Prevalence Of Risk Factors For Metabolic Syndrome In Uninsured Hispanic Adults From Low Income Communities In El Paso, Texas

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PREVALENCE OF RISK FACTORS FOR METABOLIC SYNDROME IN UNINSURED HISPANIC ADULTS FROM LOW INCOME COMMUNITIES IN EL PASO, TEXAS

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Master’s Program in Public Health

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DEDICATION

In memory of my brother Jesus Armando (1989-2010), a brilliant young man who taught me to live life to the fullest.
PREVALENCE OF RISK FACTORS FOR METABOLIC SYNDROME IN UNINSURED HISPANIC ADULTS FROM LOW INCOME COMMUNITIES IN EL PASO, TEXAS

by

JUAN AGUILERA, M.D.

THESIS

Presented to the Faculty of the Graduate School of The University of Texas at El Paso in Partial Fulfillment of the Requirements for the Degree of

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ABSTRACT

Metabolic syndrome (MetS) consists of a group of associated risk factors for cardiovascular disease and other related chronic diseases. In the U.S. it is estimated that nearly 35% of the adult population have metabolic syndrome. According to National Institutes of Health (NIH) guidelines risk factors for developing MetS include large waistline, high blood pressure, high triglyceride level, low high density lipoprotein (HDL) cholesterol level, and elevated fasting blood glucose level. The goal of this study was to investigate the prevalence of risk factors for MetS among uninsured, low socioeconomic status adult Hispanics in El Paso, Texas. The study population resided in the Housing Authority of the City of El Paso (HACEP) housing complexes with the City boundaries.

A cross-sectional study gathered data including socio-demographic information, and biometric and biochemical indicators for MetS from 657 uninsured Hispanic residents in HACEP residential complexes. Socio-demographic information gathered included age, sex, ethnicity, place of residency, educational level, occupational status, marital status, and perceived health status. Biometric and biochemical measurements gathered from all participants included waist circumference, diastolic and systolic blood pressure, and triglycerides, HDL-cholesterol, and glucose levels gathered using a Cholestech LDX ® Analyzer. Participants were categorized with MetS when they had 3 or more of the previously mentioned risk factors.

The majority of participants (87%), had an income between $0 and $19,999 and (68%); didn’t earn a high school degree and approximately one third (33%) were homemakers. The majority perceived their health status as either “good” (39%) or “fair” (36%). The most prevalent risk factors for MetS were a large waistline (64%), high triglycerides (55%), and low HDL-cholesterol (55%). High blood pressure (40%) and elevated fasting blood glucose (40%) were less
prevailent. Having a large waistline was significantly higher in women (68%) compared to men (43%). The overall prevalence of MetS in the study population was 53%. Logistic regression showed that MetS gradually increases with age from groups between 40 and 49 years old (OR 3.90, df=10, p<0.001), to groups from 50 and 59 years old (OR 5.68, df=10, p<0.001), and those 60 or older (OR 6.42, df=10, p<0.001). Also, not being employed (OR 1.15, df=10, p=0.010), and a fair or poor perceived health status (OR 2.06, df=10, p<0.001) were associated with increased odds of having MetS. A fair or poor perceived health status seems to be overall a good and cost-effective predictor for risk factors for MetS.

Compared to national rates, this study reports that Hispanics in the El Paso region, which comprise 81% of the population in El Paso, have a much higher prevalence of risk factors for MetS, which implies the need for better preventive strategies. A fair or poor perceived health status seems to be overall a good and cost-effective predictor for risk factors for MetS. People without access to healthcare should be a priority group for interventions focused on preventing the development and the mitigation of risk factors for MetS; particularly, reducing high triglycerides while improving low HDL-cholesterol levels, and among women weight loss to decrease their waistline.
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CHAPTER 1. BACKGROUND AND SIGNIFICANCE

1.1 METABOLIC SYNDROME

Metabolic syndrome (MetS) consists of a group of associated risk factors for cardiovascular disease (CVD) and other related chronic diseases. First described in 1923 by Kylin, metabolic syndrome was at first seen as a combination of gout, hypertension, and hyperglycemia (Kylin, 1923). For several decades researchers have known that certain metabolic markers were associated with type 2 diabetes mellitus (T2DM) and CVD, but not until the 1980s did researchers identify a group of metabolic markers that seemed to be associated with an increased risk of developing these two conditions (Ferrannini, Haffner, Mitchell, & Stern, 1991; Haffner et al., 1992; Reaven, 1988). Later on in 1988 the term Syndrome X was established as the simultaneous presence of hypertension, hyperglycemia, glucose intolerance, elevated triglycerides, and low high density lipoprotein cholesterol (HDL-C) (Reaven, 1988).

Recent advances in the understanding of metabolic markers and their role as risk factors of T2DM and CVD allowed for the formal designation of “metabolic syndrome”. It has been determined that MetS is linked to a metabolic state known as insulin resistance, which increases the risk of developing the aforementioned conditions (Expert Panel on Detection & Cholesterol, 2001). Recent studies have found that metabolic syndrome may pose a greater risk for developing T2DM compared to CVD (Sattar et al., 2003; Wilson, D’Agostino, Parise, Sullivan, & Meigs, 2005). Currently, MetS integrates the risk of obesity and diabetes by considering the presence of at least three out of five risk factors. According to the National Institutes of Health (NIH), the five risk factors for MetS are: large waistline, high blood pressure, high triglyceride level, low HDL-C level, and high fasting blood glucose (Figure 1) (Flegal, Carroll, Kit, & Ogden, 2012).
1.2 RISK FACTORS FOR METABOLIC SYNDROME

The risk factors for MetS have been investigated individually and are collectively critical for the development of metabolic syndrome. However, it has not been proven how all the risk factors are interrelated and working together; and resulting in MetS (Grundy, Hansen, Smith, Cleeman, & Kahn, 2004).

1.2.1 LARGE WAISTLINE

Central or abdominal obesity is defined as the excessive abdominal fat around the abdomen. Research has shown that a large waistline can contribute to chronic conditions such as: insulin resistance, hypertension, dyslipidemia (altered blood lipid levels) and hyperglycemia. A
high waist circumference is associated with an increased risk for type 2 diabetes, dyslipidemia, hypertension, and CVD. (Chan, Rimm, Colditz, Stampfer, & Willett, 1994). Also, research suggests that excess abdominal fat may be a source of inflammatory cytokines, increasing risk for MetS and CVD (Després et al., 2008). Also, a large waistline has been associated with increased risk for CVD and T2DM (Hanson, Imperatore, Bennett, & Knowler, 2002; Isomaa et al., 2001; Lee et al., 2006). Waist circumference is an indicator that reflects the amount of adipose tissue deposits in the abdomen as well as total fat mass, providing then a useful marker for waistline and consequently body fat distribution (Zhu et al., 2002). Research has shown that in the assessment of abdominal adiposity, waist circumference is complementary or a superior indicator when compared to body mass index (BMI) (Janssen, Katzmarzyk, & Ross, 2004; Tchernof & Després, 2013). When measuring central obesity, gender-ethnic specific values for waist circumference should be used, since there are differences among ethnic populations and by gender. (Lear, Toma, Birmingham, & Frohlich, 2003).

1.2.2 HIGH BLOOD PRESSURE

Blood pressure refers to the force that blood exerts on blood vessel walls when the heart beats, it’s based on two readings: systolic and diastolic. Systolic blood pressure (SBP) is measured when the heart muscles contract, whereas diastolic blood pressure (DBP) refers to the measurement when the heart muscles relax (Pickering, Shimbo, & Haas, 2006). High blood pressure can progress to a medical condition in which the blood pressure is chronically increased resulting in a condition known as hypertension. Hypertension is a major risk factor for strokes, heart attacks and heart failure (Prasad, Ryan, Celzo, & Stapleton, 2012). High blood pressure is associated with obesity, glucose intolerance and insulin resistance. It has been reported that the strength of this relation varies according to different populations (Alberti, Zimmet, & Shaw, 2006).
1.2.3 HIGH TRIGLYCERIDES

Triglycerides are the most common form of fat present in the body. To be absorbed these compounds are broken down into glycerol and fatty acids in the small intestine, and afterwards these molecules are reassembled and combined with cholesterol to form lipoproteins. Triglycerides are the source of energy for body cells. Researchers have reported that high triglyceride levels are associated with obesity and insulin resistance (Eckel, Grundy, & Zimmet, 2005; Koutsari & Jensen, 2006).

1.2.4 LOW HDL-CHOLESTEROL

High density lipoprotein (HDL) cholesterol plays an important role in cholesterol transport, mobilizing cholesterol from the peripheral tissues and directing it to the liver. In the general population, a lower-than-normal HDL level is inversely correlated with CVD. The risk of a coronary event is thought to increase 2% for every 1% decrease in HDL levels (Singh, Sharma, Kumar, & Deedwania, 2010).

Because of the increasing prevalence of CVD in women, the American Heart Association (AHA) released the evidence based guidelines for CVD prevention in women in 2004 and an update of the guidelines was released in 2007 (Mosca et al., 2007). Low HDL-cholesterol, is affected by the chronic state of high triglyceride levels (hypertriglyceridemia) (Parapid et al., 2014). Both, high triglycerides and low HDL-cholesterol levels are risk factors for MetS and associated with CVD. Variations in the pattern and magnitude of both of the aforementioned risk factors are due to the interaction of genetic factors and environmental influences including diet, physical activity and stress (Alberti et al., 2006; Grundy et al., 2004).
1.2.5 HIGH FASTING GLUCOSE

Insulin resistance is a condition in which the liver, muscles, and adipose tissue become less sensitive to insulin, thus reducing glucose uptake and storage in the body which in turn causes an increase in blood glucose (Ferrannini et al., 1991). High fasting glucose is present in most people with metabolic syndrome and it is strongly associated with some metabolic risk factors, the weakest being hypertension (Alberti et al., 2006). An abnormal fat distribution is usually seen in patients with MetS and an excess in abdominal fat is strongly correlated with high fasting glucose (Nyholm et al., 2004).

