A study of assessing knowledge and health beliefs about cardiovascular disease among selected undergraduate university students using Health Belief Model.

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Submitted in Partial Fulfillment of the Requirements of

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DISSERTATION APPROVAL

A STUDY OF ASSESSING KNOWLDEGE AND HEALTH BELIEFS ABOUT CARDIOVASCUALR DISEASE AMONG SELECTED UNDERGRADUATE UNIVERSITY STUDENTS USING HEALTH BELIEF MODEL

By

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A Dissertation

Submitted in Partial Fulfillment of the Requirements for the Degree of

Doctor of Philosophy in the field of Health Education

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AN ABSTRACT OF THE DISSERTATION OF

YUBA R. GAUTAM, for the Doctor of Philosophy degree in HEALTH EDUCATION, presented on October 17, 2012 at Southern Illinois University Carbondale.

TITLE: A STUDY OF ASSESSING KNOWLEDGE AND HEALTH BELIEFS ABOUT CARDIOVASCULAR DISEASE AMONG SELECTED UNDERGRADUATE UNIVERSITY STUDENTS USING HEALTH BELIEF MODEL

MAJOR PROFESSOR: Dr. Dale O. Ritzel

Background: In the United States, CVD is the leading cause of death for both men and women. According to National Vital Statistics Report, heart disease was the number one killer in the United States and it can be prevented. The primary purpose of this study was to determine overall knowledge and health beliefs about CVD among selected undergraduate university students and find out the risk of developing CVD in this population. The secondary purpose was to assess the relationship between knowledge, health beliefs, and personal risks; the tertiary purpose was to determine the factors that predict the relationship between demographic variables and cardiovascular risk factors among these students.

Methods: A cross-sectional, descriptive, and correlational survey design was used in this quantitative study. An existing knowledge and health belief instrument was adapted with the permission from the authors. In the 2012 Spring semester, over 600 undergraduates from Foundation of Human Health, First Aid and CPR, Medical Terminology, Math, History 101, and Geography classes at a mid-western university were surveyed to access knowledge and health belief about CVD. The Health Belief Model provided the theoretical framework for this study.

Results: Demographic data provided descriptive overview of the participants in this study. Majority of the participants were whites, lived off campus, and were domestic students. Results from data analysis revealed that overall knowledge about cardiovascular disease was low among these university students. Individual health beliefs such as perceived susceptibility, severity, and barriers regarding CVD were low; however perceived benefit about CVD was found high. Most of the undergraduate university students were at risk of developing cardiovascular diseases. Smoking and stress causing CVD was unknown among undergraduate university students.

Time to cook healthy meals and affordability of buying healthy foods were significant barriers in protecting cardiovascular health among university students. There was a positive statistically significant correlation found between CVD knowledge, knowledge subtypes, and health belief subscales. Correlations between knowledge and health beliefs were weaker while comparing to correlation between CVD knowledge and knowledge subtypes. Race/Ethnicity, Age, Family History, International/National, Live on/off campus, and number of health classes were the better predictors of cardiovascular knowledge, while perceived barrier was the strongest predictor of health belief about CVD among undergraduate university students.

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CHAPTER 1

Introduction

A famous researcher, doctor, and author of the book "Prevent and Reverse Heart Disease", Dr. Caldwell Esselstyn Jr. said about cardiovascular disease: "It's a food borne illness, and we're never going to end the epidemic with stents, with bypasses, with the drugs, because none of it is treating causation of the illness."

Background of the Problem

Cardiovascular disease (CVD) is the leading cause of death worldwide and more people die from CVD than any other diseases (World Health Organization (WHO), 2011a; Centers for Disease Control and Prevention (CDC), 2011a; American Heart Association (AHA), 2011a). About 17.3 million people die from CVD in 2008, which represents 30% of all global death (WHO, 2011b). WHO (2011b) projected that by 2030, 23.6 million people will die annually from CVD. In the United States, CVD is also the leading cause of death for both men and women (CDC, 2011a). According to National Vital Statistics Report (2009), heart disease was the number one killer in the United States in 2006 and it can be prevented (Brownstein, 2008; Labarthe, Dai, Day, Fulton, & Grunbaum, 2009; Pearson, 2007). The 2005 mortality rate data showed that about 2400 Americans die of CVD each day which is about one death every 37 seconds (Lloyd-Jones et al., 2009). Although we have made extensive progress in the modern medicine, CVD continues to pose threats to the health of all Americans, regardless of age, gender, and socioeconomic status (Donatelle, 2010).

Even though CVD is considered the disease of elderly, it is the fifth leading cause of death among 15-35 year olds, and third leading cause of death among 35- 44 years old (National

Vital Statistics Reports, 2007). Researchers have suggested beginning CVD prevention programs among youth, in order to reduce cardiovascular related morbidity and mortality later in life (Adeyanju, 1990; Downey, Cresanta, & Berenson, 1989; National High Blood Pressure Education Program, 2004). The American Heart Association for Cardiovascular Health Promotion in schools has called for increased efforts in the research and prevention of CVD among younger populations (Hayman et al., 2004).

It is well researched that risk factors for heart disease begin early at the young age (Berenson, 2009; Pencina, D'Agostino, Larson, Massaro, & Vasan, 2009; Strong et al., 1999). Studies completed among university students showed that college students are also at risk of developing heart diseases (Hlaing, Nath, & Huffman, 2007; Sparling, Snow, & Beaver, 1999; Spencer, 2002), however there was no study conducted that examined knowledge and health beliefs about CVD among university students using HBM. College years represent a major transition for students because they are living away from home for the first time and have to make lifestyle decisions regarding personal health without their parents. Students begin adopting unhealthy behaviors like binge drinking, smoking, using illicit drugs, and poor dietary choices (American College Health Association (ACHA), 2006; Brevard & Ricketts, 1996; Wechsler & Davenport, 1997). Thus, college setting offers an excellent platform to study CVD risks among young adults. College health care providers need to include cardiovascular health (CVH) as part of their regular assessment in order to make students aware of CVD risks.

Over the past several years, the prevalence of health risk among today‟s college students is increasing (ACHA, 2011; Huang et al. 2003; Rosenthal& Schreiner, 2000). Most of the risk factors for developing CVD like tobacco use, diet, physical inactivity, obesity, high blood

pressure (hypertension), high blood sugar (diabetes), and alcohol can be modified by changing lifestyle behaviors. The American College Health Assessment 2010 survey showed that more than 21% of college students are overweight, 24% are not involved in moderate intensity activity for 30 minutes, 5% drink more than 5 alcoholic drinks a day, and only 5% eat five or more servings of fruits and vegetables a day. All of these factors can contribute to the development of CVD among college students.

The Bogalusa Heart Study (Freedman, Dietz, Srinivasan, & Berenson, 1999), suggested that development of atherosclerosis in young adults depends on the number of risk factors they have. College students have multiple risk factors like high drinking habits, sedentary lifestyle, tobacco use, unhealthy eating habits, and so forth, which makes them more vulnerable to the development of CVD. Klag et al.(1993), Spencer (2002), and Sparling et al. (1999) found that college students have high levels of serum cholesterol, which is the second most preventable risk factor for developing CVD . More than 102 million American adults (20 years or older) have total cholesterol levels at or above 200mg/dl, which is above healthy levels (Lloyd-Jones et al., 2010). Therefore, The National Cholesterol Education Program (NCEP) from National Heart Lung and Blood Institute (NHLBI) recommends checking blood cholesterol levels for adults at 20 years or older every five years.

The Coronary Artery Risk Development in Young Adults (CARDIA) study found that overall CVD knowledge among young adults is very low (Lynch, Liu, Kiefe, & Greenland, 2006). Vale (2000) in her study found that majority of the young adults and adolescents think heart disease prevention is important for them, but many other studies suggested that university students have low level of knowledge regarding CVD and they do not see CVD as a threat

(Collins, Dantico, Shearer, & Mossman, 2004; Vanhecke, Miller, Franklin, Weber, & McCullough, 2006). Another study completed by Smalley, Wittler, and Oliverson (2004) found that the majority of college students identified the CVD risk factors correctly. National Center for Education Statistics (2009) reported that 34% of students age 18-34 go to colleges. Thus, this age group can have significant impact on CVD prevention efforts.

The ACHA created Healthy Campus 2010 to address health needs of college students. Healthy Campus 2010 main objective is to "increase the proportion of college and university students who receive information from their institution in each of the 6 priority health risk behavior areas" (Healthy Campus 2010 Manual, p. 11). These areas include injuries, tobacco use, alcohol and illicit drug use, sexual behaviors that leads to unintended pregnancies and sexually transmitted diseases, dietary patterns that cause disease, and inadequate physical activity. Among these, alcohol, tobacco, diet, and physical activity are major risk factors for CVD.

Healthy People 2020 has a goal of improving cardiovascular health and quality of life through prevention, detection, and treatment of risk factors for heart attack and stroke; early identification and treatment of heart attacks and strokes; and prevention of repeated cardiovascular events (U.S. Department of Health and Human services [USDHHS], 2010). The risk of Americans developing and dying from CVD would be substantially reduced if major improvements were made across the U.S. population in diet and physical activity, control of high blood pressure and cholesterol, smoking cessation, and appropriate aspirin use (Agency for Healthcare Research and Quality, 2009).

Statement of the Problem

CVD will continue to be a modern threat to young adults, especially college students, unless they have clear understanding of what, and how, risk factors contribute to the development of the disease. University students are involved in variety of health risk behaviors such as drinking, smoking, unhealthy diets, sedentary lifestyles etc. which make them prone to the development of heart diseases when they grow older (ACHA, 2011; Irazusta et al., 2007). Most of the risk factors that are related to the development of heart diseases are related to lifestyle behaviors of college students and the development of heart disease can be prevented (Pearson, 2007). A university setting provides a unique opportunity to reach many young adults through disseminating cardiovascular risk reduction information (Green, Grant, Hill, Brizzolara, & Belmont, 2003; Kelley & Lowing, 1997). Behaviors that are learned and started in adolescence will carry over to adulthood (Freedman et al., 1999), thus this study will help young individuals by finding out their risk behaviors for the development of CVD. College students are mostly asymptomatic, that is why cardiovascular risk factors can only be detected through special screening of this young population.

Purpose of the Study

The primary purpose of this study was to determine overall knowledge and health beliefs about CVD among selected undergraduate university students and find out the risk of developing CVD in this population. The secondary purpose was to assess the relationship between knowledge, health beliefs, and personal risks about CVD among these students. The tertiary purpose was to determine the factors that predict the relationship between demographic variables and cardiovascular risk factors among these students.

Significance of the Study

Even though CVD is considered the disease of the middle age or elderly, different studies have shown that it begins early in life (Berenson, 2009; Pencina et al., 2009; Strong et al., 1999). Research conducted among college students revealed that college students are at risk of developing CVD (Hlaing et al., 2007; Sparling et al., 1999; Spencer, 2002). College students must first understand the actual risks of CVD before they can make appropriate decision about their personal health choices. Green et al., (2003), found that college students do not accurately perceive their risks for developing heart disease. Not enough studies are completed among college students to find their knowledge and health beliefs about CVD.

Primary prevention partially depends on awareness and perception of personal risk (O'Donnell, 2005). In order to reduce the increasing CVD burden in our society, and fight against this number one killer, multiple prevention strategies should be implemented (Kahn, Robertson, Smith, & Eddy, 2008); however assessment of asymptomatic people, yields cost-effective benefits (Pearson, 2007). The treatment of CVD ranks among the highest in health care expenditure in the United States and it was about 503.2 billion dollars in 2010 (Lloyd-Jones et al. 2010). This includes direct cost for medical expenses and indirect cost for loss of productivity. CVD prevention efforts can significantly reduce these costs (Kahn et al., 2008).

Knowledge can help college students accurately understand CVD risks, maybe because many college students do not see CVD as a threat to their life (Collins et al., 2004; Vanhecke et al., 2006), and they continue to engage in risky behaviors (Smalley et al., 2004). Many colleges and universities do not have funding to address cardiovascular issues, however risks factors of developing CVD such as alcohol and tobacco use, overweight and obesity, physical inactivity

and poor eating habits, high cholesterol, high blood pressure, and high blood sugar are prevalent among college students (ACHA, 2011; USDHHS, 2010).

College students represent significant portion of the overall population; between 1999 and 2009, the number of 18- to 24- year-olds increased from 26.7 million to 30.4 million (National Center for Education Statistics, 2011). There is a critical need to increase knowledge and awareness about CVD to this young population. This study could help to work on AHA‟s 2020 impact goals of improving cardiovascular health of all Americans by 20% (Lloyd et. al 2010). CVD awareness and assessment among college students may be difficult to demonstrate, but this study could help individuals to be more aware of their health behaviors.

Significance to Health Education

Health educators have an excellent opportunity to reach majority of young adults by transferring cardiovascular risk reduction information through colleges and universities. Brener and Gowda (2001) proposed that “institutions‟ of higher education are in a unique position to promote healthy behaviors by providing health education to students” (p. 223). Since college students are educated member of the community, they might be considered as role models and they could promote healthy behaviors in the community. College health educators can work on providing CVD screening programs for all students. Most of the risk factors for developing CVD are lifestyle related and it can be prevented by providing health education to this population.

The report of the 2000 Joint Committee on Health Education and Promotion Terminology defined health education as "any combination of planned learning experiences based on sound theories that provide individuals, groups, and communities the opportunity to acquire information and the skills needed to make quality health decisions (Joint Committee on Health

Education and Promotion Terminology, 2002). If health educators can provide necessary information and skills for the prevention of CVD, it will be easy to fight against this number one killer in the world. According to AHA recommendations, public health initiatives on CVD education and prevention are urgently needed (Pearson et al. 2003).

Findings from this study could be used for curriculum development regarding CVD in health education setting within colleges and universities. Effective curriculum would help students to be equipped with necessary skills for adapting healthy behaviors regarding cardiovascular health. The result of this study would also help design intervention programs for CVD utilizing different constructs of the Health Belief Model (HBM). Since this study is theory based, and is going to test the constructs of HBM regarding CVD, it will add new information to the literature and to health educators about college student‟s knowledge and health beliefs about CVD. Furthermore, this study could be replicated in different settings among different population. Finally, health educators work in healthcare, community, university, and many other settings, thus they can utilize findings of this study in their respective work settings for the health promotion and prevention of CVD.

Health Belief Model

The HBM will be used as a theoretical framework for this study. The HBM model has been one of the most commonly used theory in health education and promotion (Glanz, Rimer, and Viswanath, 2008; National Cancer Institute, 2005). The HBM was developed in the 1950s to explain why tuberculosis screening programs were not successful (Hochbaum, 1958; Rosenstock, 1974). The underlying concept of the HBM is that health behavior is determined by personal beliefs or perceptions about a disease and the strategies available to decrease it

occurrence (Hochbaum, 1958). The following perceptions: perceived susceptibility, perceive severity, perceived benefits, and perceived barriers are the main four constructs of HBM (National Cancer Institute, 2003; Champion &Skinner, 2008). Each of these perceptions, individually or in combination, is used to explain health behavior.

Glanz, Rimer, and Vishwanath (2008) stated that, in general, people will adopt a new healthy behavior or product (in this case, CVD knowledge and health belief) if they consider themselves susceptible to a condition (CVD), if they think it will lead to potentially serious consequences (CVD and its complication), if they believe that a course of action available to them would be beneficial in reducing either their susceptibility or the severity of the condition, and if they believe that the estimated barriers (or cost) of taking the action are prevailed over by its benefits. The HBM has been found to be most useful because of its illustration of the importance of individual beliefs about health and the relative costs and benefits of actions to modify health behavior (Nutbeam & Harris, 2004).

Research Questions

The following research questions will be answered in this study in order to address the knowledge and health beliefs of university students regarding CVD.

1. What are the overall levels of knowledge and health beliefs about CVD among selected undergraduate university students?
2. What are the relationships between total knowledge, knowledge subtypes, and health belief subscales (knowledge and perceived susceptibility, knowledge and perceived severity, knowledge and perceived benefits, knowledge and perceived barriers) about CVD among selected undergraduate university students?

3. What are the personal risks of developing CVD and are there any relationships between personal risk, health knowledge, and individual health beliefs about CVD among selected undergraduate university students?
4. Which personal variable (age, gender, lifestyle risk, family history, total number of health classes taken, Race/Ethnicity, Domestic/International, live on campus/off campus, dietary behavior, exercise level) predicts CVD knowledge among university students?
5. Which personal variable (age, gender, lifestyle risk, family history, total number of health classes taken, Race/Ethnicity, Domestic/International, live on campus/off campus, dietary behavior, exercise level) predicts CVD individual health beliefs among university students?

Research Design

This quantitative study will use cross-sectional, descriptive, correlational survey design. Cross-sectional studies are designed "to study some phenomenon by taking a cross section of it at one time and analyzing that cross section carefully" (Babbie, 2008, p. 100). According to Isaac and Michael (1995), descriptive studies are used "to describe systematically the facts and characteristics of a given population or area of interest, factually and accurately" (p. 50). Correlational studies are used "to investigate the extent to which variations in one factor correspond with variations in one or more other factors based on correlation coefficients" (Isaac & Michael, 1995, p. 53). Surveys are commonly used for descriptive purposes and are perhaps the best method available to collect data for a population too large to observe directly (Babbie, 2008). This study will focus on how CVD knowledge and health beliefs correlate among each other.

