ARTÍCULO ORIGINAL

Riesgo Cardiovascular Entre Hispanos Residiendo en los Estados Unidos: El Sistema Conductual de Vigilancia de Factores de Riesgo 2013.

Hispanic Ethnicity and the Risk of Cardiovascular Disease in the United States: The Behavioral Risk Factor Surveillance System 2013.

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Resumen

Introducción: Aunque la enfermedad cardiovascular (ECV) es una de las mayores causas de defunción entre los hispanos que viven en los EE. UU, la asociación entre la etnia hispana y la ECV apenas se ha explorado. **Objetivo:** Examinar si ser hispano se asocia con un mayor riesgo de padecer ECV en comparación con la población adulta no Hispana de los EE. UU, basados en los datos de la encuesta nacional sobre factores de riesgo conductuales del 2013. **Métodos:** Se realizó un análisis de datos secundario de la información obtenida del Sistema de Vigilancia del Factor de Riesgo Conductual (BRFSS) para estudiar la asociación entre origen étnico (hispanos: mexicano, puertorriqueño, cubano o de origen español vs. no hispanos) y la ECV en los encuestados a través del sistema BRFSS. Utilizamos una regresión logística para obtener modelos ajustados y no ajustados para evaluar el efecto de las características de la población seleccionada en participantes que informaron tener o no ECV. **Resultados:** En este estudio se incluyeron 486 905 adultos, (48% hombres) y 57 257 (11,8%) que se autodefinieron como hispanos. Aproximadamente el 24% de los hispanos tenían entre 25 y 34 años, mientras que un 21% de los no hispanos tenían más de 65 años. Después del ajuste de variables, los hispanos tenían un 30% menos de probabilidades de reportar una ECV en comparación con los no hispanos (OR = 0.7, 99% CI = 0.6-0.8); las mujeres mostraron un 40% menos de probabilidades de presentar una ECV (OR = 0,60; IC del 99% = 0,5-0,6). Tener más edad, menos nivel de educación formal, ganar menos de <$15 000/año, el sedentarismo, el tabaquismo, el consumo excesivo de alcohol, la diabetes, la hipertensión y la hiperlipidemia aumentaron significativamente la probabilidad de presentar una ECV. **Conclusiones:** Los hallazgos sugieren que en general, los hispanos que residen en los EE. UU, especialmente mujeres, tuvieron una probabilidad significativamente menor de autoreportar que tuvieron una ECV en comparación con los norteamericanos no hispanos.

Palabras clave: la paradoja hispana; Enfermedad cardiovascular, hispano-americanos; Infarto de miocardio; Accidente Cerebro Vascular

Abstract

Background: Although the leading cause of death among Hispanics living in the United States (US) is cardiovascular disease (CVD), the association between Hispanic ethnicity and CVD has been scarcely explored. **Objective:** To examine whether being Hispanic is associated with an increased risk of CVD compared with the non-Hispanic US adult population in 2013. **Methods:** Secondary data analysis of a cross-sectional 2013 Behavioral Risk Factor Surveillance System survey in 2013 (n=486,905). The main exposure variable was Hispanic ethnicity (Mexican, Puerto Rican, Cuban or Spanish origin) and the main outcome variable was self-reported CVD (myocardial infarction/coronary artery disease/angina). The main covariates were sex, age, education, income, healthcare access, exercise, body mass index, current smoking, heavy drinking, diabetes, hypertension and hyperlipidemia. Unadjusted and adjusted logistic regressions were used to assess the effect between ethnicity and self-reported CVD. Odds ratios (OR) and 99% confidence intervals (CI) were calculated. **Results:** In total, 12% of the study participants were Hispanic (n=57,257). Approximately 24% of Hispanics were 25-34 y/o while (21%) of non-Hispanic were >65 y/o. After adjustment, Hispanics were 30% less likely to report CVD compared with non-Hispanics (OR=0.7; 99%; CI=0.6-0.8). Compared with men, women had a 40% decreased risk of having CVD (OR=0.60; 99% CI=0.5-0.6). Advanced age, lower educational attainment, income <$15,000/year, lack of exercise, smoking, non-heavy drinking, diabetes, hypertension and hyperlipidemia increased statistically significantly the likelihood of reporting CVD. **Conclusion:** The findings suggest that, in general, Hispanics residing in the US are significantly less likely to self-declare if they had a CVD compared with non-Hispanic Americans. These data suggest that although Hispanics are generally poorer and have less access to education and health services, their self-perceived health is better than in non-Hispanic residents of the US.

