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Self-reported dyslipidemia in central-west Brazil: prevalence and associated factors

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Abstract *Lipid disorders are risk factors for atherosclerotic disease and its control may reduce morbidity and mortality from coronary artery disease. Knowledge of the factors associated with this injury may subsidize campaigns to encourage change in the population's lifestyle. The objective of this study is to estimate the prevalence of dyslipidemia and to identify associated factors. Cross-sectional population-based study, with individual data from the Telephone Survey on Risk Factors and Protection for Chronic Diseases Surveillance System (VIGITEL). It included 7,975 individuals of both sexes, aged ≥ 18 years living in state capitals in the central-west of Brazil, in the year 2009. Associations were estimated using Poisson regression. The prevalence of dyslipidemia was 15%, increased with age (p = < 0.01) did and not differ significantly according to sex. After adjustments, the variables that were directly associated with the outcome were overweight (p = < 0.01), obesity (p = < 0.01) and self-rated health as poor (p = < 0.01). Regular consumption of bean (≥ 5 days/week) was inversely associated with the prevalence of dyslipidemia (p = < 0.01). The prevalence of dyslipidemia in the central-west of Brazil was increased with age and was associated with bean consumption, excess weight (overweight and obesity) and self-rated health as poor.*

Key words *Dyslipidemias, Prevalence, Information systems, Risk factors*

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Introduction

The World Health Organization (WHO)[1] estimates that more than 20 million people will die from cardiovascular diseases by 2030. In Brazil, cardiovascular diseases were the second leading cause of death based on hospital admission data from the Brazilian National Health System in 2012[2].

Dyslipidemias are chronic conditions that affect cardiovascular risk[3]and are widely recognized as associated with atherosclerotic disease[4].

Environmental factors play an important role in the genesis of dyslipidemias. Continuous monitoring of key risk indicators can provide data to support health policies to promote healthy lifestyles.

Studies on the prevalence of dyslipidemias based on population surveys are scarce in Brazil, possibly because of their high cost, limited availability of respondents and use of invasive measurements.

Self-reported surveys are an effective approach to health monitoring. Studies have showed that self-reported and measured values are highly correlated, which allows to making approximate estimates[5]. In 2006, a health monitoring system was implemented in Brazil, the Telephone-based Surveillance System of Risk and Protective Factors for Chronic Diseases (VIGITEL). VIGITEL conducts annual surveys for monitoring chronic diseases in state capitals of the 26 states and the Federal District in Brazil[6].

The aim of this study was to estimate the prevalence of self-reported dyslipidemia in central-west Brazil and to assess associated factors.

Methods

Cross-sectional population-based study conducted using VIGITEL data. Our sample included 7,975 female and male respondents aged ≥18 years living in state capitals in the central-west macroregion of Brazil in 2009.

Data on self-reported dyslipidemia was collected between 2006 and 2009. A second round of data collection was conducted in 2013, but microdata has not yet become available. Thus, we analyzed the most recent data available for the outcome of interest.

VIGITEL used probability sampling to select people aged ≥18 years who lived in a residence with at least one landline telephone in the survey year. The minimum sample size for each city was 2,000 respondents selected from 5,000 households. Details of sampling plan and procedures and weighting procedures are available elsewhere[6,7].

There were included in the study both female and male respondents aged ≥ 18 years. Women who reported being pregnant at the time of interview were excluded.

In 2009, there were interviewed 54,367 respondents using VIGITEL, of which 8,046 lived in central-west Brazil (2,010 in the Federal District, 2,011 in Goiânia, 2,012 in Cuiabá and 2,013 in Campo Grande). We excluded 71 pregnant women and thus our final sample consisted of 7,975 respondents.

Self-reported dyslipidemia was the dependent variable of this study collected using the following question, "Have you been told by your doctor that your cholesterol or triglycerides are high?." Thus, the outcome of interest denotes a previous medical diagnosis of dyslipidemia based on high levels of cholesterol or triglycerides in the blood.

The independent variables included demographic characteristics (gender, age, race/skin color, education level, marital status, employment status in the last three months); lifestyle information (alcohol use/excessive alcohol use, consumption of foods such as beans, red meat, red meat with fat, chicken skin, whole milk, soft drinks or processed juices and other variables associated with food intake such as recommended regular consumption of fruit and vegetables, salt adding after meal preparation, and eating out of home, in addition to TV watching and time spent watching TV, smoking and number of cigarettes smoked, physical activity, types of physical activities, leisure-time physical activity and/or active commuting); self-rated health; and weight classification.