Study Sample

A non-random convenience sample of selected undergraduate students enrolled in large mid-western university will be selected for this study. The participants will be males and females ages 18 and older who are enrolled in undergraduate courses like Foundation of Human Health, Medical Terminology, History, English, Engineering, and First Aid and CPR at this mid-western university. This sample was chosen because these classes are taken by undergraduate students from 32 different majors like accounting, nursing, psychology, sociology, health education, dental hygiene, physics, mathematics, biology, criminal justice, law etc. These diverse groups of students are representative of total undergraduate students. Majority of these students may not be aware of CVD risks. This young population can have a significant impact on CVD prevention efforts.

Data collection

After getting approval from the Institutional Review Board at Southern Illinois University Carbondale, data collection for this study will begin. A 30 item *Heart Disease Knowledge Questionnaire* developed by Bergman, Reeve, Moser, Scholl, and Klein(2011), a 25 item *Health Belief Related to Cardiovascular Disease Scale* developed by Tovar, Rayens, Clark, and Nguyen(2010), and 20 item personal demographic variable and risk prediction questionnaire developed by the researcher will be used as a survey instrument for this research. The survey will be distributed to the students by the researcher himself. Permission from individual instructors will be taken before scheduling the date and time of conducting survey. Informed consent will be read loud in front of the class and will be attached with the survey so that students can read themselves before deciding to participate on the survey. Instructors will be asked to leave the

classroom while students are taking the survey in order to avoid biases for students whose who are not willing to take the survey. For students who are not willing to participate in the survey, a campus newspaper will be given so that they will not be ideal for that time period. After completing the survey, students will bring their survey in front of the class. After collecting all the surveys, it will be stored in safe location by the researcher.

Data analysis

Participants will directly mark their responses on the survey instrument. Each survey item will be coded by the researcher and entered into the SPSS software. Data will be analyzed using the Statistical Package for the Social Science (SPSS®) version 19.0 (SPSS, Inc, 2010). Descriptive statistics including frequencies, percentages, measures of central tendency, and dispersion will be calculated for each item of the survey and for all demographic and personal variables. Total knowledge score and total subscale score (perceived susceptibility, severity, benefits, and barriers) will be calculated by using descriptive statistics. Pearson correlation coefficient will be conducted with total knowledge score and with total and individual subscales scores on health beliefs. Multiple regression analysis will be calculated with total knowledge scores, total health belief scores and demographic and personal variables. An alpha level of 0.05 will be set to determine the level of statistical significance. See Table 2 for details.

Assumptions

Neutens and Rubinson (2010) described assumption as facts concerning the study that are established but cannot necessarily be proven true. The following assumptions were made for this study:

1. Participants will respond to the survey item accurately and honestly reflecting their current health behavior and perceptions.
2. Cardiovascular health knowledge and beliefs are measurable concepts.
3. Participants of this study are representative of total undergraduate students at this midwestern university.
4. Survey instrument is valid and reliable based upon its extensive development, refinement, and recommendations by the published authors.

Delimitations

Delimitations are parameters or boundaries placed on a study by the researcher (Cottrell & McKenzie, 2005), and are used to limit and clarify the scope of the study. The following delimitations should be considered for this study:

1. Study population is delimited to only one rural mid-western university.
2. Participants of this study will be from selected undergraduate courses.
3. The study examined self-reported cardiovascular knowledge and health beliefs from students.

Limitations

Limitations are parameters or boundaries of the research established by factors or people other than the researcher (Neutens and Rubinson, 2010), and are beyond the control of the researcher but might impact the result of the study. The following limitations could possibly impact the results of this study:

1. Due to the use of convenience sample, the ability to generalize the results will be limited.
2. Self-reported data may not be accurate, and the researcher cannot be sure if participants carefully responded to the survey items.
3. There will be no incentives for students to participate in this study.

Definition of Terms

Atherosclerosis: the process of cholesterol deposition and buildup in the wall of an artery associated with inflammation, scarring of the arterial wall, calcium deposition, and narrowing of the artery (Gould, 1998).

Blood cholesterol: the blood concentration of a family of lipid or "fatty" molecular compounds obtained directly from the diet or produced in the body from fatty dietary compounds; a necessary factor in development of atherosclerosis (USDHHS, 2003).

Cardiovascular Disease (CVD): cardiovascular disease (CVD) is an abnormal function of the heart or blood vessels. It can cause an increase in risk for heart attack, heart failure, sudden death, stroke and cardiac rhythm problems, thus resulting in decreased quality of life and decreased life expectancy (Cardiovascular Disease Foundation, 2011a).

Cardiovascular Health (CVH): refers broadly to a combination of favorable health habits and conditions that protects against the development of cardiovascular diseases (USDHHS, 2003).

Diabetes: more commonly also called “Diabetes Mellitus”, is a condition that causes blood sugar to rise to dangerous levels: a fasting blood glucose of 126 milligrams per deciliter (mg/dL) or more (American Heart Association, 2011b).

Health beliefs: The individual perception of risk of contracting a health condition, and the severity of the condition (perceived susceptibility and perceived severity), as well as the perceived benefits minus barriers of taking action to reduce the risk (Janz, Champion, &Strecher, 2002).

Heart Disease: any affliction that impairs the structure or function of the heart (e.g., atherosclerotic and hypertensive diseases, congenital heart disease, rheumatic heart disease, and cardiomyopathies). Word heart disease often used interchangeably with CVD (USDHHS 2003).

Hypertension: a condition in which the blood pressure is elevated, leading to increased chance of having a stroke and developing cardiovascular disease. Hypertension is also called “High Blood Pressure” (Kwiterovich, 1998).

Morbidity: the occurrence of an illness or illnesses in a population (Friis& Sellers, 2004).

Mortality: the occurrence of death in a population (Friis& Sellers, 2004).

Plaque: a localized segment of artery with cholesterol builds up in the wall covered by the lining of the artery (Gould, 1998).

Perceived barriers: Belief about the tangible and psychological costs of the advised action (Champion & Skinner, 2008).

Perceived benefits: Belief in efficacy of the advised action to reduce risk or seriousness of impact (Champion & Skinner, 2008).

Perceived severity: Beliefs about how serious a condition and its sequelae are (Champion & Skinner, 2008).

Perceived susceptibility: Beliefs about the chances of experiencing a risk or getting a condition or disease (Champion & Skinner, 2008).

Preventable Risk Factors: high blood pressure, high cholesterol, excess weight, physical inactivity, smoking, diabetes, excessive alcohol consumption, illegal drug use and stress (Cardiovascular Disease Foundation, 2011b).

Unpreventable Risk Factors: previous heart attack, family member with heart disease, increasing age, gender and race (Cardiovascular Disease Foundation, 2011b).

Risk Behavior**:** a behavioral pattern associated with increased frequency of specified health problems; for example, high salt intake, smoking, and binge drinking are all associated with CVD (USDHHS, 2003).

Risk factor: an individual characteristic associated with increased frequency of specified health problems; for example, high LDL cholesterol, high blood pressure, and diabetes are all associated with CVD (USDHHS, 2003).

Screening: the presumptive identification of unrecognized disease or defects by the application of tests, examinations or other procedures that can be applied rapidly (Friis & Sellers, 2004).

Summary

This chapter provided the background for this study. Previous research and literature studied revealed the need of addressing cardiovascular health among younger population. College students were engaged on multiple health risk behaviors, and were at risk of developing CVD. The purpose of the study was to determine overall knowledge and health beliefs about CVD and assess the relationship between knowledge and health beliefs among university students. The research design, study sample, and research questions were focused to address the purpose of the study. Some of the assumptions, limitations, and delimitations of the study were also explained.

CHAPTER II

LITERATURE REVIEW

Introduction

The primary purpose of this study is to determine overall knowledge and health beliefs about CVD among selected undergraduate university students and find out the risk of developing CVD among this population. The secondary purpose is to assess the relationship between knowledge, health beliefs, and personal risks about CVD among these students. The researcher also wants to determine the factors that predict the relationship between demographic variables and cardiovascular risk factors among these students. This chapter provides in depth literature review of the history, prevalence, prevention, and health beliefs and knowledge about CVD. The major, contributing, and modifiable risk factors and their relation to CVD are discussed in detail. Finally, the HBM and its constructs are explained by providing examples relating to CVD.

Cardiovascular Disease

Cardiovascular disease (CVD) is an abnormal function of the heart or blood vessels. It can cause an increase in risk for heart attack, heart failure, sudden death, stroke and cardiac rhythm problems, thus resulting in decreased quality of life and decreased life expectancy (Cardiovascular Disease Foundation (CDF), 2011a). The term "heart disease" is often used interchangeably with "cardiovascular disease" (Mayo Clinic, 2011). CVD includes but not limited to coronary heart disease (heart attacks), cerebrovascular disease (stroke), raised blood pressure (hypertension), peripheral artery disease, rheumatic heart disease, congenital heart disease and heart failure (WHO, 2011c). Even though deaths resulting from CVD have decreased in the United States for the past four decades, CVD remains the leading cause of morbidity and

mortality for both men and women (Rogers et al., 2011). Many forms of heart disease or CVD can be prevented or treated with healthy lifestyle choices (AHA, 2011a; Pearson, 2007).

History of CVD

Prior to World War II, infectious diseases were the major causes of morbidity and mortality, and it was a major public health problem of that time (Luepker, Evans, McKeigue, & Reddy, 2004) . Most of the public health efforts were focused to reduce infectious diseases (Dawber, Meadors, & Moore, 1951; Oppenheimer, 2005). During the decades of the 1930s to 1950s, these diseases were slowly taken control by public health officials. Improved sanitation highly reduced diarrheal diseases. Tremendous efforts were made in controlling tuberculosis and pneumococcal pneumonia. After the discovery of penicillin in 1942, more reductions were made in the prevalence and incidence of many infectious diseases. In the 1940s and 1950s, infectious disease surge was replaced by the epidemic of cardiovascular disease (Blackburn, 2007).

After World War II, the CVD was on the rise and by 1950 one out of every three men in the United States developed CVD at the age of 50 (Dawber et al., 1951; Blackburn, 2007). CVD prevalence was twice as common as cancer. CVD had become the leading cause of death and the reason why life expectancy beyond age forty five did not increase. During that time there was no appropriate treatment available for prolonging life for people who survived heart attack. Little was known about the cause and risk factors about CVD but disease prevalence was increasing rapidly (Dawber, 1980). In order to explore causes and find possible prevention strategies of CVD, several epidemiological studies like Minnesota Business Men Study, Framingham Study, London Transport Workers Study and Seven Countries Study were conducted (Epstein, 1996; Luepker et al., 2004).

The Minnesota Business Men Study was conducted in 1948 among 300 healthy businessmen to find out the cause and progression of CVD (Blackburn, 2007). From those participants, relative weight, body fatness (skinfold thickness), blood pressure, and serum cholesterol were measured and followed for 15 years (Keys et al., 1963). Among the variables studied, only serum cholesterol was found significant for the development of CVD. Even though this study provided a background for formal CVD studies, its resources and sample size were inadequate to produce predictive information about CVD until long after Framingham "Risk Factors" were laid out (Dawber, 1951). The Framingham Study was the biggest epidemiological study in the history of cardiovascular disease and it was started in Framingham, Massachusetts in 1948 (Epstein, 1996; Blackburn, 2007; Oppenheimer, 2005).

The purpose of the Framingham Heart Study was to identify the common factors or characteristics that contribute to CVD by following a large group of participants who were physically healthy and had no symptoms (Dawber et al., 1951). After monitoring and following those participants over many years, major risk factors such as, high blood pressure, high blood cholesterol, smoking, obesity, diabetes, and physical inactivity were identified (Dawber, 1980). Thus, the concept of risk factors came into existence after Framingham Heart Study (Kannel, Dawber, Kagan, Revotskie, & Stokes, 1961; Luepker et al., 2004). Other information like the effects of related factors such as blood triglyceride and high density lipoprotein (HDL) cholesterol levels, age, gender, and psychosocial issues were also recognized as possible risk factors of CVD with subsequent study of CVD (Blackburn, 2007; Luepker et al., 2004).

After the start of Framingham study, other similar studies like Multifactor CVD Prevention Trial in Helsinki Businessmen, Oslo Trial on treatment of Mild Hypertension and

many other studies were conducted to find more about CVD and its risk factors in different parts of the world (Blackburn, 2007). In the past fifty years, about 1,200 Framingham study related articles were published in the leading medical journals (Blackburn, 2007; Oppenheimer, 2005). The concept of CVD risk factors has become the base of modern medicine and has led to the development of effective treatment and preventive strategies in clinical practice (Jaquish, 2007) . The Framingham Heart Study continues to make important scientific contributions by enhancing its research capabilities and it is still ongoing as of today (Blackburn, 2007).

Another study done in London called "London Transport Workers Study" examined the role of physical activity in the development of CVD (Morris, 1953). About 31,000 bus, trams and trolleybus drivers and conductors, motormen and underground railway guards were observed. The investigators found that employees in positions that required high physical activity had lower rates of coronary heart disease while comparing to employees who basically worked in seating positions. After this study, role of physical activity in the development of CVD was known and other related studies were conducted thereafter (Morris, 1973; Paffenbarger, 2001).

The Seven Countries Study by Ancel Keys began in 1957 to find out the relationship between CVD, dietary intake, and lifestyles behavior. Countries involved in this study were the USA, Finland, Netherlands, Italy, Yugoslavia, Greece, and Japan (Blackburn, 2007; Luepker et al., 2004). The Seven Countries Study provided evidence confirming the original hypotheses, that elevated mean blood cholesterol levels and intake of saturated fatty acids played vital role in the development of CVD (Epstein, 1996). Major differences in CVD risk were found among the studied population with the USA and Finland being the highest risk and Japan and Greece being the lowest risk (Blackburn, 2007). Even though Seven Countries populations had different mortality rates, the „traditional" CVD risk factors of diet, serum cholesterol, blood pressure, and

cigarette smoking were collectively predictive of an individual‟s risk of developing CVD (Dawber, 1980).

The World Health Organization launched MONICA Project (Multinational Monitoring of trends and Determinants in Cardiovascular disease) in 1978 to measure trends and determinants in cardiovascular disease mortality and coronary heart disease and cerebrovascular disease morbidity, and to assess the extent to which these trends are related to changes in known risk factors (Evans et al., 2001; Keil & Kuulasmaa, 1989). Cardiovascular risk factors were monitored from 1979-1996 across 38 populations from 21 countries representing four continents. The results of MONICA project revealed that males‟ smoking rates were on the decline whereas females‟ smoking was on the rise, blood cholesterol generally showed downward trends in both sexes, but had large effect on CVD risk, and body mass index was increased in half of females and two third of males showing significant risk of CVD . Overall, the CVD risk factor trends were downwards in most populations, but increasing trends in smoking and BMI were alarming findings of the MONICA study (Keil & Kuulasmaa, 1989).

Research and studies on CVD are ongoing as of today. Framingham Heart Study is on its third phase now and as a result of which the development of CVD risk can be predicted for 10-30 years (Framingham Heart Study, 2011). CDC launched a public health *Action Plan* to prevent heart disease and stroke in 2003 and updated it in 2008. The *Action Plan* provides a comprehensive public health strategy and a framework to guide health practitioners‟ and policy makers‟ action in heart disease and stroke prevention (CDC, 2008). AHA updates and publishes National Heart Disease and Statistics Update every year. Several organizations like AHA, CDC,

National Heart Lung and Blood Institute (NHLBI), WHO, World Heart Federation (WHF) are working for prevention and control of CVD, the number one killer in the world.

Prevalence of CVD

Prevalence is an estimate of how many people have a disease at a given point or period in time (Roger et al., 2011). During the past half century, the prevalence of CVD has declined continuously, however CVD remained the leading causing of death worldwide and in the United States. Approximately 82 million American adults (>1 in 3) have one or more types of CVD (Roger et al., 2011). The prevalence increases with age and varies within racial and ethnic backgrounds. Among 82 million adults with one or more forms of CVD, the most prevalent conditions are high blood pressure (76 million), coronary heart disease (16 million), stroke (7 million), heart failure (5.7 million), and congenital heart disease (1.3 million) (Roger et al., 2011).

Even though advancing age is the most powerful risk factor for CVD, about 62% of adults living with CVD are younger than age 65. Especially, men and women ages 55-64 are of concern because 52% men and 56.5 % women of this age group live with one or more forms of CVD. Children and young adults also represent an important age group. Even though the overall incidence of CVD in children and young adults is low (600 cases per year), sudden cardiac death accounts for one in five unexpected sudden deaths among children ages 1–13 and for one in three among those ages 14–21. Previous researches done on CVD indicated that risk factors for heart disease begin early at the young age (Berenson, 2009; Pencina et al., 2009; Strong et al., 1999). Studies completed among university students showed that college students are also at risk of developing heart diseases (Hlaing et al., 2007; Sparling et al., 1999; Spencer, 2002).

The decrease in the prevalence rate means that the prevention and control of CVD is effective, but still more work need to be done. Data from Behavioral Risk Factor Surveillance System (BRFSS) surveys for the period 2006 - 2010 revealed that the prevalence of CVD was greatest among persons aged ≥65 years (19.8%), followed by those aged 45-64 years (7.1%) and those aged 18-44 years (1.2%). CVD prevalence was greater among men (7.8%) than women (4.6%), and among those with less than a high school education (9.2%), compared with high school graduates (6.7%), those with some college (6.2%), and those with more than a college degree (4.6%). Among racial/ethnic groups, CVD prevalence was greatest among American Indians/Alaska Natives (11.6%), followed by blacks (6.5%), Hispanics (6.1%), whites (5.8%), and Asians or Native Hawaiians/Other Pacific Islanders (3.9%). By race and sex in 2010, the greatest male prevalence were among American Indian/Alaska Natives (14.3%) and whites (7.7%), and the greatest females prevalence were among American Indian/Alaska Natives (8.4%) and blacks (5.9%) (CDC, 2011b).

