	35 (63.6)	20 (36.3)	
<b>Morbidity (personal history of CD)</b>				
High blood pressure (%Yes)	8 (3.5)	5 (62.5)	3 (37.5)	<b>0.004 ‡</b>
Dyslipidemias (%Yes)	13 (5.7)	6 (46.1)	7 (53.8)	
Diabetes Mellitus (%Yes)	1 (0.4)	1 (100.0)	0 (0.0)	0.195 ‡
Cancer (% Yes)	1 (0.4)	0 (0.0)	1 (100.0)	0.229 ‡

**IR:** Interquartile Range; **BMI:** Body Mass Index; **CD:** Chronic diseases. ‡: p value determined with Fisher's exact test. £: p value determined with the Mann-Whitney test. ¥: \$1,600,000 Colombian pesos is an average value equivalent to \$761.9 USD as of the date of the survey (\$1 USD = \$2,100 Colombian pesos). §: Low physical activity: people who did not perform any type of physical activity or some physical activity but not enough to meet the criteria for moderate or high levels.

Moderate physical activity: those who met any one of the following three criteria: 1) three or more days of vigorous physical activity for at least 20 minutes/day, 2) five or more days of moderate or vigorous physical activity and/or walking at least 30 minutes/day, or 3) five or more days of any combination of moderate physical activity, vigorous activity, and walking, with an energy expenditure of at least 600 MET minutes/week. High physical activity: those who met either one of the following two criteria: 1) vigorous physical activity at least three days/week with a minimum energy expenditure of 1,500 MET minutes/week or 2) seven or more days of any combination of walking, moderate physical activity, or vigorous activity with an energy expenditure of at least 3,000 MET minutes/week (Karolinska Institute, 2005).

### 3.2 Alcohol Consumption

A total of 77.4% (95% CI: 71.2% to 82.8%) of the study participants consumed some type of alcoholic beverage during the month prior to the survey, with an average of  $70.0 \pm 69.4$  grams per week of alcohol. Of the total people who consumed an alcoholic beverage, 69.0% were women and 30.9% men. Nevertheless, there were no statistically significant differences in alcohol consumption according to sex ( $p = 0.492$ ) or age ( $p = 0.560$ ), schooling ( $p=0.654$ ), marital status ( $p=0.926$ ), or with respect to the other sociodemographic variables (Table 2).

Regarding the differences in alcohol consumption according to cardiovascular risk factors, a statistically significant difference ( $p = 0.012$ ) of 40.4 grams of alcohol per week (95% CI: 8.9, 71.8 g / week) was found between those who had hypertriglyceridemia and those who did not (the equivalent of approximately four 1-ounce glasses of an alcoholic beverage, on average) (Table 2).

Table 2. Alcohol consumed (in grams) per week by Colombian health workers, according to sociodemographic and cardiovascular characteristics

Variable	n	Mean (g)	SD (g)	p†	Adjusted (g)‡	Difference	CI 95%	p‡
<b>Sex</b>								
Women	143	52.3	63.6	0.544	Ref		-12.9;26.8	0.492
Men	70	58.3	75.8		6.9			
<b>Age group</b>								
Under 30 years	111	51.2	64.7	0.492	Ref		-14.1;26.0	0.560
30 years and over	102	57.6	71.0		5.9			
<b>Socio-economic level</b>								
Low	63	44.4	48.3	0.452	16.4		-4.9;37.8	0.484
Medium	139	60.3	75.7		Ref			
High	11	34.2	38.1					
<b>Monthly income</b>								
Under \$1,600,000	67	60.6	79.7	0.353	Ref		-33.0;14.5	0.446
\$1,600,000 and over	146	51.3	61.5		-9.2			
<b>Education</b>								
Professional to postgraduate	134	53.8	68.4	0.912	Ref		-15.5;24.7	0.654
Secondary to Technical/technological	79	54.9	66.9		4.5			
<b>Marital status</b>								
Single	133	53.2	61.3	0.794	Ref.		-19.6;21.8	0.926
Married or Free Union	73	55.9	80.3		1.0			
Separated, Divorced, or Widowed	7	55.7	41.8					

<b>Cardiovascular Risk Factors</b>							
<b>Overweight or Obesity<sup>1</sup></b>							
No	121	57.5	69.8	0.545	Ref.	-30.1;10.5	0.343
Yes	86	51.7	66.7			-9.8	
<b>Hypercholesterolemia<sup>2</sup></b>							
No	172	54.7	69.1	0.835	Ref.	-27.2;21.5	0.819
Yes	41	52.3	62.5			-2.8	
<b>Low HDL Cholesterol<sup>3</sup></b>							
No	193	55.1	69.8	0.676	Ref.	-39.3;31.6	0.831
Yes	17	47.9	44.7			-3.8	
<b>Hypertriglyceridemia<sup>4</sup></b>							
No	191	50.02	59.9	<b>0.006</b>	Ref.	8.9;71.8	<b>0.012</b>
Yes	22	91.36	110.5			40.4	
<b>High Blood Pressure<sup>5</sup></b>							
No	199	54.6	68.8	0.787	Ref.	-44.1;31.4	0.740
Yes	14	49.5	51.8			-6.3	
<b>Impaired Fasting Glucose<sup>6</sup></b>							
No	207	53.3	68.0	0.228	Ref.	-33.8;83.4	0.405
Yes	6	87.2	47.8			24.8	

SD: standard deviation; CI 95%: 95% confidence interval; †: p value estimated with simple linear regression models; ‡: adjusted differences using multiple linear regression models with differences in alcohol consumption in g/week (one of the variables of interest) as the result variable, and adjusted by sex, age, socio-economic level, education, and marital status; §: p value estimated with multiple linear regression.