1.3 DIAGNOSTIC CRITERIA FOR METABOLIC SYNDROME

Metabolic syndrome is composed by a group of five risk factors that increase the risk for various chronic diseases, such as T2DM and CVD. These risk factors include: large waistline, high blood pressure, high triglyceride level, low HDL-C level, and high fasting blood glucose. In the U.S. the cutoff values for MetS have been established by the NIH guidelines and are based on the National Cholesterol Education Program (NCEP) Adult Treatment Panel III recommendations. According to these guidelines, a cutoff point for having a large waistline and consequently abdominal-obesity is a waist circumference equal or above 35 inches (88 cm) for women and a waist circumference equal to or above 40 inches (102 cm) for men. Having either a blood pressure of 135 mmHg or higher for SBP or a blood pressure of 85 mmHg or higher for DBP is consistent with high blood pressure. A triglyceride level greater than 150 mg/dL in a blood sample serves a cut point value for this factor. In addition, having a HDL-C below 40 mg/dL in a blood sample also fulfills the criteria. Lastly, a fasting glucose level equal or greater than 100 mg/dL while fasting is a risk factor for MetS. For each one of the aforementioned criteria, a person must have a
valid measurement of at least three of the five metabolic risk factors to be categorized as having MetS (Expert Panel on Detection & Cholesterol, 2001; Grundy et al., 2004).

Table 1: Diagnostic criteria for metabolic syndrome

<table>
<thead>
<tr>
<th>Risk Factor</th>
<th>Cutoff values</th>
</tr>
</thead>
<tbody>
<tr>
<td>High fasting glucose</td>
<td>≥ 100 mg/dL</td>
</tr>
<tr>
<td>Large waistline</td>
<td>≥ 102 cm (≥ 40 inches) in men</td>
</tr>
<tr>
<td></td>
<td>≥ 88cm (≥ 35 inches) in women</td>
</tr>
<tr>
<td>High triglycerides</td>
<td>≥ 150mg/dL</td>
</tr>
<tr>
<td>Low HDL-cholesterol</td>
<td>&lt; 40mg/dL in men</td>
</tr>
<tr>
<td></td>
<td>&lt; 50mg/dL in women</td>
</tr>
<tr>
<td>High blood pressure</td>
<td>≥ 135mmHg systolic or</td>
</tr>
<tr>
<td></td>
<td>≥ 85mmHg diastolic</td>
</tr>
</tbody>
</table>

*Source:* NIH, 2015

### 1.4 PREVALENCE OF METABOLIC SYNDROME

Metabolic Syndrome is one of the major medical and public health problems in the U.S. (Beltrán-Sánchez, Harhay, Harhay, & McElligott, 2013; Ford, 2005) and worldwide (Cameron, Shaw, & Zimmet, 2004; Grundy, 2015). Approximately one-fifth (22.5%) of the adult U.S. population could be classified as having MetS; the prevalence of each risk factor by sex is shown in Table 2 (Beltrán-Sánchez et al., 2013). As indicated in the study by Ford the prevalence of this syndrome rises with age increasing from 6.7% in individuals aged 20-29 years to over 40% in individuals aged ≥ 60 years (Ford, 2005). Another study showed that MetS reaches its peak levels at the age of 60 for men and 70 for women (Park et al., 2003). Furthermore, the prevalence of MetS varies by sex and ethnicity. Ford et al reported that African American women had about 57% higher prevalence than men and Mexican American women had about 26% higher prevalence compared to men. (Ford, 2005). In the study by Park and collaborators (2003) it was found that
the lowest prevalence was reported in black men (13.9%) and the highest in Mexican American women (27.2%). Ford et al reported the highest prevalence among Mexican Americans (31.9%) and the lowest among whites (23.8%) and African Americans (21.6%) (Ford, 2005).

Table 2: Prevalence of risk factors and metabolic syndrome in the U.S.

<table>
<thead>
<tr>
<th>Risk Factor</th>
<th>Males % (CI)</th>
<th>Females % (CI)</th>
<th>Total Population % (CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Large waistline</td>
<td>46.44% (41.22–51.66)</td>
<td>65.38% (62.36–68.39)</td>
<td>56.07% (52.79–59.35)</td>
</tr>
<tr>
<td>High blood pressure</td>
<td>27.84% (23.99–31.69)</td>
<td>20.19% (17.02–23.36)</td>
<td>24.04% (20.91–27.18)</td>
</tr>
<tr>
<td>Low HDL-cholesterol</td>
<td>27.91% (23.81–32.01)</td>
<td>32.00% (28.69–35.30)</td>
<td>30.05% (26.93–33.16)</td>
</tr>
<tr>
<td>High fasting glucose</td>
<td>25.01% (20.10–29.92)</td>
<td>15.14% (11.98–18.30)</td>
<td>19.92% (16.38–23.47)</td>
</tr>
<tr>
<td>Metabolic syndrome</td>
<td>23.69% (18.79–28.58)</td>
<td>21.80% (19.04–24.56)</td>
<td>22.90% (20.28–25.53)</td>
</tr>
</tbody>
</table>

*Source:* Beltran, et al., 2013

### 1.5 THE HISPANIC POPULATION IN THE U.S.

The Hispanic population is the largest and fastest growing minority group in the U.S. As of 2014, Hispanics represent 17.37% of the U.S. population, or 55.3 million people (Census, 2015). Among Hispanic subgroups, in 2012, Mexicans ranked as the largest at 64%. In Texas as of July, 2014, the estimated population for those of Hispanic origin was 10.4 million. (Census, 2015).

Additionally, these numbers do not reflect the total of Hispanics in the country as they cannot account for an estimated 6.8 million unauthorized immigrants who live in the U.S., as estimated by a report from the Office of Immigration Statistics (Hoefer, Rytina, & Baker, 2011). The same report also states that, after California, Texas is the leading state with 1.8 million of unauthorized residents. (Hoefer et al., 2011).
According to a report by the Pew Research Center tabulations of the 2013 American Community Survey (ACS), one-third of Hispanics of Mexican origin living in the U.S. were born outside the country, compared with 35% of U.S. Hispanics and 13% of the overall U.S. population (Brown & Patten, 2013). Brown and collaborators (2013) also state that Hispanics of Mexican origin have lower levels of formal education compared to U.S. Hispanics and to the overall U.S. population. Around 10% of Hispanics of Mexican origin ages 25 and older have earned a bachelor’s degree, compared to 14% of all U.S. Hispanics and 30% among the overall U.S. population.

The median annual earnings for Hispanics of Mexican origin ages 16 and older was $20,800 in the year prior to the 2013 report by the Pew Research Center, slightly lower than an estimated income for U.S. Hispanics ($21,900) and lower than the average income received by the U.S. population ($30,000). The percentage of Hispanics of Mexican origin who live in poverty is 26%, similar to the rate for U.S. Hispanics (25%) and higher than what is reported for the overall U.S. population (16%). About 31% of Mexicans do not have health insurance, compared with 29% of all Hispanics and 15% of the general U.S. population (Brown & Patten, 2013).

In the U.S. access to health care is related to insurance coverage, type of insurance, and whether a person has access to a regular source of healthcare. Hispanics have a lower rate in terms of access to healthcare, a situation that might explain disparities in preventive services (Mayberry, Mili, & Ofili, 2000). As a result, according to the 2014 Behavioral Risk Factor Surveillance Survey (BRFSS), Hispanic adults were less likely than non-Hispanic adults to receive screenings for blood cholesterol and cancer. The efforts by Hispanics in obtaining health insurance and access to health care services has been affected by socioeconomic status, educational barriers, cultural practices, beliefs and the administrative complexity of health plans (Martinez, Ward, & Adams, 2015).
1.6 METABOLIC SYNDROME IN HISPANICS

A recent study by Heiss and collaborators (2014) reported the prevalence of MetS among Hispanics of diverse backgrounds. By sampling households in four different U.S. cities it was reported a MetS prevalence of 35% (33.7% in men and 36% in women). More than one third of the study participants were from Mexican origin and the same prevalence of MetS was reported for this subgroup (Heiss et al., 2014).

Also, current data supports that Hispanics have a disproportionate number of cardiovascular risk factors such as, obesity and diabetes when compared with non-Hispanic white population (Daviglus et al., 2012; Garcia et al., 2012).

1.7 EL PASO POPULATION

As of July 2013 the population of El Paso, Texas, located in the U.S.-Mexico border, was 674,433 making it the 19th most populous in the U.S., with a Hispanic population of 81.1% (McFall & Smith, 2015).

Border health issues in El Paso are related to social determinants of health, such as poverty. From 2007-2011, it was estimated that 23.3% of all El Paso residents were living below the poverty line. In all El Paso households, around 20.1% of its residents lived below the poverty line (Census, 2015).

Health issues of high prevalence in El Paso and its border region include diabetes, cardiovascular disease, high blood pressure, and obesity. According to the most recent Community Health Assessment and Improvement Plan reported by the City of El Paso’s Department of Public Health, in 2010, 12% of El Paso County residents reported being told by a physician they had diabetes (Mora, 2013). This assessment also reports that in El Paso County 9.9% men and 7.1%
women have been diagnosed with diabetes. With regards to obesity, the proportion of adult males and females who are classified as obese was 25.9% and 21.7% respectively (Mora, 2013). Also, it has been reported that a higher percentage of El Paso County adults with high blood pressure are not taking medication for this disorder compared to Texas and U.S. residents. Lastly, the prevalence of heart disease in El Paso County was 3.5% for all adults and in 2007 and nearly 42% of El Paso County adults reported not having a cholesterol check in five or more years (Mora, 2013).