Prevention of Cardiovascular Disease

More than half-century of research and experience in CVD provided a scientific basis for the prevention of this number one chronic killer (USDHHS, 2003). Even though CVD mortality is reduced, current evidence suggests that cardiovascular disease is potential threat for everyone (Gray, Lee, Sesso, & Batty, 2011; Lloyd-Jones et al., 2010; Roger et al., 2011). The decline in the mortality is due to the improvements in acute clinical care and secondary prevention after the onset of CVD (McGovern et al., 2001; Rosamond et al., 1998). Effective prevention strategies could reduce the current burden of CVD (Brownstein, 2008). Prevention generally divided into three main categories: primary, secondary, and tertiary prevention (McKenzie, Pinger, &

Kotecki, 2008). Other than these three categories, some authors described about primordial prevention (Pearson, 2007; Weintraub et al., 2011). Primordial prevention is defined as the prevention of the development of the risk factors in first place (Weintraub et al., 2011). Lifestyle modifications to maintain ideal body weight or reducing sodium intake in order to prevent high blood pressure are some examples of primordial prevention. AHA published guidelines for improving cardiovascular health at the community level that targeted primarily the primordial prevention (Pearson et al., 2003). This strategy has the potential not only to prevent the first heart attack or stroke in the population at risk but also to avoid the need for expensive clinical intervention in order to control risk factors such as high blood pressure, high blood cholesterol, and high blood sugar.

Primary prevention is "interventions designed to modify adverse levels of risk factors once present with the goal of preventing an initial CVD event" (Weintraub et al., 2011, p. 50). Individuals can practice primary prevention by having high level of knowledge of CVD and practicing healthy lifestyle behaviors. Some examples of primary prevention includes treating hypertension to prevent stroke or managing high cholesterol in order to prevent heart attack. There is clear evidence that population-wide primary prevention and individual health-care intervention strategies have both contributed to the declining mortality trends of CVD (Mendis, Puska, &Norrving, 2011). The MONICA project conducted by WHO showed that mortality rates from coronary heart disease and stroke declined dramatically in many of the 38 MONICA project populations (Keil, 2005).

Several well-planned risk factor intervention studies (e.g. The Stanford Three Community Study in the United States, The North Kerelia Project in Finland, Oslo Diet/Smoking

Intervention Study, Norway) have demonstrated that primary prevention can achieve substantial reduction in the incidence of CVD (Park, 2000). AHA published guidelines for primary prevention of CVD in 2002 and suggested to assess risk of CVD through risk factor screening and global risk estimation. For risk factors screening AHA recommended:

> Risk factor assessment in adults should begin at age 20 years. Family history of CVD should be regularly updated. Smoking status, diet, alcohol intake, and physical activity should be assessed at every routine evaluation. Blood pressure, body mass index, waist circumference, and pulse (to screen for atrial fibrillation) should be recorded at each visit (at least every two years). Fasting serum lipoprotein profile (or total and HDL cholesterol if fasting is unavailable) and fasting blood glucose should be measured according to patient‟s risk for hyperlipidemia and diabetes, respectively (at least every five year; if risk factors are present, every two years) For global-risk estimation Framingham risk score should be calculated for all people ages 40 or older using age, sex, smoking status, systolic blood pressure, total cholesterol, and HDL cholesterol levels and identify the level of risk (Pearson et al. 2002, p. 389).

Secondary prevention has been traditionally defined as the prevention of the disease recurrence and death after the onset of the symptomatic disease (Pearson, 2007). The goal of secondary prevention is not to prevent the onset of the disease but rather detecting early and treating early before any complications occur and it lead to disability. Examples of secondary prevention include detecting high cholesterol early and treat it or finding out diabetes at the early stage to avoid systemic complication. Approximately half of the mortality with cardiovascular disease is declined in developed countries in the last two decades due to advancement of the

medical therapy (Ford et al., 2007). New drugs trials like polypill therapy (aspirin, statins, beta-blockers, and blockers of the renin-angiotensin system are proved to reduce CVD in secondary prevention (Lonn et al., 2010).

Finally, tertiary prevention is targeted towards improving the quality of life for people with the disease by limiting complications and disabilities, reducing the severity and progression of disease, and providing rehabilitation (McKenzie et al., 2008). Examples of tertiary prevention include surgery, medication, and lifestyle changes. Angioplasty or coronary artery bypass graft for individuals who have been diagnosed with blocked arteries in the heart or who have a heart attack are examples of this level of prevention. Unlike primary and secondary prevention, tertiary prevention involves actual treatment of the disease along with its complications and is conducted primarily by health care practitioners, rather than public health agencies (Butler, 2001). Tertiary prevention efforts have demonstrated that it is possible to slow the natural course of the diseases and prevent or delay many of the complications associated with chronic diseases like heart disease.

Knowledge and Health Beliefs of CVD

Bloom (1956) identified knowledge as part of cognitive domain and identified six categories of cognitive learning. The first or very basic of these categories is knowledge, which involves recalling data or information for example identifying the symptoms of a disease or knowing safety procedures. The second level is comprehension (lowest level of understanding), third level is application (using learned material), fourth level is analysis (ability to analyze learned material), fifth level is synthesis (creating from learned material), and sixth level is

evaluation (ability to judge the value). As we move through these levels, higher level of mental functioning is required (Bloom, 1956). Knowledge can be tested as being correct or incorrect. The usual methods by which knowledge is tested are true/false questions or multiple choice questions or matching and short essay questions (Sharma & Romas, 2008; Cottrell & McKenzie, 2005).

The Coronary Artery Risk Development in Young Adults (CARDIA) study found that overall CVD knowledge among young adults is very low (Lynch et al. 2006). Vale (2000) in her study found that majority of the young adults and adolescents think heart disease prevention is important for them but numbers of other studies suggest that university students have low level of knowledge regarding CVD and they do not see CVD as a threat (Collins et al., 2004; Vanhecke et al., 2006). Another study done by Smalley et al. (2004) found that the majority of college students identified the CVD risk factors correctly, but they continued to engage in the risky behaviors. Thus, having adequate CVD knowledge is important for college students so that they can engage in healthy lifestyle behaviors.

Beliefs are convictions that a phenomenon is true or real (Rokeach, 1970). In other words beliefs can be explained as statements of perceived fact or impressions about the world, which are neither correct nor incorrect. For example, a student enters into the classroom and says that the classroom is big. For that student the classroom seems big because she might have been used to smaller classroom and from her perspective this classroom is big for her. Another student enters the same classroom and says that the classroom is small. That student might have been used to bigger classrooms and from her perspective the classroom is small. Both the student‟s statements about the class are right, but their beliefs are different.

A very common health belief is that going outside with wet head causes pneumonia (Hayden, 2009). Modern medicine tells us that pneumonia is a bacterial disease and can happen from many causes but wet head is not one of them. However, if people belief that wet head causes pneumonia, then they might not go out with the wet head. An elderly woman might not go to get pneumonia vaccine because her beliefs are staying indoor until her hair get dry keeps her away from getting pneumonia. Some people‟s belief about smoking is that it is dirty, expensive, and can cause cancer while others might belief that smoking is relaxing and sociable. There is no one definitive scale to measure health beliefs as health belief tends to change and beliefs are different from individual to individuals and from one behavior to another behavior (Champion &Skinner, 2008). Various researches that were completed using HBM constructs have used Likert scales from "strongly agree to strongly disagree" to measure health beliefs (Burak & Meyer, 1997; Silver Wallace, 2002; Steers, Elliott, Nemiro, Ditman, & Oskamp, 1996; Sullivan, White, Young, & Scott, 2010).

CVD Risk Factors

AHA (2011c) classified risk factors for CVD into three categories: major risk factors (that significantly increase the risk of CVD), contributing risk factors (are associated with increase in CVD risk, but their significance and prevalence have not been precisely determined), and modifiable risk factors (that can be controlled, modified or treated). Major risk factors that cannot be changed are age, sex, and hereditary including race. The more of these risk factors you have, the more you have chance of developing CVD (AHA, 2011c; Berenson et al., 1998). Major risk factors that can be modified, treated or controlled are high blood cholesterol, high blood

pressure, physical inactivity, obesity and overweight, high blood sugar (Diabetes Mellitus), and tobacco smoking (AHA, 2011c).

1. Major risk factors that cannot be changed:

a) Race and ethnicity

The major risk factor that we do not have control over is race/ethnicity. CVD is higher among African Americans while comparing to Caucasians and it is also high among Mexican Americans, American Indians, Native Hawaiians, and some Asian Americans (AHA, 2011c; Thomas, Eberly, Smith, Neaton, & Stamler, 2005). National Heart Disease and Stroke Update 2011 reported that the prevalence of having more than two CVD risk factors was high among blacks which were 48.7%. The rate of high blood pressure in African Americans is among the highest in the world (Lloyd-Jones et al., 2010). McGruder, Malarcher, Antoine, Greenlund, and Croft, (2004) found the higher prevalence of stroke and CVD risk factors among blacks.

b) Heredity/Family History

CVD runs in the family. People who have a close family member with a CVD may have a higher risk of developing that disease than those without such a family member (CDC, 2011c). A family history of heart disease appears to increase significantly the risk of heart disease (Murabito et al., 2005). The risk for heart disease can increase even more when heredity/family history is combined with unhealthy lifestyle choices, such as smoking cigarettes and eating a poor diet (CDC, 2011c). Patients with positive family history of CVD were found to have higher recurrent cardiovascular events (Mulders et al., 2011). The presence of family history of CVD among patients prompts physicians and clinicians to recommend necessary preventive actions

(Zlot, Valdez, Han, Silvey, & Leman, 2010). Many people know that their relatives died at young age, but most of them are unaware about the reason of death of their family members (Kwiterovich, 1998). If people know about their family history and tell their doctor about it, the doctor can find their risk of developing CVD.

c) Age

Age is the most powerful independent risk factor for CVD and the risk doubles every decade after age 55 (WHO, 2011d). Even though CVD can happen at any age, the risk of having CVD increases with age (AHA, 2011c). As people age, heart also diminishes its functions. The wall of the heart thickens and arteries may get stiff making hard for pumping the blood. All of these changes in the heart make people vulnerable for developing CVD when they age. AHA recommends everyone to undergo cardiac risk assessment at the age of 40 and every five years thereafter. Different studies on heart disease demonstrated that risk factors for heart disease begin to develop at the young age (Berenson, 2009; Pencina et al., 2009; Strong et al., 1999). Studies completed among university students showed that college students have enough risk factors for developing CVD (Hlaing et al., 2007; Sparling et al., 1999; Spencer, 2002).

d) Gender

Heart disease was thought to be of "man"s disease", but about the same number of men and women die each year in the United States because of heart disease (Mosca et al., 2006). About one in four men and women die of CVD each year in the United States (Heron, 2011). Before the menopause, women are more protected from CVD because of sex hormones they have but after menopause risk for CVD in women increases (AHA, 2011c). A study done by

Mosca et al. (2006) found that 36% of women did not perceive themselves to be at risk for heart disease. National Vital Statistics Report 2007 showed that heart disease is the number one killer for both men and women in the United States. In both men and women risk factors such as hypertension, high blood cholesterol level, smoking, lack of physical activity and obesity increase the probability of developing CVD (Zhang, 2010).

2. Major risk factors you can modify, treat or control by changing your lifestyle or taking medicine:

a) High Blood Cholesterol

High blood cholesterol is one of the major risk factors for developing heart disease (NHLBI, 2009; AHA, 2011d). As cholesterol level increases, the chance of having heart disease and stroke also increases. When there is too much cholesterol (a fat-like substance) in the blood, it builds up in the wall of the arteries making them thick and hard. As build up continues to grow, it can completely block the blood follow resulting heart attack or stroke. High blood cholesterol itself does not cause any symptom that is why many people do not know that they have high cholesterol levels. Blood cholesterol levels can be detected through fasting blood test. The recommended blood cholesterol levels by NHLBI are as follows:

- Total cholesterol - less than 200 mg/dL.
- Low-density lipoprotein (LDL, or “bad”) cholesterol - level lower than 100 mg/dL. (The higher your LDL cholesterol level, the greater your chance of getting heart disease.)

- High-density lipoprotein (HDL, or "good") cholesterol- which helps keep cholesterol from building up in the arteries. An HDL of ≥ 60 mg/dL will help lower your risk for heart disease. (The higher your HDL cholesterol level, the lower your chance of getting heart disease.)

- Triglycerides- another form of fat in your blood. Levels that are borderline high (150–199 mg/dL) or high (≥ 200 mg/dL) may need treatment in some people (NHLBI, 2009).

Blood cholesterol levels can be lowered by eating low fat containing food, maintaining healthy body weight, being physically active, and taking cholesterol lowering medications (CDC, 2011d). High cholesterol can be a part of family medical history and may increase as people grow older. Studies done among college students ages 18-26, showed high level of blood cholesterol (Sparling & Snow, 1999; Spencer, 2002). Heart Disease and Stroke Statistics Update (2010) reported that more than 102 million American adults (20 years or older) have high blood cholesterol levels. In 1985, National Cholesterol program began and it recommended checking blood cholesterol levels for adults 20 years or older every five years (NHLBI, 2011a). A study done by Klag et al. (1993) found a strong association between the serum cholesterol level at the early adult life with CVD in midlife and mortality with CVD.

b) High Blood Pressure

Blood pressure is the force exerted in the walls of the arteries when the heart pumps the blood (NHLBI, 2011b). If this pressure remains high, it can cause damage to the body in

several ways. AHA (2011e) reported high blood pressure as "the silent killer" because often it has no symptoms but it can cause damage to the heart, kidneys, eyes, and brain. Blood pressure is typically measured in two numbers, the upper one is called systolic pressure (pressure in the arteries when the heart is contracting), and the lower one is called diastolic pressure (pressure in the arteries when the heart is relaxing or filling). Less than 120 of systolic and less than 80 of diastolic pressure is considered normal blood pressure (AHA, 2011e). The following table reflects blood pressure categories defined by the AHA.

Table 1

Blood pressure categories defined by the AHA.

Blood Pressure Category	Systolic mm Hg (upper#)		Diastolic mm Hg (lower#)
Normal	less than 120	and	less than 80
Prehypertension	120-139	or	80-89
High Blood Pressure (Hypertension) Stage 1	140-159	or	90-99
High Blood Pressure (Hypertension) Stage 2	160 or higher	or	100 or higher
Hypertensive Crisis (Emergency care needed)	Higher than 180	or	Higher than 110

Adapted from AHA (2011e)

High blood pressure is another major risk factor for developing CVD (AHA, 2011c). According to National Health and Nutrition Examination Survey (NHANES) 2005-2008, approximately 68 million (33.5 %) of adults older than 18 years of age have hypertension in the United States. Only 48% of the adults who have high blood pressure are able to control their

blood pressure (Roger et al., 2011). The prevalence of hypertension is nearly equal between men and women. If left untreated, high blood pressure can cause heart attack, stroke, and even death (AHA, 2011e). Seventy-seven percent of Americans who were treated for stroke had blood pressure over 140/90 and 69 % of Americans who had their first heart attack also reported to have blood pressure levels more then140/90 (AHA, 2011e).

The Harvard Alumni Health Study examined blood pressure of almost 19,000 students when they enter college (at age 18) and followed them for 38 years (from 1914-1952), revealed that elevated blood pressure when the participants were young adults was associated with an increased risk of all-cause death, CVD related death and coronary heart disease-related death during the follow-up period (Gray et al., 2011). A longitudinal study done by The Chicago Heart Association Detection project found blood pressure above normal was significantly related to increased long-term mortality due to Coronary Heart Disease (CHD), CVD, and all causes (Miura et al., 2001). The WHF considers hypertension as the most important causes of premature death and the problem is growing (WHF, 2011a).

c) Physical inactivity

Inactive people are nearly twice as likely to develop heart disease while comparing to active people (USDHHS, 2008). In order to reduce the risk of heart disease, adults only need to do about 30 minutes of moderate activity on most, preferably all, days of the week (AHA, 2011f). Regular physical activity can improve the health and quality of life of Americans of all ages. The AHA (2011f) recommends 30-minutes of moderate activity, but three 10-minute periods of activity are almost as beneficial to your overall fitness as one 30-minute session.

According to National College Health Assessment Survey (2011), only 48.3% of college students met recommended guidelines of moderate and vigorous intensity exercise. A study done among ethnically diverse college students found that 46.7% of students did not engage in vigorous physical activity (Suminski, Petosa, Utter, & Zhang, 2002). The National Youth Risk Behavior Survey (2009) data also showed increasing trends of physical inactivity among youth. Most adults in the United States lead sedentary lifestyles and perform little physical activity and college students have same pattern (Donatelle, 2010). Physical activity can help reduce the risk of heart disease by controlling blood cholesterol, lowering blood pressure, maintaining blood sugar levels, and decreasing obesity (AHA, 2011f). Furthermore, physically active people save $500 a year in health care costs (AHA, 2011f).

d) Obesity and overweight

Obesity is now considered a major risk factor for coronary heart disease, which can lead to heart attack and stroke (AHA, 2011g; CDC, 2011f). Overweight and obesity are associated with numerous cardiac complications such as coronary heart disease, heart failure, and sudden death because of their impact on the cardiovascular system. During the past 20 years, there has been a tremendous increase in the prevalence of obesity in the United States and it continues to remain high (Flegal, Carroll, Ogden, & Curtin, 2010; CDC, 2011f; AHA, 2011g). According to the 2005–2008 NHANES, 34.2% of the U.S. adults ages 20 years and over are overweight, 33.8% are obese, and 5.7% are extremely obese.