Keywords: Hispanic Paradox; Cardiovascular disease, non-Hispanic Americans; Myocardial infarction; Stroke

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Introduction

Cardiovascular diseases (CVDs) are the leading cause of death globally.[1] Worldwide, more people die from CVDs than from any other health related problem.[1,2] The mortality from acute myocardial infarction (AMI) and coronary artery disease(CAD) causes an estimate of 7.4 million deaths every year according to the World Health Organization.[3] Cardiovascular diseases affect older people with other comorbidities and risk factors, however, every year millions of adults die due to premature deaths attributable to CVDs.[4] Mortality and morbidity due to cardiovascular diseases have decreased in the developed world, however, it is still one of the leading causes of death in medium and high income countries such as Australia, the US or Canada.[5-7] In the US about 610,000 people die of heart disease every year, in other words, out of 10 deaths, three are related to CVDs.[8] In this country, approximately 85.6 million of adults have more than one type of latent cardiovascular disease. CVDs affects all gender and races, being black Afro-Americans, White and Hispanics men those with the highest prevalence.[8,9]

According to recently published data, more than 53 million Hispanics currently live in the US.[10] This group represents more than 17% of the total US population, thus, understanding its epidemiological profile and their risks should be a public health priority. Despite the growing numbers of Hispanics living in the US, many continue to face health inequalities.[11,12] Research data on the prevalence of cardiovascular or cerebrovascular risk factors among Hispanics have been lacking.[10] The reasons of this scarcity is probably multifactorial, due in part to language barriers, mistrust of personal information and lack of proper healthcare.[13,14]

Some reports have analyzed the relationship between Hispanics and the risk of developing CVD's.[15-17] Hispanics have lower socio economic status and higher prevalence of risk factors, however, their mortality is lower when compared with other groups, condition named as the 'Hispanic Paradox" that seems to be related with cultural, genetic and dietary conditions found among Latinos, causing low mortality in relationship with their cardiovascular risk.[18-20] Recent information about this "Hispanic Paradox" was published in 2016 by a group of researchers whom studied the epigenetic clock and its relationship with race/ethnicity, sex and its impact with coronary heart diseases.[21] They reported that Hispanics age later than their Caucasian peers, being this internal clock in part responsible for the lower mortality despite the higher prevalence of risk in relationship with Caucasians.[21]

The aim of this study was to assess whether being Hispanic is associated with an increased probability of having CVD compared with being non-Hispanic among the adult US population in 2013.

Material and Methods

Study design and population

We performed a secondary data analysis from the 2013 Behavioral Risk Factor Surveillance System to study the association between ethnicity and CVDs. The study population (N=486,905) included participants aged 18 years and older and excluded those participant with missing information on ethnicity (N=5,419). Data were abstracted from telephone surveys that collected information from US residents regarding their health-related risk behaviors, chronic health conditions, and the use of preventive healthcare services. The BRFSS collects information using a disproportionate stratified sampling design.

Measurements

The main independent variable was ethnicity (Hispanic vs. non-Hispanic) and the dependent variable was self-reported history of CVD.

We used the following 2013 BRFSS variables: Having CVD if the respondent answered "yes" to any of the following diagnoses: acute myocardial infarction / heart attack or angina pectoris / coronary heart disease or cerebrovascular disease. The variable ethnicity was categorized as Hispanic or non-Hispanic. Being Hispanic was considered if the respondent answered "yes" as descendant of Mexican, Puerto Rican, and other Spanish origin; non-Hispanic was categorized if the respondent answered otherwise. Age was categorized into six groups (18-24, 25-34, 35-44, 45-54. 55-65 and 65+ years old). Sex was categorized into two groups (men or women). Educational attainment was divided in four categories: elementary school, high school, undergraduate, graduated based on highest grade or year of school completed by the respondent. Income was divided into 5 groups based on the annual household income from all sources, as reported by the respondent. Health care access was categorized into two categories: Health insured vs. non-insured. A respondent was considered health insured if they reported having prepaid plans such as HMOs, or government plans such as Medicare, or Indian Health Service. Having exercised during the past month, other than their regular job, was considered positive with the respondent answered "yes" to any physical activities such as running, calisthenics, golf, gardening, or walking. According to the global database on Body Mass Index (BMI) of the World Health Organization, the weight has been classified into four categories. BMI: <18.5 kg/m2 (Underweight), BMI: ≥18.50 to <25 (Normal), BMI: ≥ 25 to <30 (Overweight) and BMI: ≥30 (Obese). A respondent was categorized as current smoker if they answered "yes" to having smoked at least one cigarette during the previous 30 days and if they have smoked at least 100 cigarettes in their lifetime. The variable heavy drinker was categorized according