The high number of Hispanics living in the city of El Paso might explain the current trends for chronic diseases like CVD and diabetes, since as previously discussed, those conditions are prevalent among Hispanics. The percentage of El Paso County residents who have diabetes increased steadily in the last 5 years. In 2010, the reported percentage of diabetes cases for the city of El Paso was 12.2%; this rate was higher than the 9.7% rate for the state of Texas and the 8.7% rate for the whole country. A more recent survey from 2012 shows that 14.1% of El Paso residents reported having diabetes, which is still higher than the prevalence in the state of Texas (10.6%) (McFall & Smith, 2015).

1.8 ACCESS TO HEALTHCARE

There is an important need for more preventive care services to avoid mayor health cost related to chronic diseases, and to prevent this, it is necessary to identify the most influential factors and behaviors among vulnerable Hispanic populations (Control & Prevention, 2009). Despite efforts to improve access to health care services with the Affordable Care Act, a disparity still persist between Mexican Americans and non-Hispanic Whites (Control & Prevention, 2009). On average Hispanics receive primary care attention half as often as non-Hispanic whites and two-thirds as often as African Americans (Control & Prevention, 2009). About 36% of Hispanics of
Mexican origin living in the U.S. have no medical insurance compared to 16% of non-Hispanic whites and they are more likely to live in poverty and are less likely to receive or afford employer-provided health insurance when compared to non-Hispanic Whites (Vistnes & Monheit, 2011). It has been documented that Hispanics of Mexican origin living on the border region have a high prevalence of uncontrolled diabetes and hypertension, this is why efforts have been made to educate this population (de Heer et al., 2015).

1.9 HEALTHY PEOPLE 2020 OBJECTIVES

Healthy People 2020 outlines several objectives that are addressed in this research. As mentioned, MetS is a risk factor for CVD and under the Heart Disease and Stroke (HDS) topics there are several related objectives. HDS-1 is to increase the overall CVD health among the U.S. population. HSD-2 is to reduce coronary heart disease deaths. HSD-3 is to reduce stroke death. HSD-4 is to increase the proportion of adults who have had their blood pressure measured within the preceding 2 years and can state whether their blood pressure was normal or high. HSD-6 is to increase the proportion of adults who have had their blood cholesterol checked within the preceding 5 years.

Another topic that is outlined in Healthy People 2020 is Nutrition and Weight Status. NSW-8 is to increase the proportion of adults who are at a healthy weight. NWS-9 is to reduce the proportion of adults who are obese. Lastly, under the topic of Social Determinants of Health, AHS-1 is to increase the proportion of persons with health insurance (Office of Disease Prevention and Health Promotion, 2016).
CHAPTER 2. OBJECTIVES AND SPECIFIC AIMS

The overall goal of the study was to determine the prevalence of risk factors associated with MetS among uninsured Hispanic adult residents from low income communities in El Paso, Texas.

RESEARCH QUESTION 1

What is the overall prevalence of individual risk factors for MetS among Hispanic females and males who are uninsured and live in low income communities in El Paso, Texas?

SPECIFIC-AIM 1.1

Determine the prevalence of individual risk factors for MetS, including having a large waistline, high blood pressure, high triglycerides, low HDL-cholesterol, and high fasting blood glucose among the target population.

SPECIFIC-AIM 1.2

Determine whether there is any differences by sex in individual risk factors (large waistline, high blood pressure, high triglycerides, low HDL-cholesterol, and high fasting blood glucose) among the target population.

RESEARCH QUESTION 2

What are the socio-demographic characteristics among uninsured Hispanic household adult residents from low income communities in El Paso, Texas who have MetS (3 or more risk factors)?

SPECIFIC-AIM 2.1

Determine the prevalence of MetS by sex, age group, education level, marital status, occupation, income level, and perceived health among the target population.
SPECIFIC-AIM 2.2

Determine the odds ratio for individual risk factors for MetS by sex, age group, education level, marital status, occupation, income level, and perceived health among the target population.

HYPOTHESIS

Uninsured adult Hispanics adults from low income communities in El Paso are at a significantly higher risk for having MetS when compared to the general Hispanic population in the U.S.
CHAPTER 3. METHODS AND MATERIALS

3.1 STUDY DESIGN

This research is a cross sectional study in which participants were recruited through a convenience sample of uninsured participants living in El Paso, Texas from low income communities. This study is part of a large scale epidemiological study entitled “Evidence Based Screening for Cardiorespiratory Health Outcomes in Low Income Communities from El Paso”, funded by the City of El Paso Department of Public Health. The purpose of the study was to determine the prevalence of the individual risk factors for MetS and describe the socio-demographic characteristics of participants. The data used for the current study was obtained during the first year of the larger study. Participants included in this study were adults (older than 18 years), from Hispanic origin, and living in an El Paso low income community. The larger study protocol and the amendment for conducting this study have been approved by the Institutional Review Board under the project number 590300-4.

3.2 STUDY SITE

The U.S.-Mexico border region is 2,000 miles long and is defined as the area that extends 100 kilometers north and south of the international border line (La Paz Agreement, 1984). Bordering with Cd. Juarez, Mexico, the City of El Paso lies in the U.S.-Mexico border region. According to the U.S Census, in 2010 there was an estimated 649,121 residents in the city of El Paso, TX. (Census, 2015). Of the total population 52% were women and 80.7% classified themselves as Hispanic or Latino (Census, 2015). According to the U.S. Census Bureau’s Small Area Health Insurance Estimates (SAHIE) program the percentage of adults aged 18-64 years that have any type of health insurance coverage is 61.1% which is lower than the State of Texas average at 78.9% and the National average 86.6% (U.S. Census Bureau, 2014).
3.3 STUDY PARTICIPANTS

The selected subset of participants from the larger study includes 657 Hispanic adults living in a low income community from The Housing Authority for the City of El Paso (HACEP). HACEP offers a variety of programs that provide safe, decent, and affordable housing. There is a great demand for housing assistance in El Paso. In order to qualify for housing, residents must earn less than 80 percent of the area median income, which is about $39,000 per year for a family of four ("Housing Authority of the City of El Paso," 2016).

A total of 36 approved housing authority sites were selected for recruitment of study participants (Figure 2). All participants provided written consent before data collection began. The informed consent form was administered to the participants in their preferred language, Spanish or English.

Figure 2. Housing Authority Recruitment Rites.
3.4 DATA COLLECTION

The data were collected by a trained team of health professionals supervised by faculty. HACEP sites were visited by the study team which collected the data from the participants in their homes, housing main office, or other convenient location chosen by them. The study team conducted face-to-face interviews to collect information on the participants’ socio-demographic characteristics. Biometric and biochemical assessments of health status were measured on site. The data were collected at one point in time only for each participant between 8:00AM and 11:00AM; participants were asked to be fasting when recruited to participate in the study.

3.5 INFORMED CONSENT PROCESS

The study objectives, requirements, and potential risks and benefits were explained in detail to prospective participants. Those who indicated willingness to participate reviewed the informed consent form and accepted to participate by signing it. Only after obtaining the approval from the participant data collection began.

3.6 SOCIO-DEMOGRAPHIC INDICATORS

Socio-demographic characteristics of participants were collected during face-to-face interviews using a questionnaire. Socio-demographic information collected included participant’s age, address, household income, education level, occupation, marital status, perceived health status. The questionnaire was available in both Spanish and English versions. The estimated time to complete the questionnaire was 10 minutes.
3.7 BIOMETRIC INDICATORS

Waist circumference was measured and classified according to NIH guidelines. A waist line ≥ 35 in (88 cm) for women and 40 in (102 cm) for men was used as the cutoff point for waist abdominal-obesity (NIH, 2016).

Blood pressure measurements were collected using a calibrated Omron HEM907XL digital blood pressure monitor from the right arm of seated participants. Participants were seated quietly for 5 minutes in a chair; their feet on the floor and their arms supported at the heart level. This procedure followed the Seventh Report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure recommendations of blood pressure measurement. Two readings were taken and the average was recorded for systolic and diastolic blood pressure (Flegal et al., 2012).

3.8 BLOOD SAMPLE COLLECTION

The Cholestec-LDX system (Alere™), was used to determine levels of triglycerides, HDL-cholesterol, and blood glucose from capillary blood. This was obtained via fingerstick, performed by a trained health professional, following the recommendations stated in their user manual. (Cholestech, 2002)

3.9 DATA ANALYSIS

The statistical analysis plan followed recommendations suggested by statisticians from the UTEP Statistical Consulting Lab. Descriptive statistics were conducted to include sample size (n), mean, standard deviation (SD), frequency, and percentage (all where applicable). The continuous variables in this study included age, waist circumference (WC), systolic blood pressure (SBP), diastolic blood pressure (DBP), triglycerides (TG), HDL-C, and fasting blood glucose (FBG). For
further statistical analysis, WC, SBP, DBP, TG, HDL-C and FBG were coded as binary variables (Yes and No) to determine whether a participant had or not a risk factor for MetS. The recoded variables followed the diagnostic criteria defined by the NIH and they were: High Waist (Female > 88 cm, Male > 102 cm), High Blood Pressure (> 130/85 mmHg), High Triglycerides (> 150 mg/dL), Low HDL-C (Female < 50 mg/dL, Male < 40 mg/dL), and High Glucose (> 100 mg/dL) (NIH, 2016). The categorical variable “Metabolic Syndrome” was constructed by computing the presence of 3 or more of the previously mentioned risk factors. Categorical socio-demographic variables included sex, age group, education level, marital status, occupation, income level, and perceived health.