Data from National College Health Assessment Survey 2010 showed that only 62.7% of college students fall under health weight category, remaining almost 40% are overweight or

obese. Research done among college students demonstrated higher prevalence of overweight and obesity in this population (Adderley-Kelly, 2007; Desai, Miller, Staples, & Bravender, 2008; Huang et al., 2003; Struble, Lindley, Montgomery, Hardin, & Burcin, 2010). Furthermore in 2008, the estimated annual cost of obesity in the United States was $147 billion in medical expenses and loss of productivity (Finkelstein, Trogdon, Cohen, & Dietz, 2009).

e) Tobacco smoking

Cigarette smoking is very common and significant as a risk factor and the Surgeon General called it the leading preventable cause of disease and deaths in the United States (CDC, 2011g). AHA (2011h) reported that cigarette smoking increases the risk of coronary heart disease by itself and when it acts with other factors, the risks highly increase. Prevalence of smoking among college students is decreased in the recent years from 30% in 1999 to 18.1 % in 2011 (ACHA, NCHA Executive Summary, 2011), however the current rate is considered very high for this population. About 80% of the college students started smoking before the age of 18 and this is nearly equal among college men and women (Donatelle, 2011).

Smokers' chances of developing coronary heart disease are 2-4 times higher than that of nonsmokers and people who smoke a pack of cigarettes a day have more than twice the risk of heart attack than people who‟ve never smoked (AHA, 2011c; CDC, 2011g). Cigarette smoking is a powerful independent risk factor for sudden cardiac death in patients with coronary heart disease and it approximately doubles a person's risk for stroke (CDC, 2011g). Cigarette smoking also acts with other risk factors to greatly increase the risk for coronary heart disease by narrowing the blood vessels and causing reduced circulation (AHA, 2011h). Exposure to the

second hand smoking increases the risk of heart disease even for nonsmokers (CDC, 2009). Nonsmokers who are exposed to secondhand smoke at home or work increase their heart disease risk by 25–30% and their lung cancer risk by 20–30%. People who already have heart disease and are exposed to second hand smoking are at especially high risk for heart attack (CDC, 2009).

f) Type II Diabetes

Diabetes is another major risk factor for CVD (CDC, 2011c; AHA, 2011c; WHF, 2011b). More than 65% of people who have diabetes die from some type of CVD (USDHHS, 2005). In the United States, about 1.9 million people aged 20 years or older were newly diagnosed with Type II Diabetes in 2010 (National Diabetes Fact Sheet, 2011). People with diabetes have two to four times higher risk of developing CVD than people without diabetes (CDC, 2011h; WHF, 2011b). In addition, nearly 7 million people have this serious disease but do not know that. Since 1980, the prevalence of diabetes among the US adults increased by more than 50% making it a fastest growing chronic disease in American history (National Diabetes Fact Sheet, 2011).

Many people do not have diabetes, but are at high risk for developing this disease. National Diabetes Fact Sheet 2011 projected that about 79 million Americans have a condition known as “prediabetes,” in which blood glucose levels are higher than normal but not yet in the diabetic range. American Diabetic Association (ADA) defined prediabetes as a fasting blood glucose level of 100–125 mg/dL (ADA, 2011). People with prediabetes can prevent or delay the development of diabetes by making changes in their diet and physical activity. In prediabetic stage, people have a 50% greater chance of having a heart attack or stroke than those with normal blood glucose levels (WHF, 2011b). By controlling risk factors like high blood pressure,

high blood cholesterol, diet and nutrition, and being physically active, people can control their blood sugar levels (ADA, 2011).

Some of the symptoms of diabetes are like fatigue, nausea, frequent urination, unusual thirst, weight loss, blurred vision, frequent infections, and slow healing of sores. As Type II Diabetes develops gradually, sometimes you may not have any symptoms at all (ADA, 2011). ADA considers fasting blood glucose level of 126 mg/dL or higher as diabetes. By controlling blood glucose level, a person can reduce the risk of developing CVD event by 42% (WHF, 2011b). If left untreated, diabetes can cause serious health complications including heart disease, blindness, kidney failure, and lower-extremity amputations (CDC, 2011h; ADA, 2011).

3. Other factors that contribute to heart disease risk:

a) Stress

AHA (2011c) classified stress as a contributing risk factor for developing CVD. The increased risk of CVD from chronic stress has been linked to increased plaque buildup as a result of elevated cholesterol, hardening of the arteries, change in the blood pressure, and abnormal working rhythm of the heart (Dimsdale, 2008). The largest epidemiological study to date, the "INTERHEART STUDY", with almost 30,000 participants in 52 countries, identified stress as one of the key modifiable risk factor for heart attack (Whincup et al., 2005). Similarly, the National Health Interview Study conducted by CDC reported that stress is accountable for 30% risk of heart attacks (Torpy, 2007). Living a stressful life can cause people to adopt poor habits like smoking, overeating, and drinking, which in turn are risk factors for CVD (WHF, 2011a). Regular physical activity not only relieves stress, but also can directly lower one"s risk of heart

disease. Staying physically active, developing social support in a person‟s life, and sharing one‟s feelings and concerns with other people can help reduce stress and decrease the chance of developing CVD (USDHHS, 2005).

b) Alcohol

Alcohol affects the cardiovascular system in number of ways. AHA (2011i) suggested that too much consumption of alcohol can raise the levels of some fat in the blood, and can cause serious medical problems like fetal alcohol syndrome, cardiomyopathy, cardiac arrhythmia, and sudden cardiac death. Heavy alcohol consumption increases risk for hypertension, which in itself is a major risk factor for CVD (Beulens et al., 2007). Alcohol consumption is very popular on college campuses, where approximately 59.8% of students report having consumed alcoholic beverages in the past 30 days, and almost half of them were heavy binge drinkers (ACHA, 2010). Binge drinking is defined as consuming five or more drink for male or four or more drink for female in about two hours (Donatelle, 2011). A meta-analysis done by Costanzo, Di Castelnuvo, Donati, Iacoviello, and de Gaetano, (2010) showed that light to moderate alcohol consumption is good for cardiovascular health, however AHA do not recommends people to take alcohol regularly for the prevention of CVD.

c) Diet and Nutrition

Making healthy food choices can reduce the risk of getting CVD. AHA (2011j) recommends diet rich in vegetables, fruits, whole-grain and high-fiber foods, fish, lean protein and fat-free or low-fat dairy products for the good cardiovascular health. The foods people eat directly have impact on other controllable risk factors like cholesterol, blood pressure, diabetes, and being overweight. Low fruits and vegetables intake is estimated to cause 31% of coronary

heart disease and 11% of stroke worldwide (WHO, 2011 e). According to National College Health Assessment Survey 2010, only 4.8 % of college students consume recommended five or more servings of fruits and vegetables a day.

New/ Novel risk factors

Several other emerging risk factors (also called novel risk factors) for the development of CVD have been identified (WHO, 2011e; USHHS, 2005). For example: *C-reactive protein (CRP)* - high levels of CRP indicates inflammation of the arterial walls and simple blood test can detect levels of CRP in the blood. *Homocysteine* - high level of this amino acid may increase risk of heart disease. *Lp(a) protein* -is the lipoprotein that makes easier to form blood clots, thus, increases risk of CVD.

Theoretical Framework

The Health Belief Model (HBM) will be used as a theoretical framework for this study. HBM is one of the most widely used conceptual frameworks in health behavior research and it is designed to explain health behavior by better understanding beliefs about health (Glanz et al., 2008; Nutbeam & Harris, 2004). This model was originated from a group of social psychologists who worked in the U.S. Public Health Service in the 1950s: Godfrey Hochbaum, Stephen Kegels, and Irwin Rosenstock (Hochbaum 1958; Rosenstock, 1960). These psychologists were concerned about why people were not participating in free tuberculosis screening program offered by Public Health Service. To explain this phenomenon, and help recruit more people on screenings programs, these psychologists developed HBM (Sharma & Romas, 2008).

The HBM is based on value expectancy theory developed by Kurt Lewin (Lewin, 1935), who explained that behavior change depends on two things: i) the desire to avoid illness or get

well (value); and ii) the belief that a specific health action available to a person would prevent illness (expectancy) (Maiman & Becker, 1974). The expectancy was further described in terms of the individual"s approximations of personal susceptibility to and perceived severity of an illness, and likelihood of being able to reduce that threat through personal action. Initially, the HBM was used to address preventive health behaviors (Rosenstock, 1974), later it was applied to illness behaviors (Kirscht, 1974), and behaviors related to chronic illness (Kasl, 1974).

The following perceptions: perceived susceptibility, perceive severity, perceived benefits, and perceived barriers are the main four constructs of HBM (National Cancer Institute, 2003; Champion & Skinner, 2008). Each of these perceptions, individually or in combination, are used to explain health behaviors. Additional constructs such as cues to action, motivating factors, and self-efficacy have been added to the model (Champion & Skinner, 2008). This study will be based on the four main constructs of HBM.

Perceived susceptibility refers to "beliefs about the likelihood of getting a disease or condition" (Champion & Skinner, 2008, p. 47). For example, college students must believe that there is possibility of getting CVD if they do not practice healthy behaviors. Perception of susceptibility vary among individuals to any given illness or disease (National Cancer Institute, 2003). There are some people on one extreme who completely deny any possibility of getting the disease, whereas other people might admit the possibility of acquiring the disease but believe that it is not likely to happen to them (Sharma & Romas, 2008). The last groups of people are very much fearful of getting the disease but still believe that they will not acquire it. According to HBM, the more susceptible a person feels the greater likelihood of his or her taking preventive

measures (Champion & Skinner, 2008; Sharma & Romas, 2008). Perceived susceptibility has a strong cognitive component and is partly dependent on knowledge (Rosenstock, 1974).

Perceived severity/seriousness refers to "feelings about the seriousness of contracting an illness or of leaving it untreated include evaluations of both medical and clinical consequences and possible social consequences" (Champion & Skinner, 2008, p. 47). This perception also differs from person to person. Some people might perceive the disease purely from medical perspective and are mostly worried about signs and symptoms, while others might look from social perspective like adverse effects on the job, family, and relationships (Sharma & Romas, 2008). Rosenstock (1974) explained that like perceived susceptibility, perceived severity also has strong cognitive component which depends on knowledge. According to HBM, health educators need to build perceived severity by explaining the severity of the disease and personalizing those to participants (Janz et al. 2002). For example, college students might be explained that consumption of large amount of saturated fats may lead to development of CVD and might also share an example of community member who had a heart attack (Sharma & Roams, 2008).

When perception of susceptibility is combined with perceived severity, it results in perceived threat (Champion & Skinner, 2008). Previous researches shown that when there is high perceived threat, people have high chance of changing the behavior (National Cancer Institute, 2003). For example, the higher perception of threat of contracting mad cow disease, made people not to eat beef in Germany (Weitkunat et al., 2003), and colon cancer survivor changed their eating habits because of threat of recurrence of the disease (Mullens et al., 2003).

The construct of perceived benefits is a person‟s belief of the value or usefulness of a new behavior while trying to reduce the risk of developing a disease (Champion & Skinner,

2008). People tend to engage in a behavior when they believe that there is benefit of doing it. For example, smokers will never quit if they do not believe that quitting is beneficial to their health or people might not eat enough fruits and vegetables if they do not know the benefits of eating five servings of fruits and vegetables a day (National Cancer Institute, 2003). Even though procedure of mammogram and colonoscopy is uncomfortable, people still go for screening knowing the benefits of reducing breast and colon cancer (Frank, Swedmark,& Grubbs, 2004; Graham, 2002).

Perceived barrier is an individual"s own evaluation of the obstacles in the way of him or her adopting a new behavior (Champion & Skinner, 2008). An individual may believe that taking preventive action is good to reduce perceived susceptibility and perceived severity, but may consider the action to be expensive, inconvenient or upsetting (Rosenstock, 1974). In order for a new behavior to be adopted, a person should believe that benefits of adopting a new behavior should outweigh the consequences of continuing old behavior (CDC, 2004). This enables to change old behavior and adopt new behavior. Among all the constructs of HBM, perceived barriers are the most significant in determining behavior change (Janz & Becker, 1984; Champion & Skinner, 2008).

In addition to the four beliefs or perceptions, the HBM proposes that behavior is also influenced by cues to action (Champion & Skinner, 2008). Cues to action are the events or situations which trigger people to take action for their health behavior (National Cancer Institute, 2003). Illness of a family member, media reports, mass media campaigns, advice from others, reminder postcards from health care providers, and health warning levels in the products are some examples of cues to action (Graham, 2002; Ali, 2002).

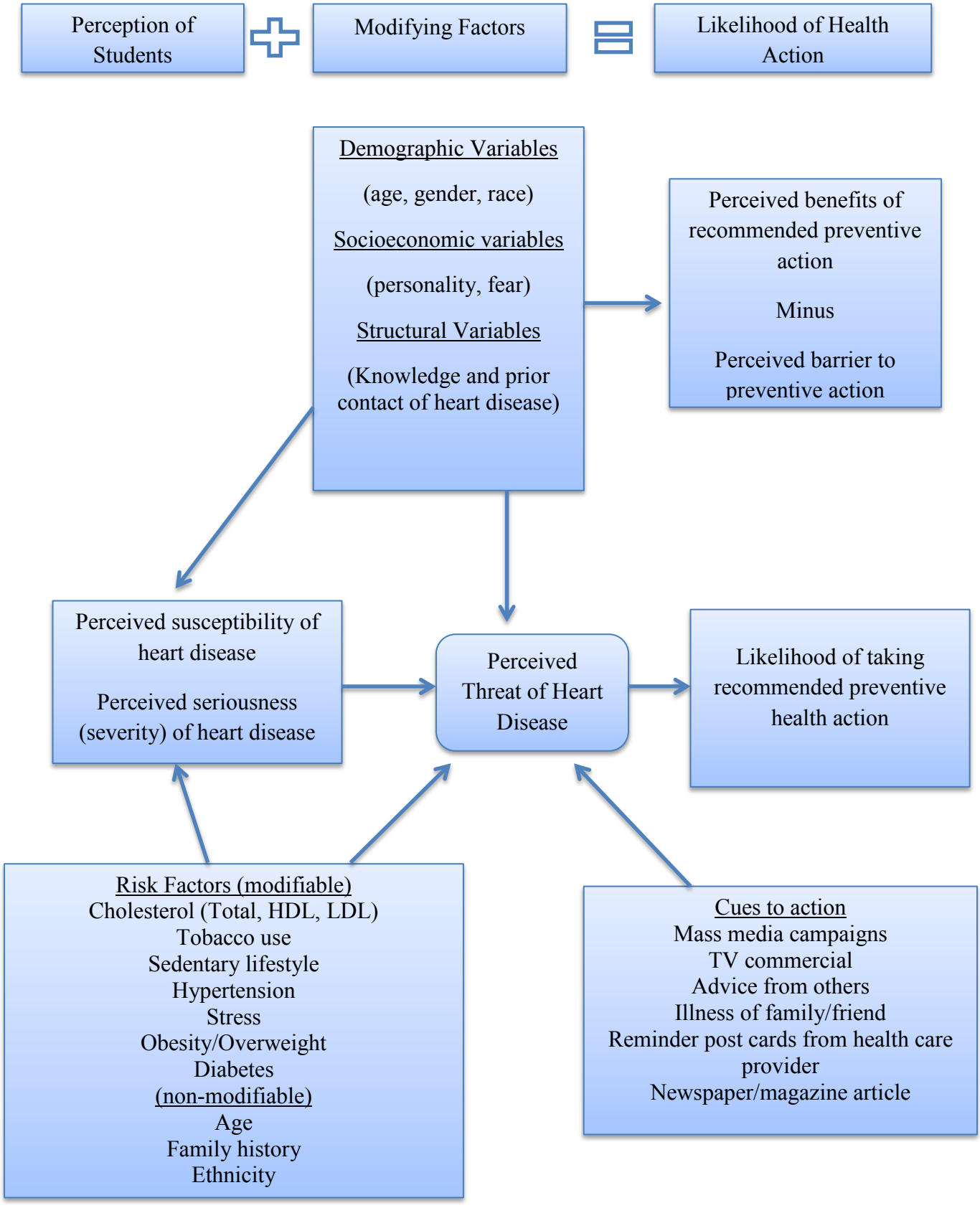
As HBM continued to change and evolve, in 1988 self-efficacy was added to the original four beliefs of HBM (Rosenstock, Strecher, & Becker, 1988). Bandura (1977) explained that self-efficacy is the belief in one‟s own ability to do something. People generally do not try to do new things unless they believe that they are capable of doing it. If someone believes that a new behavior is useful (perceived benefit), but does not think he is capable of doing it (perceived barrier), chances that it will not be tried (National Cancer Institute, 2003).