Excessive alcohol use was defined as consuming four or more drinks of beer, wine or spirits for women and five or more drinks of beer, wine or spirits for men on the same occasion in the last 30 days.

Regular consumption of fruit and vegetables was defined as eating five or more servings a day of fruit and vegetables on five or more days a week. For estimating the recommended total daily consumption of fruit and vegetables, each fruit or cup of fruit juice was considered equivalent to a serving. It was set a maximum of three daily servings of fruit, one serving of juice, and four daily servings of vegetables[7].

Leisure-time physical activity and/or active commuting was defined as mild to moderate

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physical activity for at least 30 minutes on five or more days a week or vigorous physical activity for at least 20 minutes on three or more days a week. Work or school commuting by cycling or walking was also included when people engaged at least 30 minutes a day[7].

The variable self-rated health was categorized as very good, good, fair, poor and very poor. For the multivariate analysis, it was dichotomized as either good (very good / good) or poor (fair / poor / very poor).

The WHO Body Mass Index (BMI) classification[8] was used for weight categorization in different age groups (adolescents [18–19 years old]; adults [20–59 years old] and elderly [≥ 60 years old]). For adolescents, BMI was categorized by gender and age as underweight (< –2); normal weight (≥ –2 and ≤ +1); overweight (>+1 and ≤ +2); and obesity (> +2). BMI values were expressed as z-scores[9]. For adults, we defined BMI cutoff points as follows: <18.5 kg/m^2 (underweight); ≥ 18.5 and <25.0 kg/m^2 (normal weight); ≥ 25.0 and <30.0 kg/m^2 (overweight); and ≥ 30.0 kg/m^2 (obesity). For the elderly, we used BMI cutoff points as proposed by Lipschitz[10] and recommended by WHO[8]: < 22.0 kg/m^2 (underweight); ≥ 22.0 and < 27 kg/m^2 (normal weight); and ≥ 27.0 kg/m^2 (overweight).

For all analyses, weighting was applied to account for differences in sociodemographic sample composition (people aged ≥ 18 years) at each capital city based on information obtained from the 2000 Population Census. We performed data analyses using Stata version 11 with svy commands for weighting factors. The distribution of the variables was described as proportion/prevalence (%) and 95% confidence intervals (95% CIs).

We conducted a bivariate analysis to test the association of dyslipidemia with sociodemographic and lifestyle variables, self-rated health, and weight classification by estimating the prevalence of dyslipidemia (P) as well as crude prevalence ratios (PR) and related 95% CIs.

A multivariate Poisson regression model was constructed including the variables of interest in hierarchical blocks as proposed by Victora et al.[11] Sociodemographic variables were the most distal factors included at level 1, followed by lifestyle variables at level 2, and self-rated health and weight classification at level 3. Those variables with p-value ≤ 0.20 in the bivariate analysis were included. For the final model, a significance level of 5% was set.

VIGITEL survey was approved by the National Board of Health through the Brazilian Ministry of Health National Research Ethics Committee. Respondents gave their free informed verbal consent before participating in the telephone-based interview. The present study was approved by the Research Ethics Committee at Júlio Müller University Hospital under protocol number 331,226, on July 10, 2013.

Results

We analyzed data from 7,975 respondents, of which 52.6% were female, mean age of 44.4 years (SD = 16.4), and living in state capitals in central-west Brazil. The prevalence of self-reported dyslipidemia was 15% (95% CI 13.5–16.5).

The bivariate analysis of sociodemographic variables showed no difference in prevalences between female and male respondents (PR 1.09; 95% CI 0.89–1.34). However, it evidenced a direct association of dyslipidemia with age, being more prevalent among one-third of the respondents aged ≥ 55 years. Level of education was not associated with dyslipidemia (PR 1.03; 95% CI 0.84–1.25). The prevalence of dyslipidemia was 61% higher (PR 1.61; 95% CI 1.32– 1.97) among those who reported being unemployed compared to those employed in the last three months (Table 1).

Regarding lifestyle variables, we found an inverse association of dyslipidemia with weight training (PR 0.66; 95% CI 0.44–0.98) and soccer playing (PR 0.32; 95% CI 0.18–0.59). Leisure-time physical activity and active commuting were also inversely associated with dyslipidemia, being 29% more prevalent among those who did not report them (PR 0.71; 95% CI 0.54–0.89). In addition, the prevalence of dyslipidemia was higher among respondents who reported watching TV every day (PR 1.31; 95% CI 1.01–1.68) compared to those who did not report it (Table 2).