Differences between females and male were assessed using a two-tailed t-test. Prevalence rates of risk factors for MetS according to sex were compared by conducting a chi-square test. Logistic regression analyses were used to determine the odds ratio (OR) for each risk factor and for MetS itself through a model that included each of the aforementioned socio-demographic characteristics. Logistic regression was chosen as the statistical test for this research since it has the ability to test categorical and continuous variables for specified outcome (presence or absence of metabolic syndrome) based on several types of predictor variables (age, sex, education, occupation, marital status, income, and perceived health status). Logistic regression determined the p-value and correlation between MetS and each variable via OR. The level of statistical significance was set at p value of < 0.05 for all tests. SPSS version 22.0 was used to conduct the statistical analysis portion of the study.
CHAPTER 4. RESULTS

4.1 DESCRIPTIVE CHARACTERISTICS OF PARTICIPANTS

A total of 657 participants met the inclusion criteria of being uninsured Hispanic adults (18 years or older) that were living in an El Paso low income community and were included in the statistical analysis. The statistical analyses to assess the prevalence of risk factors for MetS was based on the number of participants who had answered at least part of the questionnaire.

Table 3 depicts the average age of the total number of participants and the proportion of male and female participants by age, for further analysis stratification by age was later used in 10 year intervals. The mean age of participants was 47±13 years, and the large majority of participants were females (83.9%). When stratified by age groups, more than half of participants fall within the 30-39 years (28%) and 40-49 years (28%) intervals.

### Table 3. Proportion of female and male participants by age range, n (%)

<table>
<thead>
<tr>
<th>Age Groups</th>
<th>Overall 657 (100)</th>
<th>Male 106 (16.13)</th>
<th>Female 551 (83.87)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age, years, x̄±SD</td>
<td>47.62 (13.48)</td>
<td>46.55 (16.52)</td>
<td>47.82 (12.62)</td>
</tr>
<tr>
<td>18-29 years</td>
<td>62 (9.4)</td>
<td>20 (18.9)</td>
<td>42 (7.6)</td>
</tr>
<tr>
<td>30-39 years</td>
<td>111 (16.9)</td>
<td>16 (15.1)</td>
<td>95 (17.2)</td>
</tr>
<tr>
<td>40-49 years</td>
<td>184 (28.0)</td>
<td>23 (21.7)</td>
<td>161 (29.2)</td>
</tr>
<tr>
<td>50-59 years</td>
<td>184 (28.0)</td>
<td>26 (24.5)</td>
<td>158 (28.7)</td>
</tr>
<tr>
<td>&gt; 60 years</td>
<td>116 (17.7)</td>
<td>21 (19.8)</td>
<td>95 (17.2)</td>
</tr>
</tbody>
</table>

Table 4 shows the educational level of the participants with almost half of the participants lacking a High school education (48.8%); also, only around one out of six participants attended college (16.3%).
Table 4. Educational level by gender of the participants, n (%)

<table>
<thead>
<tr>
<th>Education</th>
<th>Overall N = 647</th>
<th>Male n = 105</th>
<th>Female n = 542</th>
</tr>
</thead>
<tbody>
<tr>
<td>Never attended or kindergarten only</td>
<td>17 (2.6)</td>
<td>5 (4.7)</td>
<td>12 (2.2)</td>
</tr>
<tr>
<td>Elementary (1-5)</td>
<td>141 (21.5)</td>
<td>19 (17.9)</td>
<td>122 (22.1)</td>
</tr>
<tr>
<td>Middle (6-8)</td>
<td>162 (24.7)</td>
<td>17 (16)</td>
<td>145 (26.3)</td>
</tr>
<tr>
<td>High school (9-12) not graduated</td>
<td>128 (19.5)</td>
<td>26 (24.5)</td>
<td>102 (18.5)</td>
</tr>
<tr>
<td>High school Graduate</td>
<td>89 (13.5)</td>
<td>12 (11.3)</td>
<td>77 (14.0)</td>
</tr>
<tr>
<td>Some college, no degree</td>
<td>54 (8.2)</td>
<td>15 (14.2)</td>
<td>39 (7.1)</td>
</tr>
<tr>
<td>Associate Degree</td>
<td>29 (4.4)</td>
<td>5 (4.7)</td>
<td>24 (4.4)</td>
</tr>
<tr>
<td>Bachelor's Degree</td>
<td>23 (3.5)</td>
<td>7 (6.6)</td>
<td>16 (2.9)</td>
</tr>
<tr>
<td>Masters, Doctoral, or Pro</td>
<td>1 (0.2)</td>
<td>0 (0)</td>
<td>1 (0.2)</td>
</tr>
</tbody>
</table>

Table 5 shows the occupational status of the participants with more than half of male participants reported being employed (59.4%) whereas only about one third of the female participants had some form of employment (35.8%). Also, more than one third of the women reported being homemakers (38.7%).

Table 5. Occupational status by gender of the participants, n (%)

<table>
<thead>
<tr>
<th>Occupation</th>
<th>Overall N = 647</th>
<th>Male n = 105</th>
<th>Female n = 542</th>
</tr>
</thead>
<tbody>
<tr>
<td>Employed-Part Time</td>
<td>146 (22.2)</td>
<td>25 (23.6)</td>
<td>121 (22.0)</td>
</tr>
<tr>
<td>Employed-Full Time</td>
<td>86 (13.1)</td>
<td>30 (28.3)</td>
<td>56 (10.2)</td>
</tr>
<tr>
<td>Self-Employed</td>
<td>28 (4.3)</td>
<td>8 (7.5)</td>
<td>20 (3.6)</td>
</tr>
<tr>
<td>Unemployed &gt;1 year</td>
<td>54 (8.2)</td>
<td>11 (10.4)</td>
<td>43 (7.8)</td>
</tr>
<tr>
<td>Unemployed &lt;1 year</td>
<td>52 (7.9)</td>
<td>11 (10.4)</td>
<td>41 (7.4)</td>
</tr>
<tr>
<td>Homemaker</td>
<td>215 (32.7)</td>
<td>2 (1.9)</td>
<td>213 (38.7)</td>
</tr>
<tr>
<td>Student</td>
<td>25 (3.8)</td>
<td>4 (3.8)</td>
<td>21 (3.8)</td>
</tr>
<tr>
<td>Retired</td>
<td>22 (3.3)</td>
<td>6 (5.7)</td>
<td>16 (2.9)</td>
</tr>
<tr>
<td>Unable to work</td>
<td>19 (2.9)</td>
<td>8 (7.5)</td>
<td>11 (2.0)</td>
</tr>
</tbody>
</table>

Table 6 shows the income level of the participants, the vast majority (86.8%) reported an income below $20,000 a year. Only very few participants (2%) indicate an income above $30,000 a year.
Table 6. Income level by gender of the participants, n (%)

<table>
<thead>
<tr>
<th>Income</th>
<th>Overall N = 626</th>
<th>Male n = 104</th>
<th>Female n = 522</th>
</tr>
</thead>
<tbody>
<tr>
<td>$0-$19,999</td>
<td>570 (86.8)</td>
<td>92 (88.1)</td>
<td>478 (86.8)</td>
</tr>
<tr>
<td>$20,000-$29,999</td>
<td>43 (6.5)</td>
<td>9 (7.3)</td>
<td>34 (6.2)</td>
</tr>
<tr>
<td>$30,000-$39,999</td>
<td>8 (1.2)</td>
<td>1 (0.9)</td>
<td>7 (1.3)</td>
</tr>
<tr>
<td>$40,000-$49,999</td>
<td>2 (0.3)</td>
<td>1 (0.9)</td>
<td>1 (0.2)</td>
</tr>
<tr>
<td>$50,000-$69,999</td>
<td>2 (0.3)</td>
<td>1 (0.9)</td>
<td>1 (0.2)</td>
</tr>
<tr>
<td>$70,000-$99,999</td>
<td>1 (0.2)</td>
<td>0 (0)</td>
<td>1 (0.2)</td>
</tr>
</tbody>
</table>

According to Table 7 more than half (54.7%) male and about one third (31.4%) of female participants reporting being married and less than on fourth male (21.7%) and female (20%) participants reported that they have never been married.