1. Overweight or obesity: Body Mass Index (BMI)  $\geq 25$  kg/m<sup>2</sup>; 2. Hypercholesterolemia: greater or equal to 200 mg/dl total cholesterol; 3. low HDL cholesterol: under 30 mg/dl for men and under 50 mg/dl of C-HDL for women; 4. Hypertriglyceridemia: equal to or over 150 mg/dl of triglycerides; 5. High blood pressure: systolic blood pressure equal to or over 140 mm HG and/or diastolic pressure equal to or over 90 mm Hg; 6. Impaired fasting glucose: fasting glucose between 100 and 125 mg/dl.

Regarding differences in the type of alcoholic beverages consumed during the month prior to the survey, the prevalence of beer, brandy, rum, and whiskey was higher for men than for women ( $p < 0.05$ ) (Figure 1). Nevertheless, no significant differences in median alcohol consumption (expressed in grams per week) were found according to sex ( $p = 0.898$ ).

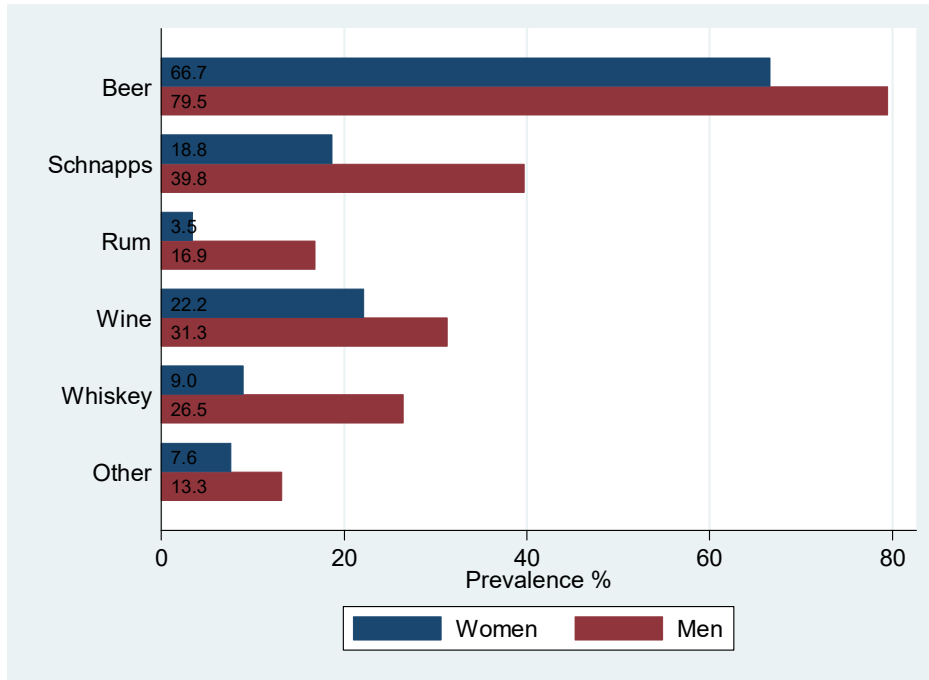


Figure 1. Frequency (%) of the consumption of alcoholic beverages during the month prior to the survey, according to sex, by workers in a health care institution in Colombia.

Figure 2 shows alcohol consumption in grams per week and the level of triglycerides of the participants in this study. After roughly 50 years of age, both the grams of alcohol consumed and the levels of triglycerides were found to increase to above normal values (hypertriglyceridemia).