to the participants' gender and by their daily consumption of alcohol. An adult man who drank more than two drinks per day and adult women who drank more than one drink per day were considered heavy drinkers. Finally, the following variables were considered positive if a healthcare professional ever told the respondent that they have had diabetes, hypertension or hyperlipidemia.

Statistical analysis

STATA software v.14 was used in order to perform statistical analyses. First, we conducted a descriptive analysis to report frequency distributions for all variables; second, we conducted bivariate analyses using Chi-square test or Student's t-test to assess the associations between population characteristics with ethnicity and population demographics. Adjusted Odds Ratio (OR) and confidence interval (CI) at the 99% level were calculated using the binary logistic regression model, controlling for: gender, age, educational attainment, income, healthcare access, exercise, BMI, current smoking, heavy drinking, diabetes, hypertension, and hyperlipidemia.

Ethical considerations

For our study, due to the nature of this research, it was not necessary to request an informed consent. According to the international guidelines of good clinical practices (GCP) and the Helsinki Declaration, anonymous databases can be used when no harm or confidentiality can be guaranteed.

Results

The results showed that there were a larger percentage of women in both Non-Hispanic and Hispanic groups compared with men. The highest percentage of respondents within the Non-Hispanics respondents were more than 65 years-old compared with whereas the Hispanics were more often to between 25 to 34 years-old. Non-Hispanics had better educational attainment than Hispanics. The Non-Hispanics attended college more often than the Hispanics (Table 1). For non-Hispanics, the majority of respondents had an income higher of 50,000 USD a year compared to Hispanics whom earn around 15,000 to 24,999 USD a year. The results of the health insurance status demonstrate that non-Hispanics have better access to health services than Hispanics (p-value <0.001). Obesity and overweight were more common in Hispanics however, the self-reported presence of daily habits and risk factors were better among the Hispanics than the non-Hispanics (Table 1).

The analysis of the distribution of the characteristics of the study population by Hispanic ethnicity demonstrated that in both groups, most of the participants had some type of medical insurance, although in Hispanics the percentage is lower (64%) than among non-Hispanics (86.3%). Overweight, obesity and diabetes are more frequent among Hispanics and the other risk factors such as exercise, hypertension, current smoker, heavy drinking and hyperlipidemia are higher among non-Hispanics.

Table 1. Description of the distribution of the total population by Ethnicity (BRFSS 2013) Percentages and significance tests adjusted for sampling weights.

Characteristics	Non-Hispanic N=449,300 %	Hispanic N=37,054 %	p-value *
Sex			0.0054
Women	51.7	50.2	
Age (years)			<0.001
18-24	12.1	17.9	
25-34	15.9	24.0	
35-44	15.7	21.0	
45-54	18.3	16.7	
55-64	17.4	11.5	
65+	20.6	8.8	
Educational attainment			<0.001
Elementary school	10.6	38.1	
High school	29.0	26.3	
Undergraduate	32.2	23.8	
Graduated	28.2	11.7	
Income (USD/year/ household)			<0.001
<15,000	11.0	25.9	
15,000 a 24,999	16.1	28.5	
25,000 a 34,999	10.8	12.5	
35,000 a 49,999	14.3	12.0	
≥50,000	47.9	21.1	
Healthcare access			<0.001
Insured	86.3	64.4	
Exercise	25.4	32.6	<0.001
BMI[1](kg/m^2)			<0.001
BMI: <18.5 (Underweight)	2.0	1.5	
BMI:≥18.50 a <25 (Normal)	35.0	30.1	
BMI:≥ 25 a <30 (Overweight)	35.3	37.2	
BMI:≥30 (Obese)	27.8	31.2	
Current smoker	18.9	13.7	<0.001
Heavy drinking	6.3	4.6	<0.001
Diabetes	10.2	10.9	0.0106
Hypertension	34.0	25.5	<0.001
Hyperlipidemia	39.2	35.1	<0.001

*p-value: based on chi/square test of association between each characteristic of study population and Cardiovascular Disease. [1]BMI-Body Mass Index.