Table 7. Marital status by sex of the participants, n (%)

<table>
<thead>
<tr>
<th>Marital Status</th>
<th>Overall N = 651</th>
<th>Male n = 105</th>
<th>Female n = 546</th>
</tr>
</thead>
<tbody>
<tr>
<td>Married</td>
<td>231 (35.20)</td>
<td>58 (54.7)</td>
<td>173 (31.4)</td>
</tr>
<tr>
<td>Divorced</td>
<td>88 (13.4)</td>
<td>8 (7.5)</td>
<td>80 (14.5)</td>
</tr>
<tr>
<td>Widowed</td>
<td>50 (7.6)</td>
<td>2 (1.9)</td>
<td>48 (8.7)</td>
</tr>
<tr>
<td>Separated</td>
<td>108 (16.4)</td>
<td>2 (1.9)</td>
<td>106 (19.2)</td>
</tr>
<tr>
<td>Never Married</td>
<td>133 (20.2)</td>
<td>23 (21.7)</td>
<td>110 (20.0)</td>
</tr>
<tr>
<td>Civil Union</td>
<td>13 (2.0)</td>
<td>4 (3.8)</td>
<td>9 (1.6)</td>
</tr>
<tr>
<td>Unmarried couple</td>
<td>28 (4.3)</td>
<td>8 (7.5)</td>
<td>20 (3.6)</td>
</tr>
</tbody>
</table>

Table 8 shows the perceived health status of participants indicating that the majority of participants perceived health status as either good (39.1%) or fair (35.5%).
Table 8. Marital status by sex of the participants, n (%)

<table>
<thead>
<tr>
<th>Perceived Health</th>
<th>Overall N = 648</th>
<th>Male n = 103</th>
<th>Female n = 545</th>
</tr>
</thead>
<tbody>
<tr>
<td>Excellent</td>
<td>26 (4.0)</td>
<td>2 (1.8)</td>
<td>24 (4.4)</td>
</tr>
<tr>
<td>Very Good</td>
<td>50 (7.6)</td>
<td>14 (12.8)</td>
<td>36 (6.5)</td>
</tr>
<tr>
<td>Good</td>
<td>257 (39.1)</td>
<td>38 (37.6)</td>
<td>219 (39.7)</td>
</tr>
<tr>
<td>Fair</td>
<td>233 (35.5)</td>
<td>39 (36.7)</td>
<td>194 (35.2)</td>
</tr>
<tr>
<td>Poor</td>
<td>82 (12.5)</td>
<td>10 (9.2)</td>
<td>72 (13.1)</td>
</tr>
</tbody>
</table>

4.2 SPECIFIC AIM 1.1

Specific aim 1 was to determine the prevalence of individual risk factors for MetS including a large waistline, high blood pressure, high triglycerides, low HDL-cholesterol, and high fasting blood glucose by sex. A univariate analysis was conducted to obtain the mean average of waist circumference, systolic and diastolic blood pressure, triglyceride levels, HDL-cholesterol levels, and fasting blood glucose. Once measured, the prevalence of each risk factor was calculated overall and for each group.

4.2.1 WAIST CIRCUMFERENCE

The mean waist circumference among all adult participants who consented to participate in the study was 95.25±14.73 cm. The mean waist circumference for males was 94.32±14.53 cm and 99.83±14.97 cm for female participants. Figure 3 provides a visual representation of the waist circumference distribution among males and females.
Figure 3. Waist circumference distribution of participants by sex.

4.2.2 BLOOD PRESSURE

The mean systolic blood pressure among all adult participants had a reading level of 126±18 mm Hg. Among males, the mean systolic blood pressure was 132±18 mm Hg and among females, the mean systolic blood pressure was 125±18 mm. The mean diastolic blood pressure among participants was 75±11 mm Hg, 79±12 mm Hg among males and 75±11 mm Hg among females. Figures 4 and 5 represent the differences in systolic and diastolic blood pressure among male and female participants.
Figure 4. Systolic blood pressure distribution of participants by sex.

Figure 5. Diastolic blood pressure distribution of participants by sex.
4.2.3 TRIGLYCERIDE LEVELS

The mean triglyceride levels obtained among participants in the study was 185±113 mg/dL. The average was 205±133 mg/dL among males and 182±109 mg/dL among females. Figure 6 shows a graph of the distribution among males and females.

Figure 6. Triglyceride level distribution of participants by sex.
4.2.4 HDL-CHOLESTEROL

The average level of HDL-cholesterol among all participants in the study was $49 \pm 14$ mg/dL. Male participants had an average level of $41 \pm 17$ mg/dL while the average was $50 \pm 13$ mg/dL among female participants. The distribution between males and females are shown in Figure 7.

![Figure 7. HDL-cholesterol distribution of participants by sex.](image-url)
4.2.4 FASTING BLOOD GLUCOSE

A level of 110±47 mg/dL was the mean value of fasting blood glucose among all participants. The average fasting glucose values among male participants was 118±61 mg/dL and 108±44 mg/dL among female participants. This result is reflected in Figure 8 and depicts the distribution among male and female participants.

Figure 8. Fasting glucose level distribution of participants by sex
4.3 SPECIFIC AIM 1.2

In order to determine whether a difference by sex exist in reference to large waistline, high blood pressure, high triglycerides, low HDL-cholesterol, and high fasting blood glucose among the target population. The statistical analyses conducted are summarized in Table 9. Significant difference between male and female result variables were calculated by conducting a two tailed t test for each of the risk factors. A statistically significant difference by sex (p=0.001) was found for waist circumference. This was also true for both, systolic and diastolic blood pressure (p=0.003 and p=0.004), and for HDL-cholesterol levels (p<0.001).

Table 9. Average risk factor values overall and by gender among the participants

<table>
<thead>
<tr>
<th>Risk Factor Values</th>
<th>Overall N</th>
<th>Overall x(±SD)</th>
<th>Female N</th>
<th>Female x(±SD)</th>
<th>Male N</th>
<th>Male x(±SD)</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Waist Circumference, cm</td>
<td>622</td>
<td>95.25 (14.73)</td>
<td>521</td>
<td>94.32 (14.53)</td>
<td>101</td>
<td>99.83 (14.97)</td>
<td>.001*</td>
</tr>
<tr>
<td>Systolic Blood Pressure, mm Hg</td>
<td>619</td>
<td>125.91 (20.37)</td>
<td>517</td>
<td>124.85 (20.62)</td>
<td>102</td>
<td>131.17 (18.22)</td>
<td>.003*</td>
</tr>
<tr>
<td>Diastolic Blood Pressure, mm Hg</td>
<td>619</td>
<td>75.23 (11.00)</td>
<td>517</td>
<td>74.58 (10.59)</td>
<td>102</td>
<td>78.60 (12.39)</td>
<td>.004*</td>
</tr>
<tr>
<td>Triglycerides, mg/dL</td>
<td>642</td>
<td>185.29 (113.44)</td>
<td>542</td>
<td>181.91 (109.22)</td>
<td>100</td>
<td>204.71 (133.78)</td>
<td>.114</td>
</tr>
<tr>
<td>HDL-Cholesterol, mg/dL</td>
<td>633</td>
<td>48.90 (14.35)</td>
<td>534</td>
<td>50.39 (13.30)</td>
<td>99</td>
<td>40.74 (16.90)</td>
<td>&lt;.001*</td>
</tr>
<tr>
<td>Fasting Blood Glucose, mg/dL</td>
<td>642</td>
<td>109.62 (46.91)</td>
<td>542</td>
<td>108.11 (43.69)</td>
<td>100</td>
<td>118.23 (61.37)</td>
<td>.127</td>
</tr>
</tbody>
</table>

*Significance level at p<0.05
Individual risk factors for MetS were determined for each participant in the study. When 3 or more risk factors were consistent with the criteria established by NIH for MetS, the participant was categorized as having the syndrome. Table 10 depicts the overall prevalence of MetS as well as individual risk factors. Also, the prevalence of both, MetS and individual risk factors was reported for female and male participants. Having a large waistline and high blood pressure were significantly different between males and females (p<0.001 and p=0.027 respectively).

Table 10. Percentage of risk factor prevalence overall and by gender among the participants

<table>
<thead>
<tr>
<th>Presence of risk factor</th>
<th>OVERALL</th>
<th>FEMALE</th>
<th>MALE</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N</td>
<td>% (95% CI)</td>
<td>n</td>
<td>% (95% CI)</td>
</tr>
<tr>
<td>Large Waistline (F&gt;88 M&gt;102)</td>
<td>624</td>
<td>63.78 (60.00-67.56)</td>
<td>522</td>
<td>67.81 (63.80-71.84)</td>
</tr>
<tr>
<td>High BP (&gt; 130/85)</td>
<td>621</td>
<td>39.77 (35.91-43.63)</td>
<td>518</td>
<td>37.83 (33.65-42.03)</td>
</tr>
<tr>
<td>High Triglycerides (&gt; 150)</td>
<td>644</td>
<td>55.43 (51.59-59.28)</td>
<td>543</td>
<td>54.69 (50.50-58.90)</td>
</tr>
<tr>
<td>Low HDL (F&lt;50 M&lt;40)</td>
<td>635</td>
<td>55.11 (51.24-59.00)</td>
<td>535</td>
<td>54.39 (50.16-58.63)</td>
</tr>
<tr>
<td>High Glucose (&gt; 100)</td>
<td>644</td>
<td>40.00 (36.27-43.68)</td>
<td>543</td>
<td>39.41 (35.29-43.53)</td>
</tr>
<tr>
<td>Metabolic Syndrome (3 or more risk factors)</td>
<td>590</td>
<td>53.39 (49.35-57.43)</td>
<td>494</td>
<td>54.85 (50.45-59.26)</td>
</tr>
</tbody>
</table>

*Significance level at p<0.05
4.4 SPECIFIC AIM 2.1

Specific aim 2.1 described the prevalence of the risk factors for MetS by sex, age group, marital status, income, education and perceived health among the target population. Socioeconomic variables were stratified into binary variables, the following table (Table 11) shows the categories that were used for each. Frequencies were determined overall and by sex for each category.