The constructs of HBM are modified by other variables such as age, sex, ethnicity, education level, past experiences, and knowledge are some of them (National Cancer Institute, 2003). All of these variables individually or in combination can influence individual‟s perceptions (Champion & Skinner, 2008). For example, if a person has experienced heart attack, he/she might have heightened perception of susceptibility because of this past experience. This person will be more conscious about his eating and drinking habits. On the other hand, this person‟s perception of severity could be diminished because of knowing and experiencing how easily heart attack is treated and cured (CDC, 2004; Sharma &Romas, 2008). Champion and Skinner (2008) gave the overview of the HBM as:

> If individuals regard themselves as susceptible to a condition, believe that condition would have potentially serious consequences, believe that a course of action available to them would be beneficial in reducing wither their susceptibility to or severity of the condition, and believe the anticipated benefits of taking action outweigh the barriers to (or cost of) action, they are likely to take action that they believe will reduce their risks (p. 47).

Figure 1. Overview of Health Belief Model

Adopted from Champion and Skinner (2008).



Some examples of behavioral research where HBM was used are: predicting health behaviors of college students (Von Ah, Ebert, Ngamvitroj, Parj, & Kang, 2004), perception of lung cancer and smoking among college students (Kofahi & Haddad, 2005), enhancing health knowledge and belief through television programming (Chew, Palmer, Slonska, & Subbiah, 2002), and osteoporosis prevention in college women (Silver Wallace, 2002). The HBM have been used as a theoretical framework in a number of cardiovascular health related studies (Boudreau, 1995; Dong-Chul et al., 2008; Prue-Owens, 2007; Shiplett, 2008).

In the study where HBM was used to find out women‟s perception of heart disease, it was discovered that participants did not perceive themselves to be at high risk for developing heart disease, however, they all regarded heart disease as a serious condition (Jones, Weaver, Grimley, Appel, & Ard, 2006). While investigating heart disease prevention behavior of women, Ali (2002) found that perceived susceptibility was the strongest predictor for participating in the prevention activities. A workshop conducted using HBM to improve CVD knowledge and susceptibility showed more than 50% increase in knowledge and susceptibility among participants (Jones, Weaver, & Friedmann, 2007). Intervention using HBM was found to be effective in improving knowledge, attitude, and behavior of coronary artery disease patients (Mohamaei, Nouri, Noohi, & Maleki, 2004).

The HBM has been found to be most useful because of its illustration of the importance of individual beliefs about health and the relative costs and benefits of actions to modify health behavior (Nutbeam & Harris, 2004). In a literature review of studies using HBM for ten years, 86% of the studies found perceived susceptibility as a positive predictor of preventive health behaviors (Janz & Becker, 1984). Among studies that looked at sick-role behaviors (such as

compliance with medication regimens, self-help behaviors among people with diabetes), "perceived benefits" proved to be the strongest predictor of engaging in health behaviors. The use of HBM from the last thirty years demonstrated that change in health beliefs of individuals can lead to change in behavior and improved health status (Champion & Skinner, 2008). Change in knowledge and belief is always the part of comprehensive health promotion program and HBM provides a framework for effective intervention programs (Sharma & Romas, 2008).

Summary

The literature review revealed that epidemiological studies on CVD began in the early 1940‟s and are ongoing as of today. During the past half century, the prevalence of CVD continuously declined, but it still remains the number one killer in the world and in the United States. Previous researches on CVD demonstrated that development of CVD begins early at young age. Studies done among college students and younger population showed that younger populations are also at risk of developing CVD and they have low level of knowledge about CVD. Major risk factors of CVD like high blood pressure, high blood cholesterol, physical inactivity, obesity and overweight, and Type II Diabetes are modifiable and can be prevented. The CVD preventive measures are focused on primordial and primary prevention. The HBM will provide a theoretical framework for this study, and its four major constructs perceived susceptibility, perceived severity, perceived benefits, and perceived barriers were explained in detail.

CHAPTER III

METHODS

Introduction

This chapter will provide overview of the procedures that will be used to complete this study. Topics in this chapter include purpose of the study, research design, research questions, sample, a detailed description of the instruments (including validity and reliability information), data collection procedures, and statistical analyses.

Purpose of the Study

The primary purpose of this study was to determine overall knowledge and health beliefs about CVD among selected undergraduate university students and find out the risk of developing CVD in this population. The secondary purpose was to assess the relationship between knowledge, health beliefs, and personal risks about CVD among these students. The tertiary purpose was to determine the factors that predict the relationship between demographic variables and cardiovascular risk factors among these students.

Research Questions

The following research questions were set for this study in order address the knowledge and health beliefs of university students regarding CVD.

1. What are the overall levels of knowledge and health beliefs about CVD among selected undergraduate university students?
2. What are the relationships between total knowledge, knowledge subtypes, and health belief subscales (knowledge and perceived susceptibility, knowledge and perceived

severity, knowledge and perceived benefits, knowledge and perceived barriers) about CVD among selected undergraduate university students?

3. What are the personal risks of developing CVD and are there any relationships between personal risk, health knowledge, and individual health beliefs about CVD among selected undergraduate university students?
4. Which personal variable (age, gender, lifestyle risk, family history, total number of health classes taken, Race/Ethnicity, Domestic/International, live on campus/off campus, dietary behavior, exercise level) predicts CVD knowledge among university students?
5. Which personal variable (age, gender, lifestyle risk, family history, total number of health classes taken, Race/Ethnicity, Domestic/International, live on campus/off campus, dietary behavior, exercise level) predicts CVD individual health beliefs among university students?

Research Design

This quantitative study will use a cross-sectional, descriptive, and correlational survey design. Quantitative research is defined as the "research based on traditional scientific methods, which generates numerical data and usually seeks to establish causal relationships between two or more variables, using statistical methods to test the strength and significance of the relationships (A Dictionary of Nursing, 2008). Babbie (2008) defined cross-sectional study as the study that "involves observations of a sample, or cross section, of a population or phenomenon that are made at one point in time" (p. 111). A cross-sectional design was considered appropriate given that the sample to be used for this study will only be tested at one particular time.

According to Isaac and Michael (1995) descriptive studies are used, "to describe systematically the facts and characteristics of a given population or area of interest, factually and accurately" (p. 50). Correlational studies are used, "to investigate the extent to which variations in one factor correspond with variations in one or more other factors based on correlation coefficients" (p. 53).This study will focus on how knowledge and health beliefs regarding CVD are related to each other. Thus, a correlational design is appropriate. Surveys are commonly used for descriptive purposes and are perhaps the best method available to collect data for a population too large to observe directly (Babbie, 2008). Surveys research is most often used research method in health science as purpose of the investigation is specified and the population is selected and questioned systematically (Neutens & Rubinson, 2010; Babbie, 2008). Thus, the proposed research design is appropriate for this study.

Study Sample

A non-random convenience sample of selected undergraduate students enrolled in large mid-western university will be selected for this study. The participants will be males and females ages 18 and older who are enrolled in undergraduate courses like Foundation of Human Health, Medical Terminology, History, English, Engineering, and First Aid and CPR at this mid-western university. This sample was chosen because these classes are taken by undergraduate students from 32 different majors like accounting, nursing, psychology, sociology, health education, dental hygiene, physics, mathematics, biology, criminal justice, law etc. These diverse groups of students are representative of total undergraduate students. Majority of these students may not be aware of CVD risks. This young population can have a significant impact on CVD prevention efforts.

A total of 15137 undergraduate students were enrolled in the university in 2010/2011 academic calendar including 8479 males (56.01%) and 6658 females (43.98%) (SIUC Quick Fact, 2011).The students represent diverse racial/ethnic background with majority 10097 (66.7%) Whites, 3109 (20.53%) Black or African Americans, 824 (5.44%) Hispanics, 279 (1.84%) Asians, 72 (0.47%) American Indians, 39 (0.25%) Native Hawaiian, 318 (2.1%) two or more races, and 107 (0.66%) identified themselves as of unknown race/ethnicity status (SIUC Quick Fact, 2011). The sample size for the proposed study will be calculated considering following general sample size determination procedure for health science research:

Probability level alpha will be set 0.05 level of significance which means confidence interval of 95% (5% chance of making Type I error or rejecting a null hypothesis when it is in fact true), power of statistical test (1-β) is set at 0.80 which means 20% chance of making type II error or incorrectly accepting a null hypothesis when in fact it is false, and effect size (degree of association between two variables, population and sample) of 0.3 is set. The total sample size of (n= 392) is determined by looking at the Polit and Hungler‟s (1995) table for sample size identification.

Instrumentation

A 30 item *Heart Disease Knowledge Questionnaire* developed by Bergman, Reeve, Moser, Scholl, and Klein(2011), a 25 item *Health Belief Related to Cardiovascular Disease Scale* developed by Tovar, Rayens, Clark, and Nguyen(2010), and 20 item personal demographic variable and risk prediction questionnaire developed by the researcher will be used as a survey instrument for this research. Hence, the final survey will consist of 75 items. This instrument was found through extensive search on EBSCO and other library databases. Original

authors who developed the surveys were contacted by email and permission was given to use their instrument for this research. Email with permission from authors to use the instrument is attached in Appendix A.

Heart Disease Knowledge Questionnaire consists of 30 items relevant to five central domains of heart disease knowledge that include dietary knowledge (6), epidemiology knowledge (4), medical knowledge (7), risk factors knowledge (9), and heart attack symptoms knowledge (4) questions. Bergman et al. (2011) described this instrument as "concise, yet discriminating instrument that reliably measures participants" heart disease knowledge levels" p. 74. These 30 items were developed in two phases. In phase I, 606 undergraduates completed an 82-item questionnaire and in phase II, 248 undergraduates completed a revise 74-item questionnaire. In both phases, item clarity and difficulty were evaluated, along with the overall factor structure of the scale. Exploratory and confirmatory factor analyses were used to reduce the scale to 30 items with fit statistics, Comparative Fit Index (CFI) = .82, Tucker-Lewis Index (TLI) = .88, and Root Mean Square Error of Approximation (RMSEA) = .03. (Bergman et al., 2011). The item mean difficulty ranged from .18 to .75. The overall 30-item scale had an acceptable internal reliability (Kuder-Richardson 20) of .73. See Appendix C for detail questionnaire.

Health Belief Related to Cardiovascular Disease Scale consists of 25 items divided into four subscales measuring four constructs of the HBM (five items for perceived susceptibility and severity subscales, six items in the perceived benefits subscale, and nine items in the perceived barriers subscale). According to Tovar et al. (2011), the susceptibility and benefits subscales demonstrated stable factor structure and acceptable reliability ($\alpha = .93$ and $\alpha = .82$), and barriers

and severity scales had unstable factor structure and little lower internal consistency reliability with α = .70 and α = .61. All the 25 questions of health beliefs are on Likert Scale form Strongly Agree, Agree, Disagree, and Strongly Disagree. Most of the social research textbooks explained about using Likert Scales in social- behavioral research (Neutens & Rubinson, 2010; Babbie, 2008; Cottrell & McKenzie, 2005; McDermott & Sarvela, 1999). Appendix C provides a copy of the health belief scales.

Demographic variable questions No. 1, 2, 3,4, & 8(age, gender, height, weight, and race ethnicity) were developed by the researcher by looking the questions from Youth Risk Behavior Survey and National College Health Assessment Survey. Questions No. 6 & 7 about residential status and number of health classes taken was added by consulting with the committee member and the adviser. Questions No. 9 through 20 will assess the current risk of CVD among college students and were adapted from textbook of Foundation of Human Health book by Donatelle (2010).

Pilot Study

After receiving approval from the dissertation committee and Human Subjects Committee, the researcher will conduct a pilot study. The purpose of the pilot study will be to establish overall quality and clarity of the instrument, find out total time to complete the survey, and establish the data coding procedures in the SPSS. Cover letter will be read before distributing the survey and students will l sign the informed consent form before participating in the survey. Students were asked to write their remarks about survey questions if they find questions that are not clear or have any difficulty understanding them. For those students who

are not willing to participate in the survey, local campus newspaper will be given to read. Thirty five undergraduate students in one section of a Spring 2012 Medical Terminology course will be surveyed. After the pilot study, appropriate revisions will be made to the instrument before the major study commences.

Data collection

After getting Human Subjects Committee Approval from the Institutional Review Board, data collection for this study will begin at the mid of Spring semester 2012 at a large mid-western university. For the distribution of the survey, undergraduate courses will be selected in a convenient non-random manner. Convenience sampling is most commonly used in health science research as it "permit the investigator to collect a large amount of information, from a large number of people, and in a relatively small amount of time" (McDermott & Sarvela, 1999, p. 267) and it saves time and money (Neutens & Rubinson, 2010). Further, McDermott and Sarvela (1999) also stated that convenience samples are useful when the issue or research topic at hand has not been previously explored. A convenience sample for this research seems appropriate given that research related to assessing knowledge and health belief abut CVD among university students using HBM has not (to the knowledge of the researcher) been explored.

Permission to contact the classroom instructors and conduct the survey will be obtained from instructor coordinators of the selected sample classes. Classroom instructors will be contacted through personal contacts, email, or phone to schedule a date time convenient for them to distribute the survey. The researcher will follow a supervised format where he will explain the purpose of the study, read the scripted directions, and supply students with instruments, writing

utensils, and informed consent documents. According to McDermott and Sarvela (1999), “a supervised format is preferred because it allows for consistent instructions, simultaneous administration, availability to answer questions, and the monitoring of completion” (p. 251).

The researcher will arrive at the beginning of the class on the scheduled date and distribute the survey by himself. Informed consent and directions to fill out the survey will be read loud in front of the class, and also it will be attached with the survey so that students can read themselves before deciding to participate in the survey. Instructors will be asked to leave the classroom while students are taking the survey in order to avoid biases for students those who are not willing to participate in the survey. After completing the survey, students will bring their survey in front of the class and placed in a manila envelope to maintain confidentiality and anonymity. Once all the surveys are collected, the envelope will be sealed and stored in safe location by the researcher. Data will be destroyed after three years of the completion of the study.

Data analysis

Participants will directly mark their responses on the survey instrument. Each survey item will be coded by the researcher and entered into the Statistical Package for the Social Science (SPSS) software. Data will be analyzed using the SPSS version 19.0 (SPSS, Inc, 2010). Descriptive statistics including frequencies, percentages, measures of central tendency, and dispersion will be calculated for each item of the survey and for all demographic and personal variables. Total knowledge score and total subscale score (perceived susceptibility, severity, benefits, and barriers) will be calculated by using descriptive statistics. Pearson correlation

coefficient will be conducted with total knowledge score and with total and individual subscales scores on health beliefs. Multiple regression analysis will be calculated with total knowledge scores, total health belief scores and demographic and personal variables. An alpha level of 0.05 will be set to determine the level of statistical significance. The summary of research questions, survey items, and data analysis procedures are shown in Table 2.

Table 2

Summary of research question and data analysis procedures:

Research Questions	Survey Items	Data Analysis
1. What are the overall levels of knowledge and health beliefs about CVD among selected undergraduate university students?	Knowledge Q. No: 1-30, and Belief Q. No: 1-25.	Descriptive statistics
2. What are the relationships between total knowledge, knowledge subtypes, and health belief subscales (knowledge and perceived susceptibility, knowledge and perceived severity, knowledge and perceived benefits, knowledge and perceived barriers) about CVD among selected undergraduate university students?	Total knowledge score from Q. No: 1-30, knowledge subtype scores, and health belief subscale scores from Q. No: 1-25.	Pearson Correlation

Table 2 Continued.

3. What are the personal risks of developing CVD and are there any relationships between personal risk, health knowledge, and individual health beliefs about CVD among selected undergraduate university students?	Personal risk score from Q. 8-20, total knowledge score, and subscales scores Q 1-5 (Susceptibility), Q. 6-10 (Severity), Q. 11-16 (Benefits), Q. 17-25 (Barriers).	Pearson Correlation
4. Which personal variable (age, gender, lifestyle risk, family history, total number of health classes taken, Race/Ethnicity, Domestic/International, live on campus/off campus, dietary behavior, exercise level) predicts CVD knowledge among university students?	Personal variable questions from 1-20 and total knowledge score.	Multiple Regression
5. Which personal variable (age, gender, personal history, family history, total number of health classes taken, BMI, Race/Ethnicity, Domestic/International, live on campus/off campus) predicts CVD individual health beliefs among university students?	Personal variable questions 1-20 and individual health belief scores.	Multiple Regression

The knowledge part of the survey contains 30 items. Each item has true, false, and do not know option so that there is no force choice option for respondents. Items 1-30 were coded as categorical variables where "correct" = 1, and "not correct" and "do not know" = 0. Total 30 items were summed to create a total knowledge score. Total knowledge scores ranged from 0 – 30. Health beliefs part of the survey contains 25 items in four subscales: perceived susceptibility, perceived severity, perceived benefits, and perceived barriers. These items had a four-point Likert-type scale response format where 1 = "strongly disagree" (SD), 2 = "disagree" (D), 3 = "agree" (A), and 4 = "strongly agree" (SA). Total 25 items were summed to create a total health belief score. Total health belief score ranged from 25 – 100.

From each subscales total, a subscale score will be calculated. Perceived susceptibility subscale contained five items; total perceived susceptibility scores ranged from 5 – 20. Perceived severity contained five items; total scores for this subscale ranged from 5 – 20. The third subscale, perceived benefits, contained 6 items; therefore, total scores for this section ranged from 6 – 24. Finally, perceived barriers subscale contained 9 items and the possible score ranged from 9 – 36. For demographic and personal variables, there were 10 questions and each question was coded individually and entered into SPSS software.