With regard to food consumption, dyslipidemia was 38% more prevalent among respondents who did not report regular consumption of beans (≥ 5 days a week) compared to those who reported it (PR 1.38; 95% CI 1.10–1.75). Reverse causality bias was observed in the unadjusted measure of association of dyslipidemia with regular consumption of fruit and vegetables (≥ 5 days a week) (PR 0.82; 95% CI 0.68–0.99) and soft drinks (PR 0.60; 95% CI 0.45–0.78). We found no association between dyslipidemia and consumption of foods such as red meat, red meat with fat, chicken skin, whole milk and eating out of home (Table 3).

Table 1. Socioeconomic and demographic characteristics of the population (%), prevalence of dyslipidemia (%), Prevalence Ratio (PR), and 95% Confidence Interval (95% CI). VIGITEL, central-west Brazil, 2009.

Variables	%	P (%)	PR (CI 95%)	P- value
Gender				
Male	47.4	14.3	1	0.40
Female	52.6	15.6	1.09 (0.89; 1.34)	
Age (years)				
18 – 24	23.6	4.4	1	
25 – 34	27.1	8.7	1.96 (1.17; 3.30)	
35 – 44	21.6	16.4	3.72 (2.27; 6.10)	
45 – 54	13.9	22.2	5.03 (3.17; 8.01)	
55 – 64	7.7	34.5	7.83 (4.87; 12.60)	<0.01*
65	5.9	37.5	8.51 (5.36; 13.54)	
Race/skin color				
White	35.3	16.5	1	0.11
Non-white	64.7	14.1	0.85 (0.70; 1.04)	
Education level (years)				
0 – 8	52.2	14.8	1	0.79
9 e +	47.8	15.2	1.03 (0.84; 1.25)	
Marital status				
Married	52.6	17.8	1	<0.01
Not married	47.4	11.8	0.67 (0.54; 0.81)	
City				
Cuiabá	11.6	11.8	1	
Campo Grande	15.3	14.5	1.23 (1.00; 1.51)	<0.01
Goiânia	26.9	16.9	1.43 (1.16; 1.75)	
Distrito Federal	46.2	14.8	1.25 (0.98; 1.59)	
Empolyed (last three months)				
Yes	69.9	12.6	1	<0.01
No	30.1	20.4	1.61 (1.32; 1.97)	

* p of trend < 0,01.

The bivariate analysis also showed a linear increase in the prevalence of dyslipidemia with self-rated health, being three times as high among those who rated their health as very poor compared to those who rated it very good (PR 4.48, 95% CI 2.54–7.91). A similar trend of linear increase ($p<0.01$) was seen for weight classification with a dose-response gradient between dyslipidemia and the magnitude of excess weight: PR 1.79 (95% CI 1.43–2.25) for overweight and PR 2.18 (95% CI 1.64–2.91) for obesity (Table 4).

In the multivariate analysis, only age showed a direct linear association with dyslipidemia at level 1 (sociodemographic variables). The variable gender remained in the model for it has an explanatory power for the outcome of interest regardless of significance level. After adjusting for level 1 variables, consumption of beans was the single level 2 (lifestyle) variable that was associated with dyslipidemia. Dyslipidemia was 32% more prevalent (PR 1.32; 95% CI 1.06–1.65) among respondents who did not report regular consumption of beans (≥ 5 days a week) compared to those who reported it. After adjusting for level 1 and 2 variables the most proximal factors that were significantly associated with dyslipidemia were self-rated health and weight classification. Dyslipidemia was 49% more prevalent among respondents classified as overweight than those underweight / normal weight (OR 1.49; 95% CI 1.20-1.84) and 83% more prevalent (PR 1.83; 95% CI 1.44-2.31) among obese than those in the reference category. Respondents who self-rated their health as poor (fair / poor / very poor) had a prevalence of dyslipidemia 56% higher (OR 1.56; 95% CI 1.15–2.12) than those who rated it as good and very good (Table 5).

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Tabela 2. Lifestyle of the population, prevalence of dyslipidemia (%), Prevalence Ratio (PR), and 95% Confidence Interval (95% CI). VIGITEL, central-west Brazil, 2009.