Table 11. Socio demographic characteristics of the participants

<table>
<thead>
<tr>
<th>Variable</th>
<th>Overall N (%)</th>
<th>Male n (%)</th>
<th>Female n (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Education level</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>High School and above</td>
<td>324 (49.3)</td>
<td>65 (61.3)</td>
<td>259 (47.0)</td>
</tr>
<tr>
<td>Middle School or less</td>
<td>320 (48.7)</td>
<td>41 (38.7)</td>
<td>279 (50.6)</td>
</tr>
<tr>
<td><strong>Occupation Status</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Employed</td>
<td>260 (39.6)</td>
<td>63 (59.4)</td>
<td>197 (36.3)</td>
</tr>
<tr>
<td>Not Employed</td>
<td>387 (58.9)</td>
<td>42 (39.6)</td>
<td>345 (63.7)</td>
</tr>
<tr>
<td><strong>Marital status</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Divorced-Separated-Single</td>
<td>329 (50.1)</td>
<td>33 (31.1)</td>
<td>296 (53.7)</td>
</tr>
<tr>
<td>Married-Widowed-Couple-Union</td>
<td>322 (49.0)</td>
<td>72 (67.9)</td>
<td>250 (45.4)</td>
</tr>
<tr>
<td><strong>Yearly Income</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$20,000 or more</td>
<td>56 (8.5)</td>
<td>12 (11.3)</td>
<td>44 (8.0)</td>
</tr>
<tr>
<td>$0-$19,999</td>
<td>570 (86.8)</td>
<td>92 (86.8)</td>
<td>478 (86.8)</td>
</tr>
<tr>
<td><strong>Perceived Health Status</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Good, great or excellent</td>
<td>333 (50.7)</td>
<td>50.9 (52.4)</td>
<td>279 (50.6)</td>
</tr>
<tr>
<td>Fair or Poor</td>
<td>315 (47.9)</td>
<td>46.2 (47.6)</td>
<td>266 (48.3)</td>
</tr>
</tbody>
</table>
In order to obtain the prevalence of individual risk factor for MetS, the frequencies for socioeconomic variables was calculated to obtain the number and percentage for each participant, this is shown in Table 12. Also, the last column represents the frequencies for those participants that were categorized with MetS (with 3 out of the 5 risk factors).

Table 12. Frequencies by socio demographic characteristic for each risk factor and MetS.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Large Waistline</th>
<th>High Blood Pressure</th>
<th>High Triglycerides</th>
<th>Low HDL-Cholesterol</th>
<th>High Fasting Glucose</th>
<th>Metabolic Syndrome</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age group</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18-29 years</td>
<td>25 (6.3)</td>
<td>12 (4.9)</td>
<td>20 (5.6)</td>
<td>32 (9.1)</td>
<td>15 (5.8)</td>
<td>13 (4.1)</td>
</tr>
<tr>
<td>30-39 years</td>
<td>54 (13.5)</td>
<td>20 (8.1)</td>
<td>48 (13.4)</td>
<td>65 (18.6)</td>
<td>26 (10.1)</td>
<td>29 (9.2)</td>
</tr>
<tr>
<td>40-49 years</td>
<td>121 (30.3)</td>
<td>60 (24.3)</td>
<td>96 (26.9)</td>
<td>105 (30)</td>
<td>65 (25.2)</td>
<td>89 (28.3)</td>
</tr>
<tr>
<td>50-59 years</td>
<td>124 (31.1)</td>
<td>85 (34.4)</td>
<td>121 (33.9)</td>
<td>94 (26.9)</td>
<td>93 (36)</td>
<td>112 (35.6)</td>
</tr>
<tr>
<td>&gt; 60 years</td>
<td>75 (18.8)</td>
<td>70 (28.3)</td>
<td>72 (20.2)</td>
<td>54 (15.4)</td>
<td>59 (22.9)</td>
<td>72 (22.9)</td>
</tr>
<tr>
<td>Sex</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>44 (11)</td>
<td>51 (20.6)</td>
<td>60 (16.8)</td>
<td>59 (16.9)</td>
<td>44 (17.1)</td>
<td>44 (14)</td>
</tr>
<tr>
<td>Female</td>
<td>355 (89)</td>
<td>196 (79.4)</td>
<td>297 (83.2)</td>
<td>291 (83.1)</td>
<td>214 (82.9)</td>
<td>271 (86)</td>
</tr>
<tr>
<td>Education level</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>High School and above</td>
<td>174 (44.6)</td>
<td>105 (43.6)</td>
<td>168 (47.9)</td>
<td>175 (51.3)</td>
<td>116 (46)</td>
<td>137 (44.5)</td>
</tr>
<tr>
<td>Middle School or less</td>
<td>216 (55.4)</td>
<td>136 (56.4)</td>
<td>183 (52.1)</td>
<td>166 (48.7)</td>
<td>136 (54)</td>
<td>171 (55.5)</td>
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<tr>
<td>Occupation Status</td>
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<tr>
<td>Employed</td>
<td>142 (36.4)</td>
<td>84 (34.4)</td>
<td>148 (42.2)</td>
<td>136 (39.8)</td>
<td>102 (39.8)</td>
<td>112 (36.4)</td>
</tr>
<tr>
<td>Not Employed</td>
<td>248 (63.6)</td>
<td>160 (65.6)</td>
<td>203 (57.8)</td>
<td>206 (60.2)</td>
<td>154 (60.2)</td>
<td>196 (63.6)</td>
</tr>
<tr>
<td>Marital status</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Single</td>
<td>203 (51.1)</td>
<td>121 (49.6)</td>
<td>178 (50.1)</td>
<td>178 (51)</td>
<td>121 (47.3)</td>
<td>155 (49.5)</td>
</tr>
<tr>
<td>Married-Widowed-</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Couple-Union</td>
<td>194 (48.9)</td>
<td>123 (50.4)</td>
<td>177 (49.9)</td>
<td>171 (49)</td>
<td>135 (52.7)</td>
<td>158 (50.5)</td>
</tr>
<tr>
<td>Yearly Income</td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$20,000 or more</td>
<td>33 (8.7)</td>
<td>22 (9.2)</td>
<td>32 (9.4)</td>
<td>34 (10.4)</td>
<td>23 (9.3)</td>
<td>30 (10.1)</td>
</tr>
<tr>
<td>$0-$19,999</td>
<td>347 (91.3)</td>
<td>217 (90.8)</td>
<td>309 (90.6)</td>
<td>292 (89.6)</td>
<td>224 (90.7)</td>
<td>267 (89.9)</td>
</tr>
<tr>
<td>Perceived Health Status</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Good, great or excellent</td>
<td>180 (45.7)</td>
<td>104 (42.4)</td>
<td>167 (47.3)</td>
<td>168 (48.7)</td>
<td>104 (40.9)</td>
<td>130 (41.8)</td>
</tr>
<tr>
<td>Fair or Poor</td>
<td>214 (54.3)</td>
<td>141 (57.6)</td>
<td>186 (52.7)</td>
<td>177 (51.3)</td>
<td>150 (59.1)</td>
<td>181 (58.2)</td>
</tr>
</tbody>
</table>
Most participants with risk factors for MetS were in the 50-59 years and the older than 60 years age groups. There seems not to be much difference regarding educational level or marital status, around two thirds of the participants with MetS are not employed. The majority of the participants reporting having a yearly income below $20,000. There was not a difference between any of the groups with respect to perceived health status.

4.5 SPECIFIC AIM 2.2

This specific aim seeks to determine the odds ratio for each individual risk factor and for MetS in relation to sex, age group, marital status, income, occupation and perceived health among the study’s participants. In order to do so, logistic regression modeling was used for MetS and each of the individual risk factors. These findings are summarized in Table 13.
Table 13. Odds ratio (OR) of risk factors for MetS by socio-demographic and perceived health status