Table 2 describes the associations between population characteristics by the reported presence of cardiovascular disease. Being Hispanic was significantly associated with less proportion of cardiovascular disease (p<0.001). There was a significant higher proportion of CVD among respondents who were men, older than 65 years, had lower educational attainment, were uninsured and earned less than <15,000 USD a year. A similar significant proportion of CVD was reported by those who exercised less,

were obese, and were current smokers. Those respondents who were told by a health professional of having diabetes, hypertension or hyperlipidemia reported significant higher proportion of CVD. Finally, heavy drinkers reported significant lower percentage of CVDs than those not considered heavy drinkers.

The unadjusted and adjusted OR and 99% CI for the association between ethnicity and CVD are presented in Table 3. Unadjusted data shows that Hispanics were 40% less likely to have CVD compared to non-Hispanics (OR 0.6, 99% CI=0.6-0.7). Adjusted data showed that Hispanics were 30% less likely to have CVD compared to non-Hispanics (OR 0.7; 99% CI=0.6-0.8). Adjusted data also showed that healthcare access and BMI were no longer statistically significant variables for Ethnicity and CVD, healthcare access (OR 0.87, 99% CI=0.8-1.0) and BMI (in all categories) had no association with Ethnicity and CVD and vice versa.

Table 2. Bivariate associations between population characteristics and the presence or not of having cardiovascular diseases in the US in 2013.

Characteristics	No CVD N= 429648 %	CVD N=57257 %	p-value*
Ethnicity			<0.001
Non-Hispanic	90.9	9.1	
Hispanic	94.0	6.0	
Sex			<0.001
Men	90.3	9.7	
Women	92.5	7.5	
Age (years)			<0.001
18-24	99.0	1.0	
25-34	98.2	1.8	
35-44	96.8	3.2	
45-54	92.9	7.1	
55-64	87.6	12.4	
65+	76.8	23.2	
Educational attainment			<0.001
Elementary school	86.6	13.1	
High school	90.4	9.6	
Undergraduate	92.1	7.9	
Graduated	94.5	5.5	
Income (USD/year/ household)			<0.001
<15,000	86.5	13.5	
15,000 to 24,999	88.0	12.0	
25,000 to 34,999	89.8	10.2	
35,000 to 49,999	91.7	8.3	
≥50,000	94.9	5.1	
Healthcare Access			<0.001
Insured	90.7	9.4	
Non-Insured	95.0	5.0	
Exercise			<0.001
Yes	92.8	7.2	
No	87.2	12.8	
BMI (kg/m^2)			<0.001
BMI: <18.5 (Underweight)	92.6	7.4	
BMI: ≥18.50 to <25 (Normal)	93.8	6.2	
BMI: ≥25 to <30 (Overweight)	90.9	9.1	
BMI: ≥30 (Obese)	88.5	11.5	
Current Smoker			<0.001
Yes	90.2	9.8	
No	91.6	8.4	
Heavy drinking			<0.001
Yes	93.9	6.2	
No	91.2	8.8	
Diabetes			<0.001
Yes	74.4	25.6	
No	93.4	6.6	
Hypertension			<0.001
Yes	81.0	19.0	
No	96.4	3.6	
Hyperlipidemia			<0.001
Yes	82.0	18.0	
No	94.0	5.3	

Abbreviations: CVD-Cardiovascular Disease. BMI- Body Mass Index.

Discussion

Our study showed that before adjusting Hispanics were 40% less likely to have CVD compared to non-Hispanics. After adjusting for all possible confounders, Hispanics were 30% less likely to have CVD compared to non-Hispanics. This showed that confounding factors played an important role in presence or absence of CVD as there is a 10% increased likelihood of being Hispanic and having CVD.