Summary

This quantitative study will use a cross-sectional, descriptive, and correlational survey design. A 30 item *Heart Disease Knowledge Questionnaire* developed by Bergman, Reeve, Moser, Scholl, and Klein(2011), a 25 item *Health Belief Related to Cardiovascular Disease Scale* developed by Tovar, Rayens, Clark, and Nguyen (2010), and 20 item personal

demographic variable questionnaire developed by the researcher will be used as a survey instrument for this research. A non-random convenience sample of selected undergraduate students enrolled in large mid-western university will be selected for this study. After getting Human Subjects Committee Approval from the Institutional Review Board, data collection for this study will begin at the end of spring semester 2012 at a large mid-western university. A pilot study using the survey instrument will be initiated upon doctoral committee and Human Subjects Committee approval in order to establish overall quality and clarity of the instrument, find out total time to complete the survey, and establish the data coding procedures in the SPSS. Data will be analyzed to answer the proposed research questions using descriptive statistics, correlation, and multiple regression analyses. A brief summary table including all research questions and data analysis procedures is presented in Table 2.

CHAPTER IV

RESULTS

Introduction

This chapter provides detailed findings of the study. Initial section describes full explanation of the sample. The middle section examined about the reliability of the instrument and the last section described the comprehensive findings of each research questions stated at the beginning of the study.

Purpose of the Study

The primary purpose of this study was to determine overall knowledge and health beliefs about CVD among selected undergraduate university students and find out the risk of developing CVD in this population. The secondary purpose was to assess the relationship between knowledge, health beliefs, and personal risks about CVD among these students. The tertiary purpose was to determine the factors that predict the relationship between demographic variables and cardiovascular risk factors among these students.

Description of the Sample

The population of this study was 15,137 undergraduate students in a mid-western rural university. Six hundred surveys were distributed in different undergraduate classes such as Foundation of Human Health, First Aid and CPR, Medical Terminology, Math, History, and Geography. All of these classes represented diverse group of students who were enrolled in 32 different majors. Surveys were collected in the month of March through May during the Spring semester 2012. In order to participate in the study, participant had to be an undergraduate student and completed the survey only once. The researcher announced the participation criteria in every class before distributing the survey. Twenty two surveys were not fully completed by the

participants and 56 surveys were returned blank. Thus, surveys with missing data and blank surveys were not included in the data analysis. Ten respondents from different classrooms did not want to participate in the study. Students attending similar classes and who had filled out the survey once were told not to fill out the survey again. A total of 522 participants (n=522) fully completed the survey (87% response rate) and these data were used for statistical analysis.

The completed surveys were coded and entered into the Statistical Package for the Social Sciences (SPSS®) software program version 19.0 (SPSS, Inc., 2010) by the researcher. Data cleaning was done by running frequencies and finding out the data entry error. Few missing variables were entered looking back into the original survey. After the initial data cleaning, 50 random surveys (about 10%) were selected and checked for data entry error and consistency by the researcher. No data entry error was found and all the codes were matched with what was entered into SPSS®.

Among the participants, 53.6 % were females and 46.4% were males. The majority of the participants (85%) were 18 to 23 years old, 7.7 % were 24 to 26 years old, and the remaining 7.3 % were 27 years old or older. The average age of the participants was 21.77 (SD = 5.1), median age was 21, and range was 18 - 57. The Race/Ethnicity of the sample was represented by Whites (64.8 %), African American (22.8%), Asian 2.9 %, Hispanic/Latino (2.7%), Native American (0.6%), Pacific Islander (0.4%), and Other (5.9%). Eighteen participants presented themselves as multi-racial and they were included in the other ethnical category. About 60% of the participants lived off campus while 40% lived on campus. The majority of the participants (95.8%) were domestic, while only 4.2% were international students.

Body mass indexes (BMI) were calculated with self-reported height and weight information from the participants. Calculated BMI showed that 4.4 % of participants were underweight (BMI < 18.5), 59.4 % normal weight (BMI 18.5 - 25), 26.2 % overweight (BMI 25 - 29.9), and 10% (BMI 30 or higher) obese. More than half of the participants (56.9%) had taken one, 17.4% had taken two, 4% had taken three, and 8.4% had taken more than three health classes at the university. Detailed demographic information of the sample is presented in Table 3.

Table 3

Demographic Characteristics of Study Participants (n= 522 total)

Demographic Variables	**Frequency (n)**	**Percentage (%)**
Gender		
Male	242	46.4
Female	280	53.6
Age Category		
18-20	259	49.6
21-23	185	35.4
24-26	40	7.7
>27	38	7.3
Race/Ethnicity		
White	338	64.8
African American	119	22.8
Asian	15	2.9
Hispanic/Latino	14	2.7
Native American	3	0.6
Pacific Islander	2	0.4
Other	31	5.9
Living Status		
Off Campus	313	60
On Campus	209	40
Nationality		
Domestic	500	95.8
International	22	4.2
Number of Health Classes		
Zero	69	13.2
One	297	56.9
Two	91	17.4
Three	21	4
>Three	44	8.4

Note: Mean Age = 21.77, Median Age = 21, Standard Deviation = 5.1

Instrument Reliability

Cronbach alpha scores for the health belief subscales were calculated to find internal consistency of the instrument. Overall Cronbach alpha for the entire 25 item health belief questionnaire was 0.68. Among the four individual subscales of HBM, Cronbach alpha was 0.88 for perceived benefits, 0.83 for perceived susceptibility. 0.63 for perceived severity, and 0.58 for perceived barriers. The scores‟ results of the internal consistency reliability from this study showed similar patterns when comparing to the original survey (Bergman et al., 2011). When one question from severity subscale (Q. No. 6) was removed, the Cronbach alpha of severity subscale was increased from 0.63 to 0.68. From the barrier subscale, when two questions (Q. No. 19 & 20) were removed, the Cronbach alpha was increased from 0.58 to 0.76. For this study, those three questions (Q. No. 6, 19, & 20) were not used for data analysis. To find the internal consistency reliability of the knowledge items, the Kuder-Richardson 20 was calculated, which was 0.79 (See Table 4).

Table 4

Reliability of the instrument (n = 522)

Item	Cronbach Alpha	Kuder-Richardson-20
Health Belief Questionnaire (25 items)	0.68	
Perceived Benefits (six items)	0.88	
Perceived Susceptibility (five items)	0.83	
Perceived Severity (four items)	0.69	
Perceived Barriers (seven items)	0.76	
Knowledge Questionnaire (30 items)		0.79

Research Questions and Findings

Research Question No. 1: What are the overall levels of knowledge and health beliefs about CVD among selected undergraduate university students?

Thirty questions assessed general knowledge of CVD. Overall 53.33% of the participants answered knowledge questions correctly, 18.82% answered incorrectly, and 27.77% responded "do not know". The mean for total knowledge score was 16 out of 30, standard deviation 5.35, and range 1- 29. All knowledge questions were divided into dietary, epidemiological, medical, risk factors, and symptoms. Among these, 58.27% of participants correctly responded to epidemiological knowledge questions that CVD is the leading cause of death in the United States (n = 368, 70.5%) and it is considered as a long term chronic illness (n = 357, 68.4%). Risk factors‟ knowledge of CVD was correctly answered by 56.3 % of the participants. The majority of the participants answered the risk factor questions correctly such as walking and gardening lowers CVD risk (n = 453, 86.8%), eating red meat increases CVD risk (n = 395, 75.7%), diabetes increases CVD risk (n=383, 73.4%,), and high fiber diet lowers the chance of developing CVD (n=317, 60.7%). From all the risk factor questions, knowledge about smoking and stress were found to be low among the participants (n = 228, 43.7%) and (n = 164, 31.4%). Fifty-five percent of the participants answered the questions on dietary knowledge correctly. Questions such as knowledge about cholesterol content of vegetables (n = 357, 68.4%), dietary fiber‟s role in blood cholesterol (n = 320, 61.3%), and cholesterol in the yellow part of an egg (n = 309, 59.2%) showed higher correct responses.

Knowledge about CVD symptoms were correctly responded by 50.52% of the participants. An equal percentage of participants (n = 332, 63.6%) correctly responded to the

question about common symptoms of the heart attack and similar experiences among men and women about the heart attack. Less than half of the participants correctly answered medical knowledge question (47.15%). Majority of the participants demonstrated knowledge on high blood pressure (n = 353, 67.6%), while 43.50% (n = 227) identified high and low density lipoproteins (HDL and LDL) as being good or bad cholesterol, and 37.4% (n = 195) of the participants knew that rapid breathing for a sustained period of time was the healthiest exercise for the heart. A summary of these findings are presented in Table 5.

Health belief about CVD was measured by 25 health belief questions, out of which 22 were used for data analysis. These 22 questions were divided into four subscales: perceived susceptibility (5 items), perceived severity (4 items), perceived benefits (6 items), and perceived barriers (7 items). The summary of the HBM constructs with the calculated grand mean of the subscales are presented in Table 6. Descriptive statistics (frequencies, percentages, mean, and standard deviation) of each subscale scores are presented in Tables 7, 8, 9 and 10.

Perceived susceptibility measured participants‟ belief about personal suceptibility to CVD; the higher the score, the greater the tendency to feel susceptible to CVD. Grand mean score on the perceived susceptibility subscale was 1.95 with the standard deviation of 0.58. Considering mean of two as central mean, the participant‟s susceptibility to CVD was just below the mean. This indicates that majority of the participants did not feel themselves susceptible to CVD. Among perceived susceptibility questions, the majority of the participants 54% (n = 282) disagreed and 20.90% (n = 109) strongly disagreed that they will suffer from CVD in future. Almost equal number of participants 46.4% (n = 242) and 46.2% (n = 241) disagreed and strongly disagreed that their chances of suffering from CVD in the next few years are great.

Table 5

Frequencies and Percentages of responses to General Knowledge Items (n =522)

Item	Correct Answer n(%)	Incorrect Answer n(%)	Don‟t Know n(%)
Dietary Knowledge			
Polyunsaturated fats are healthier for the heart than the saturated fats.	250 (47.9)	95 (18.2)	177 (33.9)
Trans-fats are healthier for the heart than most other kinds of fats.	301 (57.7)	104 (19.9)	117 (22.4)
Most cholesterol in an egg is in the white part of the egg.	309 (59.2)	133(25.5)	80 (15.3)
Dietary fiber lowers blood cholesterol.	320 (61.3)	41 (7.9)	161 (30.8)
Margarine with liquid safflower oil is healthier than margarine with hydrogenated soy oil.	175 (33.5)	92 (17.6)	255 (48.9)
Many vegetables are high in cholesterol.	357 (68.4)	46(8.8)	119 (22.8)
Epidemiology Knowledge			
Women are less likely to get heart disease after menopause than before.	248 (47.5)	73 (14)	201 (38.5)
Heart disease is the leading cause of death in the United States.	368 (70.5)	72 (13.8)	82 (15.7)
Most women are more likely to die from breast cancer than heart disease.	244 (46.7)	100(19.2)	178 (34.1)
Heart disease is better defined as a short-term illness than a chronic, long term illness.	357 (68.4)	56(10.7)	109 (20.9)
Medical Knowledge			
Most people can tell whether or not they have high blood pressure.	353 (67.6)	109 (20.9)	60 (11.5)
The healthiest exercise for the heart involves rapid breathing for a sustained period of time.	195 (37.4)	171(32.7)	156(29.9)
A healthy person‟s pulse should return to normal within 15 minutes after exercise.	404 (77.4)	27 (5.2)	91 (17.4)
Cardiopulmonary resuscitation (CPR) helps to clear clogged blood vessels.	272 (52.1)	99 (19)	151 (28.9)
HDL refers to „good‟ cholesterol, and LDL refers to „bad‟ cholesterol.	227 (43.5)	78 (14.9)	217 (41.6)

Table 5 Continued

Item	Correct Answer n(%)	Incorrect Answer n(%)	Don"t Know n(%)
Atrial defibrillation is a procedure where hardened arteries are opened to increase blood flow.	102 (19.5)	196 (37.6)	224 (42.9)
„High" blood pressure is defined as 110/80 [systolic/diastolic] or higher.	169 (32.6)	137 (26)	216 (41.4)
Risk Factor Knowledge			
Having had chicken pox increases the risk of heart disease.	236 (45.2)	42 (8.2)	244 (46.6)
Eating a lot of red meat increases heart disease risk.	395 (75.7)	70 (13.4)	57 (10.9)
The most important cause of heart attacks is stress.	164 (31.4)	254 (49.4)	100 (19.2)
Walking and gardening are considered types of exercise that can lower heart disease risk	453 (86.8)	24 (4.6)	45 (8.6)
Smokers are more likely to die due to cancer than heart disease.	228 (43.7)	179 (34.3)	115 (22)
Taking an aspirin each day decreases the risk of getting heart disease.	235 (45)	163 (31.2)	124 (23.8)
Taller people are more at risk for getting heart disease.	234 (44.8)	72 (13.8)	216 (41.4)
People who have diabetes are at higher risk of getting heart disease.	383 (73.4)	32 (6.1)	107 (20.5)
Eating a high fiber diet increases the risk of getting heart disease.	317 (60.7)	65 (12.5)	140 (26.8)
Symptoms			
Turning pale or gray is a symptom of having a heart attack.	280 (53.6)	67 (12.9)	175 (33.5)
Sudden trouble seeing in one eye is a common symptom of having a heart attack.	111 (21.3)	202 (38.7)	209 (40)
Feeling weak, lightheaded, or faint is a common symptom of having heart attack.	332 (63.6)	76 (14.6)	114 (21.8)
Men and women experience many of the same symptoms of a heart attack.	332 (63.6)	110 (21.1)	80 (15.3)

Note: Total knowledge mean score = 16, Standard Deviation = 5.35, Range = 1 – 29.

Only one third of the participants 30.1 % (n = 152) believed that they will have CVD sometime during their life. Almost two third of the participants 77.4% (n = 404) disagreed and strongly disagreed their current possibility of having CVD and about the same number of participants 68.90% (n = 360) were not concerned about having CVD in the near future (see Table 7).

Perceived severity measured participant's belief about seriousness of developing CVD; the higher the score, the greater tendency to perceive CVD as serious. Grand mean scores on the perceived severity subscale was 2.37 with the standard deviation of 0.57. Regarding individual questions on perceived severity about if participant's life would change, if they have heart attack and stroke, the majority of them 53.3% (n = 278) agreed, and 26.6% (n = 139) strongly agreed with the statement. Almost all (87.5%, n = 457) the participants disagreed or strongly disagreed that they will die from CVD within ten years (see Table 8).

Perceived benefit measured the participant's belief about the benefits of healthy behaviors in order to prevent CVD; the higher the score, the greater tendency to perceive benefits as good for preventing CVD. As shown in Table 9, overall grand mean score on the perceived benefit scale was 3.55 and the standard deviation was 0.49. Perceived benefit mean score was the highest among all the subscales. Most of the participants knew that eating healthy and exercising regularly is good for preventing themselves from CVD. Among the individual questions on benefit subscale, approximately 94% (n = 492) of the participants agreed and strongly agreed that increasing exercise and eating healthy will decrease their chances of having CVD. About similar number of the participants (n = 509, 97.5%), strongly agreed or agreed that they felt good when they exercise and eat healthy foods.

Table 6

Summary Table for Constructs of Health Belief Model (n =522)

Construct	Grand Mean	Standard Deviation
Perceived Susceptibility [a]	1.95	0.58
Perceived Severity [b]	2.37	0.57
Perceived Benefits [c]	3.55	0.49
Perceived Barriers [d]	2.03	0.51

Note: Strongly Agree = 4, Agree = 3, Disagree = 2, Strongly Disagree = 1.

a The higher the score, the greater the tendency to feel susceptible to CVD.

[b]The higher the score, the greater the tendency to perceive CVD as serious.

[c]The higher the score, the greater tendency to perceive benefits as important for CVD.

[d]The higher the score, the more are barriers for engaging into healthy behaviors.

Finally, perceived barriers measured participants‟ belief about the barriers towards health promoting behaviors preventing CVD; the higher the score, the higher were the barriers. Grand mean score on perceived barrier subscale was 2.03 and standard deviation was 0.51. From the individual subscale barrier questions, 62.7% (n = 327) participants disagreed and strongly disagreed that they do not know the appropriate exercises to perform to reduce the risk of CVD, but about 37.4% (n = 195) agreed or strongly agreed with that statement. Only 23.5% (n = 123) of the respondents reported that they do not have enough time to exercise 30 minutes a day for

most days of the week. Almost two third of the participants 77.2% (n = 403) knew what was a healthy diet that would prevent them from developing CVD. About 40% (n = 205) of the participants agreed or strongly agreed that they did not have time to cook meals for themselves, and almost similar number of participants 37.2% (n = 194) agreed or strongly agreed that they could not afford to buy healthy foods. Interestingly, about 68% (n = 355) of the participants disagreed or strongly disagreed with the statement that they had other problems more important than worrying about CVD (see Table 10).

Table 7

Participants Perceived Susceptibility regarding Cardiovascular Disease (n = 522)

Item	SD n (%)	D n (%)	A n(%)	SA n (%)	Mean	Standard Deviation
It is likely that I will suffer from a CVD in the future	109 (20.9)	282 (54)	120 (23)	11 (2.1)	2.06	0.72
My chances of suffering from a CVD in the next few years are great	242 (46.4)	241 (46.2)	35 (6.7)	4 (0.8)	1.62	0.64
I feel I will have a CVD sometime during my life	121 (23.2)	249 (47.7)	137 (26.2)	15 (2.9)	2.09	0.77
Having a CVD is currently a possibility for me	171 (32.8)	233 (44.6)	109 (20.9)	9 (1.7)	1.92	0.77
I am concerned about the likelihood of having a CVD in the near future	150 (28.7)	210 (40.2)	136 (26.1)	26 (5)	2.07	0.86

Note: SD (Strongly Disagree) = 1; D (Disagree) = 2; A (Agree) = 3; SA (Strongly Agree) = 4.