<table>
<thead>
<tr>
<th></th>
<th>Large Waistline</th>
<th>High Blood Pressure</th>
<th>High Triglycerides</th>
<th>Low HDL-Cholesterol</th>
<th>High Fasting Glucose</th>
<th>Metabolic Syndrome</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>OR (CI 95%)</td>
<td>P value</td>
<td>OR (CI 95%)</td>
<td>P value</td>
<td>OR (CI 95%)</td>
<td>P value</td>
</tr>
<tr>
<td><strong>Age group</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18-29 years</td>
<td>1.0 (Ref)</td>
<td></td>
<td>1.0 (Ref)</td>
<td>1.0 (Ref)</td>
<td>1.0 (Ref)</td>
<td>1.0 (Ref)</td>
</tr>
<tr>
<td></td>
<td>(0.52-2.31)</td>
<td></td>
<td>(0.46-2.85)</td>
<td>(0.92-4.03)</td>
<td>(0.71-2.98)</td>
<td>(0.56-3.26)</td>
</tr>
<tr>
<td>30-39 years</td>
<td>1.1</td>
<td>0.810</td>
<td>1.15</td>
<td>0.770</td>
<td>1.93</td>
<td>1.45</td>
</tr>
<tr>
<td></td>
<td>(1.21-5.11)</td>
<td>(1.06-5.55)</td>
<td>(1.25-5.03)</td>
<td>(2.09-9.3)</td>
<td>(1.57)</td>
<td>(1.72-8.86)</td>
</tr>
<tr>
<td>40-49 years</td>
<td>2.8</td>
<td>0.010</td>
<td>2.17</td>
<td>0.040</td>
<td>0.010</td>
<td>&lt;0.001</td>
</tr>
<tr>
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<td>(1.1-4.73)</td>
<td>(2.47-9.3)</td>
<td>(1.0-3.5)</td>
<td>(0.6-2.47)</td>
<td>(0.8-3.14)</td>
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</tr>
<tr>
<td>50-59 years</td>
<td>1.78</td>
<td>0.150</td>
<td>1.41</td>
<td>&lt;0.001</td>
<td>&lt;0.001</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td></td>
<td>(0.81-3.94)</td>
<td>(3.43-21.01)</td>
<td>(1.73-8.21)</td>
<td>(0.35-1.54)</td>
<td>(1.22-6.13)</td>
<td>(2.61-15.75)</td>
</tr>
<tr>
<td>60 or more years</td>
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<tr>
<td>Sex</td>
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<td></td>
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<td></td>
</tr>
<tr>
<td>Male</td>
<td>1.0 (Ref)</td>
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<td>1.0 (Ref)</td>
<td>1.0 (Ref)</td>
<td>1.0 (Ref)</td>
<td>1.0 (Ref)</td>
</tr>
<tr>
<td></td>
<td>(1.52-4.06)</td>
<td>(0.26-0.72)</td>
<td>(0.45-1.21)</td>
<td>(0.48-1.25)</td>
<td>(0.48-1.28)</td>
<td>(0.76-2.17)</td>
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<tr>
<td>Female</td>
<td>2.48</td>
<td>&lt;0.001</td>
<td>0.43</td>
<td>&lt;0.001</td>
<td>0.74</td>
<td>0.78</td>
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<td>(1.47-4.06)</td>
<td>(0.26-0.72)</td>
<td>(0.45-1.21)</td>
<td>(0.48-1.25)</td>
<td>(0.48-1.28)</td>
<td>(0.76-2.17)</td>
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<tr>
<td>Education level</td>
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</tr>
<tr>
<td>High School and above</td>
<td>1.0 (Ref)</td>
<td></td>
<td>1.0 (Ref)</td>
<td>1.0 (Ref)</td>
<td>1.0 (Ref)</td>
<td>1.0 (Ref)</td>
</tr>
<tr>
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<td>(0.94-2.07)</td>
<td>(0.78-1.71)</td>
<td>(0.63-1.32)</td>
<td>(0.74-1.53)</td>
<td>(0.69-1.45)</td>
<td>(0.78-1.7)</td>
</tr>
<tr>
<td>Middle School or less</td>
<td>1.4</td>
<td>0.090</td>
<td>1.16</td>
<td>0.470</td>
<td>0.91</td>
<td>1.07</td>
</tr>
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<td>(0.94-2.07)</td>
<td>(0.78-1.71)</td>
<td>(0.63-1.32)</td>
<td>(0.74-1.53)</td>
<td>(0.69-1.45)</td>
<td>(0.78-1.7)</td>
</tr>
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<td>Occupation Status</td>
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</tr>
<tr>
<td>Employed</td>
<td>1.0 (Ref)</td>
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<td>1.0 (Ref)</td>
<td>1.0 (Ref)</td>
<td>1.0 (Ref)</td>
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<td>(0.71-1.47)</td>
<td>(0.71-1.47)</td>
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<td>Not Employed</td>
<td>1.43</td>
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<td>(0.77-1.54)</td>
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</tr>
<tr>
<td>Divorced-Separated-Single</td>
<td>1.0 (Ref)</td>
<td></td>
<td>1.0 (Ref)</td>
<td>1.0 (Ref)</td>
<td>1.0 (Ref)</td>
<td>1.0 (Ref)</td>
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<td>(0.69-1.48)</td>
<td>(0.48-1.03)</td>
<td>(0.68-1.38)</td>
<td>(0.66-1.33)</td>
<td>(0.8-1.65)</td>
<td>(0.7-1.53)</td>
</tr>
<tr>
<td>Married-Widowed-Union</td>
<td>1.01</td>
<td>0.970</td>
<td>0.7</td>
<td>0.070</td>
<td>0.97</td>
<td>0.94</td>
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<td>(0.48-1.03)</td>
<td>(0.68-1.38)</td>
<td>(0.66-1.33)</td>
<td>(0.8-1.65)</td>
<td>(0.56-1.9)</td>
</tr>
<tr>
<td>Couple-Union</td>
<td>1.04</td>
<td>0.460</td>
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<td>(0.71-1.53)</td>
<td>(0.27-1.06)</td>
<td>(0.27-1.06)</td>
<td>(0.53-1.03)</td>
</tr>
<tr>
<td>Yearly Income</td>
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<td></td>
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<tr>
<td>$20,000 or more</td>
<td>1.0 (Ref)</td>
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<td>1.0 (Ref)</td>
<td>1.0 (Ref)</td>
<td>1.0 (Ref)</td>
<td>1.0 (Ref)</td>
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<tr>
<td></td>
<td>(0.44-1.59)</td>
<td>(0.33-1.26)</td>
<td>(0.43-1.45)</td>
<td>(0.43-1.45)</td>
<td>(0.41-1.44)</td>
<td>(0.27-1.06)</td>
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<tr>
<td>$0-$19,999</td>
<td>0.84</td>
<td>0.580</td>
<td>0.65</td>
<td>0.200</td>
<td>0.79</td>
<td>0.72</td>
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<td>(0.43-1.45)</td>
<td>(0.43-1.45)</td>
<td>(0.43-1.44)</td>
<td>(0.27-1.06)</td>
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<td>Perceived Health</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Good, great or excellent</td>
<td>1.69</td>
<td>0.010</td>
<td>1.49</td>
<td>0.040</td>
<td>1.41</td>
<td>0.050</td>
</tr>
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<td>(1.16-2.46)</td>
<td>(1.03-2.16)</td>
<td>(0.99-1.99)</td>
<td>(0.99-1.99)</td>
<td>(0.99-1.97)</td>
<td>(1.31-2.64)</td>
</tr>
<tr>
<td>Fair or Poor</td>
<td>1.16</td>
<td>0.140</td>
<td>1.49</td>
<td>0.050</td>
<td>1.4</td>
<td>0.050</td>
</tr>
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<td>(1.16-2.46)</td>
<td>(1.03-2.16)</td>
<td>(0.99-1.99)</td>
<td>(0.99-1.97)</td>
<td>(0.99-1.97)</td>
<td>(1.31-2.64)</td>
</tr>
</tbody>
</table>

*Significance level at p<0.05

Large Waistline (dependent variable): χ² = 55.570; df = 10; p < 0.001
High Blood Pressure (dependent variable): χ² = 85.878; df = 10; p < 0.001
High Triglycerides (dependent variable): χ² = 34.095; df = 10; p < 0.001
Low HDL-cholesterol (dependent variable): χ² = 10.917; df = 10; p = 0.364
High Fasting Blood Glucose (dependent variable): χ² = 46.438; df = 10; p < 0.001
Metabolic Syndrome (dependent variable): χ² = 83.355; df = 10; p < 0.001
Logistic regression showed that being between 40 and 49 years old (OR 2.48, df=10, p=0.010), being female (OR 2.48, df=10, p<0.001), and a fair or poor perceived health status (OR 1.69, df=10, p=0.010) were associated with increased odds of having a large waistline.

Results from logistic regression also showed that being between 50 and 59 years old (OR 4.17, df=10, p<0.001), being 60 or older (OR 8.49, df=10, p<0.001), not being employed (OR 2.01, df=10, p<0.001), and a fair or poor perceived health status (OR 1.49, df=10, p=0.040) were associated with increased odds of having high blood pressure; being female (OR 0.43, df=10, p<0.001) was associated with decreased odds of having high blood pressure.

Furthermore, logistic regression showed that being between 40 and 49 years old (OR 2.51, df=10, p=0.010), 50 and 59 years old (OR 4.52, df=10, p<0.001), being 60 years or older (OR 3.77, df=10, p<0.001), and a fair or poor perceived health status (OR 1.41, df=10, p=0.050) were associated with increased odds of having high triglycerides.

For having a low HDL-cholesterol level, logistic regression demonstrated that a fair or poor perceived health status (OR 1.40, df=10, p=0.050) was associated with increased odds. Also, logistic regression showed that being between 50 and 59 years old (OR 3.04, df=10, p<0.001), being 60 or older (OR 2.73, df=10, p=0.010), and a fair or poor perceived health status (OR 1.49, df=10, p=0.040) were associated with increased odds of having high fasting blood glucose.

Lastly, logistic regression demonstrated that being between 40 and 49 years old (OR 3.90, df=10, p<0.001), 50 and 59 years old (OR 5.68, df=10, p<0.001), being 60 or older (OR 6.42, df=10, p<0.001), not being employed (OR 1.15, df=10, p=0.010), and a fair or poor perceived health status (OR 2.06, df=10, p<0.001) were associated with increased odds of having metabolic syndrome.
CHAPTER 5. DISCUSSION

Metabolic syndrome is a prevalent and serious health condition in the U.S. and globally (Beltrán-Sánchez et al., 2013; Grundy, 2015). According to the NIH, the risk for CVD and T2DM increases with the number of metabolic risk factors. The risk of having MetS is closely linked to obesity and the lack of physical activity (NIH, 2015).

Among U.S. Hispanics, the prevalence of MetS has been reported to be even higher than the national average (Heiss et al., 2014). One of the reasons for the high prevalence of MetS in the U.S. could be that Hispanic populations have a disproportionate number of cardiovascular risk factors when compared to non-Hispanic white population because of their level of exposure and adaptability to a new culture, this is known as acculturation (Garcia et al., 2012). The city of El Paso confronts several social issues such as poverty which is above the national average and very low access to healthcare (McFall & Smith, 2015). Given that a very high percentage of Hispanic population (81.8%) is living in El Paso, its population is at higher risk of being affected by a myriad of risk factors, which leads to MetS (Mora, 2013).

The socio demographic characteristics from the selected sample were consistent with other convenience samples from similar studies conducted in the region (de Heer et al., 2015) (Balcázar, 2012). Most participants in the study were female (83.9%), between 40 and 59 years old (56%), with low education level (48.7% with middles school or less), and not employed (58.9%). The fact that they were recruited in HACEP residential complexes, the majority had an income level below $20,000 a year (86.6%).

According to a study by Osborn et al., 2014, MetS and its consequences, specifically hypertension, diabetes, and dyslipidemia appeared to be strongly associated with CVD in Hispanics from Mexican origin. Efforts to prevent CVD and limit its impact in the Hispanics
population should focus on controlling and preventing these diseases (Osborn, Miller, Badr, & Zhang, 2014). This is one of the reasons why MetS becomes an integral indicator of the risk of developing CDV disease and chronic diseases (hypertension, diabetes, and dyslipidemia) in a given population.