Variables	%	P (%)	PR (CI 95%)	P-value
Alcohol use				
No	59.4	15.5	1	
Yes	40.6	14.2	0.91 (0.73 – 1.14)	0.42
Excessive alcohol use				
No	80.6	15.1	1	
Yes	19.4	14.3	1.06 (0.83 – 1.35)	0.64
Salt adding after meal preparation				
No	89.7	14.9	1	
Yes	10.3	15.8	1.06 (0.75 – 1.51)	0.73
Physical activity (last three months)				
No	50.3	16.0	1	
Yes	49.7	13.9	1.15 (0.94 – 1.41)	0.16
Types of physical activity				
No	50.3	16.0	1	
Walking	20.1	18.0	1.12 (0.92 – 1.37)	
Running	2.5	19.4	1.21 (0.78 – 1.89)	
Weight training	5.5	10.6	0.66 (0.44 – 0.98)	<0.01
Gymnastics	2.8	15.8	0.98 (0.67 – 1.45)	
Soccer playing	11.4	5.2	0.32 (0.18 – 0.59)	
Other	7.4	16.1	1.00 (0.60 – 1.68)	
Leisure-time physical Activity				
No	69.1	16.5	1	
Yes	30.9	11.6	0.71 (0.54 – 0.89)	<0.01
Watching TV				
No	20.3	12.0	1	
Yes	79.7	15.7	1.31 (1.01 – 1.68)	0.04
Time spent watching TV (hour)				
No	20.3	12.0	1	
< 1 – 3	55.9	16.1	1.34 (1.04 – 1.72)	
> 3	23.8	14.8	1.23 (0.87 – 1.73)	0.08
Tobacco use				
No	84.7	15.3	1	
Yes	15.3	13.5	0.87(0.58 – 1.32)	0.52
Cigarette/day				
No	84.7	15.2	1	
1 – 4	3.1	12.6	0.83 (0.46 – 1.50)	
5 – 9	3.1	6.4	0.42 (0.23 – 0.76)	0.03
≥ 10	9.0	16.0	1.05 (0.62 – 1.79)	

Discussion

The present study evidenced an increasing linear trend of dyslipidemia with age ($p < 0.01$) in central-west Brazil, with no difference in prevalence between female and male respondents. Excess weight and poor self-rated health were proximal variables directly associated with the outcome of interest. In addition, we found an inverse association of dyslipidemia with regular consumption of beans.

There scarce studies on the prevalence of dyslipidemia in the general population as well as in specific population groups in different macro-regions in Brazil[12]. Most studies included small samples and used lipid profile to assess the prevalence of dyslipidemia[13,14]. Moreover, studies using self-reported data were conducted in very specific samples[15,16].

The prevalence of dyslipidemia found in this study did not show any significant difference by gender, which corroborates the findings of the

Tabela 3. Food consumption (%), prevalence of dyslipidemia (%), Prevalence Ratio (PR), and 95% Confidence Interval (95% CI). VIGITEL, central-west Brazil, 2009.

Variables	%	P (%)	PR (CI 95%)	P-valor
Beans (≥ 5 days/week)				
No	22.7	19.1	1.38 (1.10; 1.75)	
Yes	77.3	13.7	1	<0.01
Red meat (≥ 5 days/week)				
No	54.2	15.9	1	
Yes	45.8	13.8	0.87 (0.71; 1.06)	0.16
Red meat with fat				
No	70.4	15.8	1	
Yes	29.6	13.0	0.83 (0.64; 1.07)	0.15
Chicken skin				
No	77.5	15.4	1	
Yes	22.5	13.5	0.88 (0.66; 1.16)	0.35
Regular consumption of fruits and vegetables (≥ 5 days/week)				0.04
No	65.9	13.9	0.82 (0.68; 0.99)	
Yes	34.1	16.9	1	
Recommended consumption of fruits and vegetables				0.32
No	78.3	14.6	0.90 (0.73; 1.10)	
Yes	21.7	16.2	1	
Soft drinks/processed juices (≥ 5 days/week)				
No	76.7	16.5	1	<0.01
Yes	23.3	8.3	0.60 (0.45; 0.78)	
Whole milk				
No	44.6	16.3	1	0.11
Yes	55.4	13.8	0.85 (0.69; 1.04)	
Out-of-home eating				
No	49.0	16.1	1	0.14
Yes	51.0	13.9	0.86 (0.71; 1.05)	

Framingham cohort study that reported similar risk ratios for total cholesterol in men and women[17]. It has not been well established whether there is any difference in prevalence rates of dyslipidemia between men and women. Studies of lipid profile found a higher prevalence in females[18,19] while others have showed a higher prevalence in males[14,20]. It is noteworthy a high prevalence of dyslipidemia in menopausal women[21], possibly due to loss of hormone protection[22] during menopause[23].

The prevalence of dyslipidemia increased linearly with age. Several studies have confirmed an increased prevalence of comorbidities with advancing age in both sexes, with many conditions co-occurring as age advances[24-26].