Perceived Susceptibility Grand Mean Score = 1.95, Standard Deviation = 0.58.The higher the score, the greater tendency to feel susceptible to CVD.

Table 8

Participants Perceived Severity regarding Cardiovascular Disease (n= 522)

Item	SD n (%)	D n (%)	A n(%)	SA n (%)	Mean	Standard Deviation
Having a heart attack or stroke will threaten my relationship with my significant other	161 (30.8)	218 (41.8)	111 (21.3)	32 (6.1)	2.03	0.87
My whole life would change if I had a heart attack or stroke	20 (3.8)	85 (16.3)	278 (53.3)	139 (26.6)	3.03	0.76
Having a heart attack or stroke would have a very bad effect on my sex life	63 (12.1)	196 (37.5)	183 (35.1)	80 (15.3)	2.54	0.89
If I have a heart attack or stroke I will die within ten years	126 (24.1)	331 (63.4)	52 (10)	13 (2.5)	2.00	0.65

Note: SD (Strongly Disagree) = 1; D (Disagree) = 2; A (Agree) = 3; SA (Strongly Agree) = 4.

Perceived Severity Grand Mean Score = 2.28, Standard Deviation = 0. 51. The higher the score, the greater tendency to perceive CVD as serious.

Table 9

Participants Perceived Benefits regarding Cardiovascular Disease (n= 522)

Item	SD n (%)	D n (%)	A n(%)	SA n (%)	Mean	Standard Deviation
Increasing my exercise will decrease my chances of having a heart attack or stroke	12 (2.3)	26 (5)	212 (40.6)	272 (52.1)	3.43	0.69
Eating a healthy diet will decrease my chances of having a heart attack or stroke	15 (2.9)	15 (2.9)	189 (36.2)	303 (58)	3.49	0.69
Eating a healthy diet and exercising for 30 minutes most days of the week is one of the best ways for me to prevent a heart attack or stroke	7 (1.3)	12 (2.3)	182 (34.9)	321 (61.5)	3.57	0.61
When I exercise I am doing something good for myself	5 (1)	8 (1.5)	135 (25.9)	374 (71.6)	3.68	0.55
When I eat healthy I am doing something good for myself	3 (0.6)	11 (2.1)	129 (24.7)	379 (72.6)	3.69	0.53
Eating a healthy diet will decrease my chances of dying from cardiovascular disease	6 (1.1)	19 (3.6)	221 (42.3)	276 (52.9)	3.47	0.62

Note: SD (Strongly Disagree) = 1; D (Disagree) = 2; A (Agree) = 3; SA (Strongly Agree) = 4.

Perceived Benefits Grand Mean Score = 3.55, Standard Deviation = 0.49 The higher the score, the greater tendency to perceive benefits as good for preventing CVD.

Table 10

Participants Perceived Barriers regarding Cardiovascular Disease (n= 522)

Item	SD n (%)	D n (%)	A n(%)	SA n (%)	Mean	Standard Deviation
I do not know the appropriate exercises to perform to reduce my risk of developing cardiovascular disease	104 (19.9)	223 (42.7)	160 (30.7)	35 (6.7)	2.24	0.84
It is painful for me to walk for more than 5 minutes	381 (73)	119 (22.8)	18 (3.4)	4 (0.8)	1.32	0.57
I do not have time to exercise for 30 minutes a day on most days of the week	155 (29.7)	244 (46.7)	93 (17.8)	30 (5.7)	2.00	0.84
I do not know what is considered a healthy diet that would prevent me from developing cardiovascular disease	132 (25.3)	271 (51.9)	94 (18)	25 (4.8)	2.01	0.79
I do not have time to cook meals for myself	109 (20.9)	208 (39.8)	160 (30.7)	45 (8.6)	2.27	0.88
I cannot afford to buy healthy foods	104 (19.9)	224 (42.9)	144 (27.6)	50 (9.6)	2.27	0.88
I have other problems more important than worrying about diet and exercise	116 (22.2)	239 (45.8)	140 (26.8)	27 (5.2)	2.15	0.82

Note: SD (Strongly Disagree) = 1; D (Disagree) = 2; A (Agree) = 3; SA (Strongly Agree) = 4.

Perceived Barriers Grand Mean Score = 2.03, Standard Deviation =0.51. The higher the score, the more are the barriers in participating in healthy behaviors.

Research Question No. 2: What are the relationships between total knowledge, knowledge subtypes, and health belief subscales (knowledge and perceived susceptibility, knowledge and perceived severity, knowledge and perceived benefits, knowledge and perceived barriers) about CVD among selected undergraduate university students?

Pearson correlations were calculated between total knowledge score, knowledge subtypes (dietary, epidemiology, medical, risk factor, and symptom), and four subscales of HBM (perceived susceptibility, perceived severity, perceived benefits, and perceived barriers) about CVD. The correlation between total knowledge and subscales ranged from negative 0.037 to positive 0.818 (see table 11). There was very strong positive statistically significant correlation between total knowledge score and knowledge subtypes. Risk factor and dietary knowledge had very strong statistically significant correlation with total knowledge score with r =0.82 and 0.77. Medical, epidemiology, and symptoms knowledge score had strong positive statistically positive correlation with total knowledge score with r = 0.70, 0.68, and 0.54 respectively.

Overall, health belief subscales had lower correlation scores with total knowledge score while comparing to knowledge subscales. Only perceived benefit (r = 0.28) and perceived severity (r = 0.11) had positive weak statistically significant correlation, while perceived barrier (r = -0.18) had negative weak statistically significant correlation with total knowledge score. Risk factor (r = 0.55) and epidemiology knowledge score (r = 0.43) had strong positive statistically significant correlation with dietary knowledge score. Medical (r = 0.39) and symptom (r = 0.23) knowledge score had weak statistically significant correlation with dietary knowledge score. Interestingly, only perceived benefits had positive weak statistically significant

correlation (r = 0.24), and perceived barrier (-0.17) had negative statistically significant correlation with dietary knowledge score.

Epidemiological knowledge score had weak to moderate correlation with risk factor (r = 0.44), medical (r = 0.37), and symptom (r = 0.30) knowledge scores. Perceived benefit (r = 0.18) and susceptibility (0.15) had very weak positive statistically significant correlation with epidemiology knowledge scores. Like dietary knowledge score, epidemiology knowledge score also had weak negative statistically significant correlation with perceived barrier (r = -0.12). Medical knowledge had moderate positive statistically significant correlation with risk factor (r = 0.45) and weak positive statistically significant correlation with symptom (r = 0.27) knowledge score. Among health belief subscales, only perceived benefits (r = 0.16) had positive weak statistically significant correlation with medical knowledge score.

Risk factor knowledge had moderate positive statistically significant correlation with symptoms (r = 0.34). From the health belief subscales, perceived benefit (r = 0.20) and severity (r = 0.09) had positive very weak statistically significant correlation, while perceived barrier (r = -0.17) had negative very weak statistically significant correlation with risk factor knowledge. Interestingly, knowledge on symptoms had very weak positive statistically significant correlation with only perceived benefits (r = 0.18). The perceived susceptibility subscale had positive statistically significant moderate correlation with perceived barriers (r = 0.34), but weak positive statistically significant correlation with perceived severity (r =0.25).There was negative statistically significant correlation between perceived susceptibility and perceived benefits (r = -0.14). Perceived severity had no correlation with benefits, but very weak positive statistically

significant correlation with perceived barriers (r = 0.10). Finally, perceived benefits had negative statistically significant very weak correlation with perceived barrier (r = - 0.22). (see Table 11).

Research Question No. 3: What are the personal risks of developing CVD and are there any relationships between personal risk, health knowledge, and individual health beliefs about CVD among selected undergraduate university students?

Questions about personal risk were related to family risk (family history), lifestyle risk, exercise level, and dietary behavior. There were total of 12 questions and possible maximum score was 12. The lower the score, the less are personal risk of developing CVD. A mean personal risk score was 3.34, standard deviation 1.72, and range 0 - 8. Interestingly, only 3.6% (n = 19) of the participants were found to have no personal risk of developing CVD, while the overwhelming majority 96.4% (n =503) of the participants reported to have more than one risk factors for developing CVD. Frequencies and percentages of personal risk are presented in Tables 12, 13, and 14.

As shown in Table 12, among individual questions that were related to family history of CVD, 69.3% (n = 362) of the participants reported that their primary relatives (grandparents, parents, siblings) have high blood pressure. Nearly half of the participants 47.1% (n = 250) indicated that their primary relatives (parents, grandparents, siblings) had diabetes, while 43.3% (n = 226) had high cholesterol. About 42% (n = 219) of the participants reported that their primary relatives (parents, grandparents, siblings) had history of CVD.

Table 11

Correlation Between Total Knowledge, Knowledge Subtypes, and Health Belief Model Subscales (n = 522)

	1	2	3	4	5	6	7	8	9	10
1. Total Knowledge (TK) Score										
2. TKDietary	0.77**									
3. TKEpidemiology	0.68**	0.43**								
4. TKMedical	0.70**	0.39**	0.37**							
5. TKRiskfactors	0.82**	0.55**	0.44**	0.45**						
6. TKSymptoms	0.54**	0.23**	0.30**	0.27**	0.34**					
7. TotalBelief (TB) Susceptibility	0.07	-0.04	0.15**	0.05	0.06	0.06				
8. TBSeverity	0.11*	0.08	0.08	0.60	0.09*	0.07	0.25**			
9. TBBenefits	0.28**	0.24**	0.18**	0.16**	0.20**	0.18**	-0.14**	0.02		
10. TBBarriers	-0.18**	-0.17**	-0.12**	-0.08	-0.17**	-0.04	0.34**	0.10*	-0.22**	

** Correlation is significant at the 0.01 level (two tailed). * Correlation is significant at the 0.05 level (two tailed).

Note: Mean Total knowledge Score = 16.0, Standard Deviation = 5.25, Range = 1 - 30.

Table 12

Family History of Cardiovascular Disease (n = 522).

Question	Frequency (n)	Percentage Positive (%)
1. Do any of your primary relatives (parents, grandparents, siblings) have a history of heart disease?	219	42
2. Do any of your primary relatives (parents, grandparents, siblings) have diabetes?	250	47.9
3. Do any of your primary relatives (parents, grandparents, siblings) have high blood pressure?	362	69.3
4. Do any of your primary relatives (parents, grandparents, siblings) have a history of high cholesterol?	226	43.3

From the lifestyle risk related questions, it was found that majority (56.5%,n = 295) of the participants‟ family consumed a high fat diet (lots of red meat, whole diary, butter/margarine) at home. About 40.8% (n = 213) of the respondents reported that their life is highly stressful, while 22.8 % (n = 118) reported that they smoke cigarettes. Among the participants high blood cholesterol, high blood pressure, and pre- diabetic or diabetic status were responded positive on 5.9% (n = 31), 4% (n=21), and 2.5% (n = 13) respectively (see Table 13).

Table 13

Lifestyle Risk of Cardiovascular Disease (n =522).

Question	Frequency (n)	Percentage Positive (%)
1. Would you say that your family consumed a high fat diet (lots of red meat, whole diary, butter/margarine) during your time spent at home?	295	56.5
2. Is your cholesterol level higher than it should be?	31	5.9
3. Do you have high blood pressure?	21	4
4. Have you been diagnosed as pre-diabetic or diabetic?	13	2.5
5. Would you describe your life as being highly stressful?	213	40.8
6. Do you smoke?	118	22.8

Finally, the last questions on personal risks were intended to find out about exercise level and dietary behavior of the participants. Majority of the participants 88.5% (n =462) reported that they did less than recommended level of exercise each day, however the remaining 11.5% (n = 60) reported that they did more than recommended level of exercise each day. About dietary behavior, a little less than half 49% (n = 256) of the participants reported that they eat more than recommended number of calories each day. About more than half 51% (n = 266) of the participants responded that they eat less than or equal number of calories each day (see Table 14).

Table 14

Diet and Exercise Behavior of Participants (n = 522).

Question	< OR = to recommended	> than Recommended
1. How would you describe the level of exercise that you get each day?	462 (88.5%)	60 (11.5%)
2. How would you describe your dietary behavior?	266 (51%)	256 (49 %)

Pearson correlation was calculated to find the relationship between personal risk, total health knowledge, and health belief subscales. Family history had a positive weak statistically significant correlation perceived susceptibility (r = 0.25), but very weak positive statistically significant correlation was found with lifestyle risk (r = 0.12), and epidemiology (r = 0.15). Family history also showed negative very weak statistically significant correlation with medical knowledge (r = -0.12). Lifestyle risk had positive weak statistically significant correlation with perceived susceptibility and barriers (r = 0.23 for both), whereas there was very weak positive significant correlation was found with perceived severity (r = 0.13), exercise level (r = 0.12), and dietary behavior (r = 0.11).

Interestingly, exercise level had negative very weak statistically significant correlation with perceived barriers (r = - 0.22) and perceived susceptibility (r = 0.12), while only dietary knowledge (r = 0.11) had very weak positive statistically significant correlation. Dietary knowledge found to have no statistically significant correlation with individual health beliefs and other knowledge subtypes. Details of these findings are presented in Table 15.

Table 15

Correlation Between Personal Risks, Total Knowledge, and Total Beliefs (N = 522)

		1	2	3	4	5	6	7	8	9	10	11	12	13
1.	Family History													
2.	Lifestyle Risk	0.12 **												
3.	Exercise Level	-0.04	0.12**											
4.	Dietary Behavior	-0.01	0.11*	0.07										
5.	Total Knowledge (TK)	0.10	0.02	0.11**	0.04									
6.	Dietary TKEpidemiology	0.15**	0.05	0.04	0.06	0.43**								
7.	TKMedical	-0.12**	0.06	0.02	0.06	0.39**	0.37**							
8.	TKRiskfactors	0.11*	0.02	0.03	0.03	0.55**	0.44**	0.45**						
9.	TKSymptoms	0.03	-0.001	-0.01	-0.01	0.23**	0.30**	0.28**	0.34**					
10.	TotalBelief (TB)	0.25**	0.23**	-0.12**	0.04	-0.04	0.15**	0.05	0.06	0.06				
	Susceptibility													
11.	TBSeverity	0.001	0.13**	-0.03	0.06	0.08	0.08	0.06	0.09*	0.07	0.25**			
12.	TBBenefits	0.05	0.02	0.03	0.05	0.24**	0.18**	0.16**	0.20**	0.18**	-0.14**	0.19		
13.	TBBarriers	0.04	0.23**	-0.22**	-0.08	-0.17**	-0.12**	-0.08	-0.17**	-0.04	0.34**	0.10*	-0.22**	

* Correlation is significant at the 0.05 level (two tailed). ** Correlation is significant at the 0.01 level (two tailed).

Research Question No. 4: Which personal variable (age, gender, lifestyle risk, family history, total number of health classes taken, ethnicity, being domestic or international, living on campus or off campus, dietary behaviors, exercise levels) predicts CVD knowledge among university students?

Simple linear stepwise regression was conducted in order to find out which personal variables (age, gender, lifestyle risk, family history, total number of health classes taken, ethnicity, being domestic or international, living on campus or off campus, dietary behaviors, exercise levels) were the better predictor of CVD knowledge among university students. Total knowledge score was taken as dependent variable, while all other personal variables were considered as independent predictor variables. Stepwise selection criteria were determined as follows: Probability of F to enter <= 0.05 and probability of F to remove >=0.10. The Analysis of Variance (ANOVA) computed in conjunction with the regression showed that computed model was the best fit and statistically significant ($F(6, 515) = 14.24$, $p = 0.001$).

Out of total ten predictor variables , race/ethnicity ($t(515) = 5.65$; $p = 0.001$), age ($t(515) = 3.32$; $p = 0.001$), family history ($t(515) = 2.95$; $p = 0.003$), domestic/international ($t(515) = -2.60$; $p = 0.01$), live on campus/off campus($t(515) = -2.46$; $p = 0.01$), and number of health classes ($t(515) = 2.02$; $p = 0.04$) were identified as statistically significant individual predictors for CVD knowledge (see Table 16). For these statistically significant independent variables, the unstandardized test statistic B was 0.70 for race/ethnicity, 0.15 for age, 0.49 for family history, -2.84 for domestic international, - 1.18 for live on campus/off campus, and 0.43 for number of health classes taken. The standardized test statistic β was 0.23 for race/ethnicity, 0.15 for age, 0.12 for family history, - 0.11 for domestic international, - 0.11 for living status, and 0.08 for

number of health classes taken. The higher the value of β, the higher the impact of independent variable on the dependent variable (Brace, Kemp, & Snelgar, 2000); therefore race/ethnicity was the number one predicting variable for CVD knowledge. Family history and number of health classes were second and third predictors, while age, living on/off campus, and domestic/international were at the bottom. Interestingly, among all these predictors, only 14.2% of the variability was explained by these variables (see Table 16).