The results are consistent with other reports that have found this Hispanic paradox. The majority of studies explained that the Hispanic living in the US are usually at higher risk of developing stroke, however, it also seems like those Hispanic-Americans live longer than non-Hispanic whites, which would explain the lower mortality among them.[16-18]

The different risk factors modified the probability of presenting the mentioned pathology. Being non-Hispanic is an obvious risk factor, because the high probability of developing CVD because they have several risks factors that influence, such as smoking, hyperlipidemia, hypertension, among others.

Our study revealed that several risk factors and population characteristics may influence prevalence of CVD. We found that a higher percentage of Hispanics were overweight (37.2%) or obese (31.2%) and had diabetes (10.9%), compared with non-Hispanics. These finding were similar to Hayes et al., who reported data analyzed by the CDC from the 2003 (BRFSS) survey in order to assess the prevalence of multiple risk factors for heart disease and stroke and to identify differences in risk factors among socioeconomic groups and racial/ethnic populations. They found that prevalence of having two or more risk factors was highest among blacks (48.7%) and American Indians/ Alaska Natives (46.7%), second

Table 3. Unadjusted and adjusted association between Ethnicity and other risk factors for cardiovascular disease (BRFSS 2013).

Characteristics	Unadjusted OR (99% CI)	Adjusted OR (99% CI)
Ethnicity		
Non-Hispanic	Reference	
Hispanic	0.6 (0.6-0.7)	0.7 (0.6-0.8)
Sex		
Men	Reference	
Women	0.7 (0.7-0.8)	0.6 (0.55-0.62)
Age (years)		
18-24	Reference	
25-34	1.8 (1.3-2.4)	1.8(1.2-2.9)
35-44	3.2 (2.4-4.3)	2.8 (1.8-4.2)
45-54	7.4 (5.7-9.8)	4.7 (3.2-7.0)
55-64	13.8 (10.6-18.1)	7.4 (5.0-11.0)
65+	29.6 (22.8-38.6)	13.4 (9.1-19.9)
Educational attainment		
Elementary school	2.7 (2.5-2.9)	1.4 (1.3-1.6)
High school	1.8 (1.7-2.0)	1.2 (1.1-1.3)
Undergraduate	1.5 (1.4-1.6)	1.2 (1.1-1.4)
Graduated	Reference	
Income (USD/year/ household)		
<15,000	2.9 (2.7-3.1)	2.5 (2.3-2.9)
15,000 to 24,999	2.5 (2.4-2.7)	2.1 (1.9-2.3)
25,000 to 34,999	2.1 (1.9-2.3)	1.6 (1.4-1.8)
35,000 to 49,999	1.7 (1.5-1.8)	1.3 (1.2-1.5)
≥50,000	Reference	
Healthcare Access		
Insured	Reference	
Non-Insured	0.5 (0.5-0.6)	0.87 (0.8-1.0)
Exercise		
Yes	Reference	
No	1.9 (1.8-2.0)	1.2(1.2-1.3)
BMI (kg/m^2)		
BMI: <18.5 (Underweight)	1.2 (1.0-1.5)	1.3(0.9-1.7)
BMI: ≥ 18.50 to <25 (Normal)	Reference	
BMI: ≥ 25 to <30 (Overweight)	1.5 (1.4-1.6)	0.96 (0.89-1.05)
BMI: ≥30 (Obese)	2.0 (1.9-2.1)	1.02 (0.93-1.11)
Current Smoker		
Yes	1.2 (1.1-1.3)	1.4 (1.3-1.5)
No	Reference	
Heavy drinking		
Yes	0.7 (0.6-0.8)	0.8 (0.70-0.96)
No	Reference	
Diabetes		
Yes	4.8 (4.6-5.2)	1.6 (1.5-1.8)
No	Reference	
Hypertension		
Yes	6.3 (5.9-6.6)	2.2 (2.0-2.4)
No	Reference	
Hyperlipidemia		
Yes	3.9 (3.7-4.1)	2.0 (1.9-2.2)
No	Reference	

Abbreviations: CVD-Cardiovascular Disease, OR-Odds Ratio, CI- Confidence Intervals, BMI- Body Mass Index.