Over the past decade, efforts have been made to improve understanding of the gender difference in MetS as well as its role in CVD (Mosca, Barrett-Connor, & Wenger, 2011). According to the CDC, a waist circumference above recommended levels represents a risk factor not only for MetS but also for obesity, T2DM, CVD, among others (CDC, 2011). Females in the overall population tend to have a higher than normal waist circumference that puts them at a higher risk for MetS. Significant differences between males and females were noticed among participants in this study both in waist circumference and when assessing the presence of a large waistline as a risk factor.

The SBD and DBP average among participants differed between male and female groups, given this it is not surprising a significant difference of the presence of high blood pressure as a risk factor for MetS among our study population. This is consistent with expectations according to a study by Sandberg and collaborators that observed the rates for hypertension by gender regardless of race and ethnicity (Sandberg & Ji, 2012).

Low HDL-C cholesterol represents a risk factor for MetS and females in general tend to have a higher level of lipoprotein when compared to men, so it was expected to see a significant difference when calculating the averages by gender. But, once the risk factor is adjusted by the difference in criteria for sex no statistical significant difference was observed for low HDL-C as a risk factor.

Nationally, the prevalence of MetS among adults is 22.90% (23.69% for men, and 21.8%
among women) (Beltrán-Sánchez et al., 2013); while among Hispanics that number increases to 35% (33.7% in men and 36% in women) (Heiss et al., 2014). In this study, 53.39% of the participants had MetS which was determined by having at least 3 out of the 5 risk factors that were measured (45.83% for male and 54.85% for female), this number is well above the national prevalence for Hispanics. The higher prevalence of MetS among participants might be explained by the fact that our target populations was also composed of participants from low income levels who did not have access to health insurance. The uninsured are at a significant higher risk because they’re less likely to seek medical care, less likely to use prescriptions, and less likely to see a health professional (Salinas, de Heer, Lapeyrouse, Heyman, & Balcázar, 2015).

Logistic regression showed that each of the risk factors for MetS itself occurs at a higher rate as age increases, and even when accounting for the different age groups, they continue to increase. Also, the same trend was observed for MetS. There are many predisposing conditions which increase in prevalence during aging, such as obesity, insulin resistance, inflammation, changes in the activity of hormonal pathways, and stress (Veronica & Esther, 2014); these could explain the increased odds of being classified with MetS.

There are increased odds for a larger waistline in women and for high blood pressure in men. Socio demographic characteristics also showed that there is a higher risk for having high blood pressure and MetS if the participant is not employed. This could be attributed to stress or even dietary factors given their economic need in a similar way than what is exposed by Wiernik et al (Wiernik et al., 2014). Perceived health status had a significant effect in all of the logistic regression models, participants who stated that had a fair or poor health have an increase odds of having any of the risk factors and furthermore MetS. This question alone could be an important predictor for MetS and therefore CVD.
5.1 STRENGTHS

One of the main strengths of this study was the large sample size collected from the main study, this allowed for a proper selection of participants with similar characteristics (uninsured Hispanic adults, from low income HACEP communities). The sub sample size of 657 participants, allowed the analysis and detection of statistically significant differences and odds ratios for MetS and its risk factors among Hispanics which could be useful in generalizing findings among this ethnic group.

Another strength was the consistency in which the data was collected, throughout the first year of the study, the team of health professionals in charge of data collection remained the same. This also applies to the sampling and recruitment of participants.

Lastly, the support and recommendations provided by the statistical consulting lab, allowed for better data selection and interpretation of regression analysis, this resulted in a higher quality analysis which gives more significance to this study.

5.2 LIMITATIONS

The large majority of females (83.87%) in the sample pose a limitation since the socioeconomic and metabolic characteristics differ by gender. Low male participation could be attributed because in Hispanic culture, males are usually the head of the household and may not have had the same opportunity to participate in the project due to work schedules. Also, given the characteristics of the biometric and biochemical measures, some data was not normally distributed. Another limitation, could also be fact that even though participants are required to be fasting, there is no way to be certain that they followed the instruction before the study. Other risk factors for CVD (elevated BMI, high levels of: total cholesterol, LDL, VLDL) weren’t part of the analysis since they were not in the criteria for metabolic syndrome.
CHAPTER 6. CONCLUSION

The results of this study add an important source of information related to the prevalence of risk factors for MetS in Hispanics living a U.S.-Mexico border region. As a result, there is a need for the implementation of effective evidence based interventions aimed at reducing the prevalence of risk factor for MetS, in order to mitigate the current prevalence of obesity, hypertension, lipid disorders, type 2 diabetes and CVD. With the border region being considered a medically underserved area in U.S., efforts are key to improve access to resources in order to enhance the overall health of minority groups and the general population. Intervention efforts may include increasing awareness of enrollment information for insurance programs. There is a need for better preventive efforts and modifications of eating habits and physical activity patterns across all age groups and among both genders. Because Hispanics are disproportionately affected by the prevalence of having a larger waistline, interventions aimed at targeting them is critical. This study will have future implications for increasing awareness of MetS as a risk factor for developing CVD, and the current prevalence among uninsured Hispanic populations.
REFERENCES


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GLOSSARY

- Glucose Intolerance: Fasting glucose concentration >110 mg-dL (2016)
- High blood pressure: A single time measurement of elevated resting systolic and diastolic blood pressure (> 130/85 mmHg) (2016)
- High fasting blood glucose: A single time elevated measurement of blood glucose while fasting. (> 100mg/dL) (NIH, 2016)
- Hypertension: A chronic state of elevated resting systolic and diastolic blood pressure (>130/85 mmHg) (NIH, 2016).
- Hypertriglyceridemia: A chronic state of blood triglyceride concentrations above 150 mg-dL (NIH, 2016).
- Insulin Resistance: The body’s inability to properly utilize the insulin resulting in a decrease in blood glucose regulation (Alberti et al., 2006).
- Low HDL-C: High density lipoprotein cholesterol concentrations < 40mg-dL in men and < 50 mg-dL in women (NIH, 2016).
- Metabolic marker: a characteristic that is objectively measured and evaluated as an indicator of biological processes, pathogenic processes, or responses to a therapeutic intervention. (Alberti et al., 2006)
- Metabolic Syndrome: A clustering of three or more CVD risk factors such as, visceral obesity, insulin resistance, low HDL-C, glucose intolerance, Type 2 diabetes, hypertriglyceridemia, and hypertension (NIH, 2016).
• Type 2 Diabetes: A chronic elevated blood glucose concentration state as a result of the body’s inability to use the insulin produced or inability to make enough insulin. A fasting blood glucose level of >126 mg-dL characterizes type 2 diabetes (Alberti et al., 2006).

• Visceral Obesity: An excess of abdominal fat determined by waist circumference (men: > 102 cm, women: > 88 cm) (NIH, 2016).
APPENDIX

SOCIO DEMOGRAPHIC QUESTIONNAIRE

ID:___________

Community:______________

Today's Date:____________

Date of Birth (mm/dd/yyyy):_____________

Age (in years):________

Home address:_________________________

City:__________________

State:_________________

Zip Code:_______________

Sex
☐ Male
☐ Female

Ethnicity
☐ Hispanic or Latino
☐ Not Hispanic or Latino
What is the highest grade or level of school you have completed or the highest degree you have received?
- Never attended or Kindergarten only
- Elementary School (1-5th grades)
- Middle School (6-8 grades)
- High School, no diploma (9-12 grades)
- High School graduate; GED; or Equivalent
- Some college, not completed a degree
- Associate degree
- Bachelor's degree (example: BA, AB, BS, BBA)
- Master's; Doctoral; or Professional degree

Which of the following best represents your current employment status?
- Employed-Part time
- Employed-Full time
- Self-employed
- Not employed for more than 1 year
- Not employed for less than 1 year
- Homemaker
- Student
- Retired
- Unable to work

Including everyone who lives in your house, what is your yearly household income in US dollars?
- $0 - $19,999
- $20,000 - $29,000
- $30,000 - $39,999
- $40,000 - $49,000
- $50,000 - $69,999
- $70,000- $99,999
- $100,000 or more
Which of the following best describes your marital status

- Married
- Divorced
- Widowed
- Separated
- Never married (Single)
- Civil union
- A member of an unmarried couple

In general, would you say your health is?

- Excellent
- Very Good
- Good
- Fair
- Poor

Do you currently have any form of health insurance?

- Yes
- No
VITA

Juan Aguilera has an educational background targeted towards Medicine, Public Health and interdisciplinary research at the Border Community of El Paso and Ciudad Juarez. He is a physician surgeon with a Medical Degree (MD) from the University of Ciudad Juarez (UACJ) and a Diploma in Emergency Medicine from the Instituto Politecnico Nacional (IPN). Now pursuing a Master’s degree in Public Health (MPH) at The University of Texas at El Paso, his research focuses on assessing the current risk factors for metabolic syndrome and its complications such as hypertension and diabetes mellitus in Hispanic populations. Currently, he was awarded the Paso del Norte Health Foundation Fellowship and works with The Paso del Norte Institute for Healthy Living, an organization that provides leadership and innovative approaches to support regional community efforts to promote proper nutrition, healthy eating behaviors, and physical activity, including advocacy and technical assistance for effective programs and public policies. At the same time, he coordinates the “Evidence Based Screening for Cardiorespiratory Health Outcomes in Low Income Communities from El Paso”, a study funded by the City of El Paso’s Department of Public Health. He was also a GRA in a R01 study funded by the National Institute of Health (NIH) of “Urban air pollution and carotid intima-media thickness in at risk children of El Paso, Texas”. He serves as the current President of the Student for Public Health (SPH) graduate student organization leading campaigns of screening and early detection of HIV in at risk populations, and as a recurring guest speaker at the Mexican Consulate with the lecture “Childhood Obesity” as part of the “Ventanillas de Salud” education program.

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This thesis/dissertation was typed by Juan Aguilera.