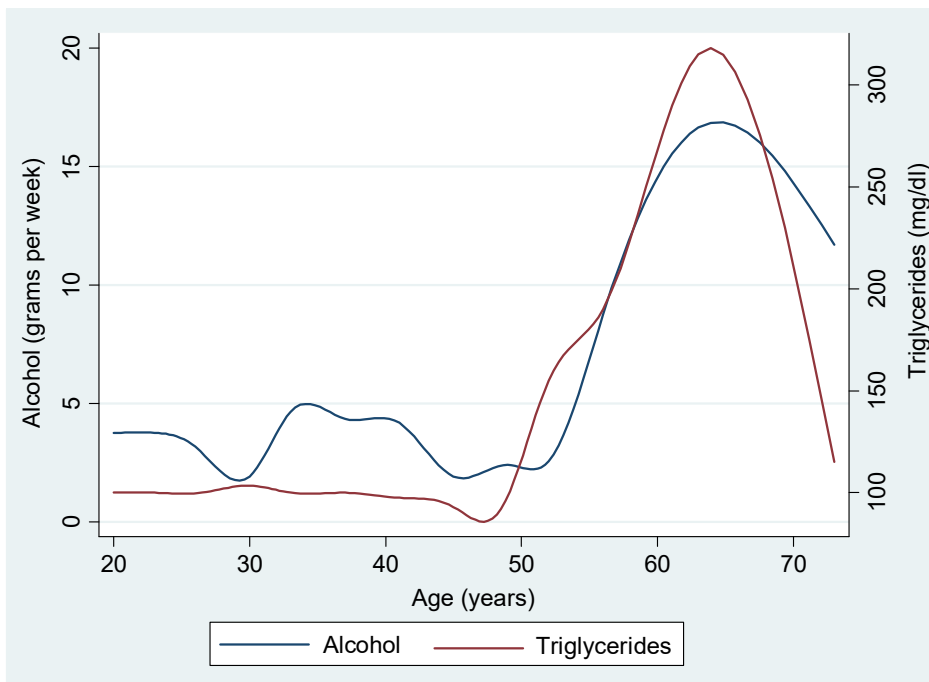


Figure 2. Alcohol Consumption and Triglyceride Levels, by Age

**4. Discussion**

This study’s findings show that roughly 75% of the study population consumed some type of alcoholic beverage

during the month prior to the survey. And of the total variables analyzed, a statistically significant difference in alcohol consumption was found only for serum levels of triglycerides.

For men, the average consumption in our study, in grams of alcohol per week, was 10 grams below the value reported by Herran et al. for the Colombian population in 2009 (Herran & Ardila, 2009a). Meanwhile, that same article reported a consumption of 34.1 grams of alcohol per week for women, which is 53% less than our study.

After determining the prevalences in the study sample and adjusting by sex, age, socio-economic level, schooling, and marital status, we found a relationship between a high weekly consumption of alcohol (in grams) by the workers at the health care institution studied and triglyceride levels above the normal ranges.

The association between alcohol consumption and hypertriglyceridemia has been studied for several decades. In 1974, a study was published that concluded that the daily use of moderate amounts of alcohol significantly increases pre-existing hypertriglyceridemia, without impairing fasting or postprandial glucose or insulin levels (Ginsberg, Olefsky, Farquhar, & Reaven, 1974).

In terms of a lifestyle of excessive alcohol consumption, our study shows that a gap exists between knowledge and practice. While the health sector's professional workers traditionally lead the discourse around health promotion and disease prevention, our findings show that in some cases alcohol consumption is excessive even in this population, which belongs to a health care institution specializing in cardiovascular diseases. This is notable given that alcohol consumption is associated with one of the most important risk factors for cardiovascular health, namely, hypertriglyceridemia, thereby reflecting what is known as the "paradox of prevention" (Schou, Storrø, & Moan, 2014).

Finally, one of the strengths of this study is a reduction in the measurement error as a result of using measurement instruments that were developed and validated for the Colombian population (Herran & Ardila, 2009a; Herran & Ardila, 2006), for the purpose of adequately characterizing the amount of alcohol consumed (g/week). Another strength is that those who were responsible for the interviews and the anthropometric measurements were trained in standardized techniques.

A limitation of this study is that this was a cross-sectional study, and therefore it was not possible to establish the temporality of the relationship found between alcohol consumption and altered triglyceride levels. Thus, our results should be interpreted with caution.

Another limitation is that this study could not identify the typology of the alcohol consumer (e.g., problematic, dependent, safe limit) (Loughlin & Kayson, 1990); rather, it determined the weekly amount of alcohol consumed. In addition, our study did not analyze factors such as genetics and diet, which could have a significant effect. However, the association that was found is relevant and should be taken into account.

Furthermore, although the sample analyzed in this study is specific given its characteristics as health workers and its particular social, cultural and demographic context, which could limit its external validity, we consider that there is a potential impact of our findings on global health in the measure that these contribute to the generation of solid evidence regarding the triad composed by knowledge, self-care and counseling in health education, meaning that the results of this study highlight, once again, the incoherence between what health professionals know and their lifestyle practices such as the alcohol consumption.

## 5. Conclusions

In conclusion, this population consumed 70 grams ( $\pm$  69.4 g) of alcohol per week, on average, which is equivalent to drinking roughly two 1-ounce glasses of an alcoholic beverage. Our study also found that a high consumption of grams of alcohol per week by the workers in the health care institution studied was related to triglyceride levels above the normal ranges.

While the association between the consumption of alcohol and the condition of being a worker has already been studied, and has been described according to sociodemographic factors, violence, and absence from work (Chagas, Gaunekar, Patel, Kukalekar, & Fernandes, 2003; Lapham, Gregory, & McMillan, 2003; Loughlin & Kayson, 1990; Ramírez, Martínez, & del Barco, 2011), no evidence has previously been reported of a relationship between alcohol consumption and hypertriglyceridemia in workers in the health sector. Therefore, this study's findings provide an important contribution to the scientific literature, and will enable implementing interventions or programs related to the responsible consumption of alcohol by workers, especially for those who work in the health field.

## Competing Interests Statement

The authors declare that there are no competing or potential conflicts of interest.



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