highest among Hispanics (39.6%). Similarly, Zhang et al. used data from BRFSS from 2005 to 2008 to evaluate racial/ ethnic in the prevalence of obesity and estimated the attributable risk of developing obesity-related diseases by racial/ethnic group and BMI category. Hispanics were 2.71 times more likely to have Diabetes compared to whites. Also, Hispanics and Blacks had higher odds of being obese and statistically significant higher risk of stroke, high blood pressure, high cholesterol, and coronary artery disease. We found that a lower percentage of Hispanics had high cholesterol compared to non-Hispanics. This was different from findings from another study that revealed that the prevalence of having high cholesterol was higher among Hispanics than among any other racial/ethnic group.[18-20]

Incidentally, we found that non-heavy drinkers of alcohol had a higher prevalence of CVD and heavy drinkers were 20% less likely to have CVD. However, Sacco et al. assessed the protective effect of moderate alcohol consumption on ischemic stroke. They described moderate alcohol consumption as up to 2 drinks per day and heavy alcohol as 5 or more drinks. They found a higher prevalence of stroke in heavy drinkers and that moderate alcohol consumption was protective against stroke.[22]

After modeling, women were 40% less likely to have CVD compared to men. Spence, et al., discussed the importance of sex and gender in atherosclerosis and cardiovascular disease. They suggested that men might be at increased risk of developing CVD compared to women due to increased risk taking behaviors in men such as smoking and excessive alcohol consumption compared to women. Also women are less likely to develop CVD especially before menopause, as estrogen is protective against heart disease.[23]

Our results indicate that a higher percentage of Hispanic exercised compared to non-Hispanics. These results were similar to those found to in The Dallas Heart study, which assessed Ethnic Differences in Physical Activity and Metabolic Risk. They found that Hispanics had higher levels of moderate activity than whites or blacks. However, they also found that Hispanics had a higher prevalence of diabetes and obesity and higher triglyceride levels compared to whites regardless of their activity level.

Our results show a higher percentage of non-Hispanics to be current smokers compared to Hispanics and smokers were 40% more likely to have CVD. However, Kaplan., et al., evaluated cigarette use among Hispanic/ Latino adults in the US and found that Puerto Rican and Cuban men have higher smoking prevalence compared to US non-Hispanic whites.[24]

Our results show that those with household income of < 15000 USD/year had the highest likelihood of having CVD (OR= 2.5 (2.3-2.9)). Shen et al. analyzed the associations between ethnicity and the severity of illness, treatment environments, outcomes, as well as their inte-

ractions among acute myocardial infarction. A higher proportion of Hispanic patients (16.5%) than that of non-Hispanic White patients (4.1%) lived in areas where the median income by zip code was less than $25,000.[25]

We also found that BMI (in all categories) and Access to Healthcare had no association with CVD after modeling. All other variables remained significant and would require further investigation.

Naturally, our study had some limitations. Since the BRFSS is a telephone-based survey it excludes people without a landline or cellphone and the data is subject to respondent and recall bias. BMI being insignificant may come form less accurate estimates, as respondents tend to overestimate their height and underestimate their weight. Thus, the actual overweight and obesity prevalence estimates may be underestimated and may actually be significant. The result of heavy drinkers being less likely to have CVD may be due to lack of categorizing or recording number of drinks if the BRFSS which described heavy drinking as: adult men having more than two drinks per day and adult women having more than one drink per day. This criterion fails to categorize alcohol drinkers as light, moderate or heavy and we may have had more light or moderate drinkers in our survey population. Our limitations may be used as suggestions to expand the BRFSS questionnaire to obtain even more accurate data and therefore, results.

Conclusion

The findings suggest that, in general, Hispanics residing in the US are significantly less likely to self-declare if they had a CVD compared with non-Hispanic Americans. The results obtained in our study, demonstrate that there is a lower probability (30% less) than the Hispanics who live in United States and women in general develop CVD compared to non-Hispanic and with the male population.

These data suggest that although Hispanics are generally poorer and have less access to education and health services, their self-perceived health is better than in non-Hispanic residents of the US. This discordance between major risk factors and lower mortality in general has been entitled as the Hispanic Paradox that is apparently justified by the fact that Hispanics age slower than white Americans.

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