In this study, after adjusting for potential confounding factors, the single lifestyle variable that remained associated with dyslipidemia was regular consumption of beans. We found a lower prevalence of dyslipidemia among respondents who reported consuming beans at least five times a week, which supports the positive effect of beans on lipid profile. It is likely that soluble fiber found in beans help decrease blood cholesterol levels[27]. In view of these potential health benefits of beans it is important to encourage regular consumption of beans among Brazilian population, as there has been a dietary change and the Brazilian traditional diet based on rice and beans has been replaced with other foods[28].

Our study evidenced a significant dose-response gradient between dyslipidemia and the magnitude of excess weight. Dyslipidemia was 49% more prevalent among overweight respondents than those with normal weight or underweight, and 83% more prevalent in obese compared to the reference category. This association has been well documented in the literature[29-30].

Self-rated health is a subjective perception of individuals regarding their own health with a physical and an emotional component[31]. We

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Tabela 4. Self-assessment of health status and weight status (%), Prevalence Ratio (PR), and 95% Confidence Interval (95% CI). VIGITEL, central-west Brazil, 2009.

Variables	%	P (%)	PR (CI 95%)	P-value
Self-rated health				
Very good	20.5	8.9	1	
Good	47.9	11.8	1.30 (0.93; 1.83)	
Fair	26.4	23.4	2.60 (1.83; 3.67)	
Poor	4.2	21.5	2.40 (1.31; 4.35)	
Very poor	0.9	40.4	4.48 (2.54; 7.91)	<0.01
Weight classification				
Underweight/Normal	59.7	10.9	1	
Overweight	30.3	19.6	1.79 (1.43; 2.25)	
Obesity	10.0	23.8	2.18 (1.64; 2.91)	<0.01

Table 5. Adjusted Prevalence Ratios (PRad) and 95% Confidence Interval (95% CI) between dyslipidemia and variables of the study. VIGITEL, central-west Brazil, 2009.

Level	PRad	CI 95%	P-value
1 – Sociodemographic variables			
Gender			
Male	1		
Female	1.06	0.88 ; 1.27	0.56
Age(years)			
18 – 24	1		
25 – 34	1.97	1.17 ; 3.30	
35 – 44	3.72	2.26 ; 6.10	
45 – 54	5.03	3.16 ; 8.00	
55 – 64	7.82	4.86 ; 12.6	
≥ 65	8.49	5.34 ; 13.5	<0.01
2 – Lifestyle*			
Bean consumption (≥ 5 day/week)			
Yes	1		
No	1.32	1.06 ; 1.65	0.01
3 – Weight classification**			
Weight classification			
Underweight/Normal	1		
Overweight	1.49	1.20 ; 1.84	<0.01
Obesity	1.83	1.44 ; 2.31	<0.01
Self-rated health as poor			
No	1		
Yes	1.56	1.15 ; 2.12	<0.01

* adjusted for gender and age. ** adjusted for gender, age and bean consumption.

found a strong association between dyslipidemia and self-rated health; dyslipidemia was estimated to be 56% more prevalent among those who rated their health as poor. This variable is believed to be a good indicator of people's lack of health[26], and a predictor of morbidity and mortality[32].

One of the limitations of this study is its cross-sectional design that does not allow to inferring causality, and allowed simply to assessing

factors associated with dyslipidemia. Another limitation is regarding consistency of self-reported data, which may lead to reporting bias and result in either an underestimate or overestimate of the true prevalence. However, some studies comparing self-reported and measured data found similar results[5,33].

Key strengths of telephone-based surveys are the speed with which they can be conducted and low-cost monitoring[5]. These surveys are valuable because they help map out the prevalence of chronic diseases and can provide other central information for rational planning of health services. Continuous monitoring of dyslipidemias is crucial because on-the-spot health interventions such as nutritional counseling can effectively reduce high prevalences. Kinchoku et al.[34] assessed changes in lipid profile following nutritional counseling in individuals with dyslipidemia and found a reduction of up to 36% in lipids and lipoproteins because of this intervention.

Conclusions

In light of the prevalence of dyslipidemia found in this study and its association with excess weight and poor self-rated health, it is paramount to continuously monitor dyslipidemia and possibly implement a strategy of telephone-based nutritional counseling as one approach to reduce dyslipidemia in the Brazilian population.

Collaborators

LP Pereira was involved in all stages of this research project: concept and design of the study, acquisition of data and data analysis, interpretation of results and manuscript preparation. R Sichieri and RMVG da Silva helped with interpretation of results and review of the manuscript. NJ Segri help with data analysis and review of the manuscript. MG Ferreira was involved in the concept and design of the study, acquisition of data and data analysis, interpretation of results and manuscript preparation. All authors approved the final version of the manuscript submitted for publication.

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