Table 16

Summary of Multiple Regression Analysis to Predict CVD Knowledge

Predictors	Total Knowledge on CVD		
	B	Standard Error	B
Race/Ethnicity	0.70**	0.13	0.23**
Age	0.15**	0.05	0.15**
Family History	0.49**	0.17	0.12**
National/International	-2.84*	1.09	-0.11*
Live on/off Campus	-1.18*	0.48	-0.11*
No. of Health Classes	0.43*	0.21	0.08*
R^2		0.14	
F		14.24	
ΔR^2		0.13	

* Correlation is significant at the 0.05 level (two tailed). ** Correlation is significant at the 0.01 level (two tailed).

Research Question No. 5: Which personal variable (age, gender, lifestyle risk, family history, total number of health classes taken, ethnicity, being domestic or international, living on campus or off campus, dietary behaviors, exercise levels) predicts CVD individual health beliefs among selected university students?

Simple linear stepwise regression was conducted in order to find out which personal variables (age, gender, lifestyle risk, family history, total number of health classes taken, ethnicity, being domestic or international, living on campus or off campus, dietary behaviors, exercise levels) were the better predictor of CVD individual health beliefs among university students. Each of the subscales of HBM (perceived susceptibility, severity, benefits, and barriers) were taken as dependent variable, while all other personal variables were considered as independent predictor variables. Stepwise selection criteria were determined as similar to research question number four.

For the model where perceived susceptibility was taken as dependent variable, the Analysis of Variance (ANOVA) computed in conjunction with the regression showed that computed model was the best fit and statistically significant ($F(4, 517) = 17.86$, $p = 0.001$). Out of total ten predictor variables, only four were found to be statistically significant for perceived susceptibility. Family history was the number one predictor for perceived susceptibility with ($t(517) = 5.54$; $p = 0.001$), lifestyle was in second place with ($t(517) = 4.46$; $p = 0.001$), exercise level was on the third place with ($t(517) = -2.47$; $p = 0.01$), and gender was in the fourth place with ($t(517) = -2.17$; $p = 0.03$). For these statistically significant independent variables, the unstandardized test statistic B was 0.51 for family history, 0.56 for lifestyle risk, -0.95 for exercise level, and -0.53 for gender (See table 17).

Table 17

Summary of Multiple Regression Analysis to Predict Perceived Susceptibility to CVD

Predictors	Perceived Susceptibility to CVD		
	B	Standard Error	β
Family History	0.51**	0.09	0.23**
Lifestyle Risk	0.56**	0.13	0.19**
Exercise Level	-0.95*	0.38	-0.10*
Gender	-0.53*	0.24	-0.09*
R^2		0.12	
F		17.86	
ΔR^2		0.12	

* Correlation is significant at the 0.05 level (two tailed). ** Correlation is significant at the 0.01 level (two tailed).

The standardized test statistic β was 0.23 for family history, 0.19 for lifestyle risk, -0.10 for exercise level, and -0.09 for gender. Only 12.1% of the variability was explained by these variables, so there should be more variables that need to be investigated to predict perceived susceptibility.

For the model where perceived severity was taken as dependent variable, the Analysis of Variance (ANOVA) computed in conjunction with the regression showed that computed model was the best fit and statistically significant ($F (3, 518) = 9.72$, $p = 0.001$). Out of total ten predictor variables, only three were found to be statistically significant for perceived severity. Gender was the number one predictor for perceived severity with ($t (518) = -3.84$; $p = 0.001$), while lifestyle risk was the second with ($t (518) = 2.45$; $p = 0.02$), and age was the third with ($t (518) = 2.20$; $p = 0.03$). For these statistically significant independent variables, the unstandardized test statistic B was -0.76 for gender, 0.25 for lifestyle risk, and 0.04 for age (See

table 18). The standardized test statistic β was -0.17 for gender, 0.11 for lifestyle risk, and 0.10 for age. Only 5.3% of the variability was explained by these variables, so there should be more variables that need to be investigated to predict perceived severity.

Table 18

Summary of Multiple Regression Analysis to Predict Perceived Severity to CVD

	Perceived Severity to CVD		
Predictors	B	Standard Error	B
Gender	-0.76**	0.20	-0.17**
Lifestyle Risk	0.25*	0.10	0.11*
Age	0.04*	0.02	0.10*
R^2		0.05	
F		9.72	
ΔR^2		0.05	

* Correlation is significant at the 0.05 level (two tailed). ** Correlation is significant at the 0.01 level (two tailed).

For the model where perceived benefits was taken as dependent variable, the Analysis of Variance (ANOVA) computed in conjunction with the regression showed that computed model was the best fit and statistically significant ($F(1, 520) = 7.64$, $p = 0.006$). Out of total ten predictor variables, only living on/off campus was found to be statistically significant for perceived benefits with ($t(518) = -2.76$; $p = 0.006$). The unstandardized test statistic B for living on/off campus was -0.73 and standardized test statistic β was-0.12. There was almost negligible (1.4%) of the variability was explained by perceived benefits. More investigation needed to find good predictors for perceived benefits subscale (see Table 19).

Table 19

Summary of Multiple Regression Analysis to Predict Perceived Benefits to CVD

Predictors	Perceived Benefits to CVD		
	B	Standard Error	β
Live on/off Campus	-0.73**	0.26	-0.12**
R^2		0.01	
F		7.64	
ΔR^2		0.01	

* Correlation is significant at the 0.05 level (two tailed). ** Correlation is significant at the 0.01 level (two tailed).

Finally, for the model where perceived barriers was taken as dependent variable, the ANOVA computed in conjunction with the regression showed that computed model was the best fit and statistically significant (F (4, 517) = 20.77, p = 0.001). From the ten predictor variables, only four were found to be statistically significant for perceived barriers. Lifestyle risk was the number one predictor with (t (517) = 5.19; p = 0.001), living on/off campus was second with (t (517) = 4.76; p = 0.001), exercise level was third with (t (517) = -4.62; p = 0.001), and number of health classes was fourth with (t (517) = -2.28; p = 0.02).

For these statistically significant independent variables, the unstandardized test statistic B was 0.79 for lifestyle risk, 1.44 for living on/off campus, -2.16 for exercise level, and -0.33 for number of health classes (See table 20). The standardized test statistic β was 0.21 for lifestyle risk, 0.20 for living on/off campus, -0.19 for exercise level, and -0.09 for number of health classes. Furthermore, 13.8% of the variability was explained by these variables to predict perceived barriers. Among the four HBM subscales, perceived barriers were found to have highest variability explained by the independent predictors.

Table 20

Summary of Multiple Regression Analysis to Predict Perceived Barriers to CVD

	Perceived Barriers to CVD		
Predictors	B	Standard Error	B
Lifestyle Risk	0.79**	0.15	0.21**
Live on/off Campus	1.44**	0.30	0.20**
Exercise Level	-2.16**	0.47	-0.19**
No. of Health Classes	-0.33*	0.14	-0.09*
R^2		0.14	
F		20.77	
ΔR^2		0.13	

* Correlation is significant at the 0.05 level (two tailed). ** Correlation is significant at the 0.01 level (two tailed).

Summary

This chapter provided an overview of the results by answering each research question along with description of the demographics of the sample. The majorities of the participants were whites and lived off campus. A little more than half of the participants answered CVD knowledge questions correctly. About one fourth of the participants responded to "do not know" on the knowledge questionnaire. Most of the college students knew CVD risk factors, but knowledge on smoking and stress was found low.

Among individual health belief scales, perceived susceptibility had the lowest mean while perceived benefits had the highest mean. Majority of the participants did not feel susceptible to CVD, while most of them also did not care about the severity of the disease. From the perceived benefit subscale it was found that most of the participants knew about eating

healthy and doing exercise is good to prevent CVD and they felt good about it. From the barrier subscale, it was revealed that time to cook healthy meal and affordability of buying healthy food were the significant barriers for this population.

A positive statistically significant correlation was found between CVD knowledge and health belief subscales except for perceived barriers which had negative statistically significant correlation. From the HBM subscales, positive statistically significant correlation was found with knowledge and perceived benefits while negative statistically significant correlation was found with knowledge and perceived barriers. Perceived susceptibility had positive significant correlation with severity and barriers. Interestingly, negative statistically significant correlation was found with susceptibility and benefit subscale. Perceived severity had no correlation with benefits and barriers.

Overwhelmingly the majority of the participants had more than one risk factor for developing CVD. Significant positive correlation was found with personal risk, total knowledge, and individual health belief scores. Results from the multiple regression revealed that Race/Ethnicity, Age, Family History, International/National, Live on/off campus, and number of health classes were the better predictors of knowledge. For the individual health beliefs, perceived susceptibility was predicted by family history, lifestyle risk, exercise level, and gender, while perceived severity had gender, lifestyle risk, and age as significant predictors. Interestingly, perceived benefits had only one predictor that was living on/off campus. Perceived barrier had four significant predictors like lifestyle risk, living on/off campus, exercise level, and number of health classes.

CHAPTER V

SUMMARY, CONCLUSIONS, DISCUSSION, AND RECOMMENDATIONS

Introduction

This chapter provides detailed information about the summary of the study and implication of the research findings. Conclusions, recommendations, and limitations of the study are discussed in depth. Recommendations for professional preparation and future research on cardiovascular diseases among university students are suggested.

Purpose of the Study

The primary purpose of this study was to determine overall knowledge and health beliefs about CVD among selected undergraduate university students and find out the risk of developing CVD among this population. The secondary purpose was to assess the relationship between knowledge, health beliefs, and personal risks about CVD among these students. The researcher also wanted to determine the factors that predict the relationship between demographic variables and cardiovascular risk factors among these students.

Summary of the study

In the United States, CVD is the leading cause of death for both men and women (CDC, 2011a). According to National Vital Statistics Report (2009), heart disease was the number one killer in the United States in 2006 and it can be prevented (Brownstein, 2008; Labarthe, Dai, Day, Fulton, & Grunbaum, 2009; Pearson, 2007). It is well researched that risk factors for heart disease begin early at the young age (Berenson, 2009; Pencina, D'Agostino, Larson, Massaro, & Vasan, 2009; Strong et al., 1999). Studies completed among university students showed that college students are also at risk of developing heart diseases (Hlaing, Nath, & Huffman, 2007; Sparling, Snow, & Beaver, 1999; Spencer, 2002) however there was no study conducted that

examined knowledge and health beliefs about CVD among university students using HBM. College students must first understand the actual risks of CVD before they can make appropriate decision about their personal health choices.

In the 2012 Spring semester, over 600 undergraduates from Foundation of Human Health, First Aid and CPR, Medical Terminology, Math, History 101, and Geography classes at a mid-western university were surveyed to access knowledge and health belief about CVD. A 30 item *Heart Disease Knowledge Questionnaire* developed by Bergman, Reeve, Moser, Scholl, and Klein, 2011 , a 25 item *Health Belief Related to Cardiovascular Disease Scale* developed by Tovar, Rayens, Clark, and Nguyen, 2010, and 20 item personal demographic variable and risk prediction questionnaire developed by the researcher was used as a survey instrument for this research. Demographic and personal risk questions assessed age, gender, height, weight, living on/off campus, national/international, number of health classes, race/ethnicity, family risk, lifestyle risk, exercise, and dietary behavior of the participants. This study used a cross-sectional, descriptive, and correlational survey design. Nearly 600 surveys were used to answer the following research questions:

1) What are the overall levels of knowledge and health beliefs about CVD among selected undergraduate university students?
2) What are the relationships between total knowledge, knowledge subtypes, and health belief subscales (knowledge and perceived susceptibility, knowledge and perceived severity, knowledge and perceived benefits, knowledge and perceived barriers) about CVD among selected undergraduate university students?

3) What are the personal risks of developing CVD and are there any relationships between personal risk, health knowledge, and individual health beliefs about CVD among selected undergraduate university students?
4) Which personal variable (age, gender, lifestyle risk, family history, total number of health classes taken, Race/Ethnicity, Domestic/International, live on campus/off campus, dietary behavior, exercise level) predicts CVD knowledge among university students?
5) Which personal variable (age, gender, lifestyle risk, family history, total number of health classes taken, Race/Ethnicity, Domestic/International, live on campus/off campus, dietary behavior, exercise level) predicts CVD individual health beliefs among selected university students?

The proposed research questions were answered using the collected data which were entered into the Statistical Package for the Social Sciences (SPSS®) software program version 19.0 (SPSS, Inc., 2010). Descriptive statistics were used to assess overall knowledge, health beliefs, and personal risks about CVD among undergraduate university students. Pearson moment correlations were conducted to determine the relationship between total knowledge, knowledge subtypes, individual health beliefs, and personal risks. Multiple regression analyses were conducted to determine which personal variable (age, gender, lifestyle risk, family history, total number of health classes taken, Race/Ethnicity, Domestic/International, live on campus/off campus, dietary behavior, exercise level) predicted CVD knowledge and individual health beliefs among university students. Consistent with Social Science research, probability levels were set at 0.05 levels.

Demographic data provided descriptive overview of the participants of this study. Among the participants, females were slightly more than the males (53.6% Vs 46.4%). Overwhelming majority (85%) of the participants were 18-23 years old with average age of 21.77. Majority of the participants were whites, lived off campus, and were domestic students. Calculated BMI from the self-reported height and weight data showed that about 60% were normal weight, 26% overweight, 10% obese, and 4% underweight. Most of the participants had taken at least one health classes, while about 14% had not taken any health classes at all.

Thirty questions assessed general knowledge of CVD. A little more than half of the participants answered CVD knowledge questions correctly, while one fourth of the participants responded to "do not know". The mean for total knowledge score was 16 out of 30, standard deviation 5.35, and range 1- 29. Among the knowledge subtype questions, epidemiological questions related to CVD was most correctly answered, while risk factor related to CVD was on the second place of correctly answered items. Dietary knowledge questions related to CVD was third, while medical and symptoms related questions to CVD were fourth and fifth place of correctly answered items by the participants. Most of the college students knew CVD risk factors, but knowledge on smoking and stress was found low. Knowledge about HDL and LDL showed lower correct responses by the participants.

Among individual health belief scales, perceived susceptibility had the lowest mean while perceived benefits had the highest mean. Mean on the perceived susceptibility scale showed lower than average score indicating that participants did not feel susceptible to CVD. Among the individual questions on perceived susceptibility, majority of the participants disagreed and strongly disagreed that they suffer from CVD in future. A little less than half of

the participants disagreed and strongly disagreed with the statement that "their chances of developing CVD in the future are great." Only about 30% of the participants believed that they will have CVD sometime in their life. Almost two third of the participants disagreed and strongly disagreed their current possibility of having CVD and about the same number of participants were not concerned about developing CVD in the near future.

From the perceived barrier subscale, the majority of the participants agreed and strongly agreed that their life would change if they had heart attack and stroke. An overwhelming majority (87%) of the participants disagreed or strongly disagreed that they will die from CVD within ten years. Perceived benefit mean score was the highest among all the subscales. Most of the participants knew that eating healthy and exercising regularly is good for preventing themselves from CVD. Majority of the participants strongly agreed or agreed that they felt good when they exercise and ate healthy foods.

Among the perceived barrier subscale questions, it was revealed that majority of the participants knew about healthy diet and were aware of the exercises to perform in order to reduce the risk of developing CVD. Most of the participants reported that time to cook healthy meal and affordability of buying healthy foods were the major barriers for them in order to take care of their cardiovascular health.

A positive statistically significant correlation was found between CVD knowledge, knowledge subtypes, and health belief subscales except for perceived barriers which had negative statistically significant correlation. Among the knowledge subtypes, risk factor and dietary knowledge had very strong statistically significant correlation, while medical, epidemiology, and symptoms knowledge score had strong statistically positive correlation with

total knowledge score. Overall, health belief subscales had lower correlation scores with total knowledge score while comparing to knowledge subscales. Only perceived benefit and perceived severity had positive weak statistically significant correlation, while perceived barrier had negative weak statistically significant correlation with total knowledge score.

Risk factor and epidemiology knowledge scores had strong positive statistically significant correlation with dietary knowledge score. Medical and symptom knowledge scores had weak statistically significant correlation with dietary knowledge score. Interestingly, only perceived benefits had positive weak statistically significant correlation and perceived barrier had negative statistically significant correlation with dietary knowledge score. Epidemiological knowledge score had weak to moderate correlation with risk factor, medical, and symptom knowledge scores. Perceived benefit and susceptibility had very weak positive statistically significant correlation with epidemiology knowledge scores. Like dietary knowledge score, epidemiology knowledge score also had weak negative statistically significant correlation with perceived barrier. Medical knowledge had moderate positive statistically significant correlation with risk factor and weak positive statistically significant correlation with symptom knowledge score. Among health belief subscales, only perceived benefits had positive weak statistically significant correlation with medical knowledge score.

Risk factor knowledge had moderate positive statistically significant correlation with symptoms. From the health belief subscales, perceived benefit and severity had positive very weak statistically significant correlation, while perceived barrier had negative very weak statistically significant correlation with risk factor knowledge. Interestingly, knowledge on symptoms had very weak positive statistically significant correlation with only perceived

benefits. The perceived susceptibility subscale had positive statistically significant moderate correlation with perceived barriers, but weak positive statistically significant correlation with perceived severity. There was negative statistically significant correlation between perceived susceptibility and perceived benefits. Perceived severity had no correlation with benefits, but very weak positive statistically significant correlation with perceived barriers. Finally, perceived benefits had negative statistically significant very weak correlation with perceived barrier.

An overwhelmingly majority of the participants had more than one risk factor for developing CVD. Some of the main risk factors were high blood pressure, diabetes, and high blood cholesterol. From the lifestyle related questions, it was found that the participants‟ family consumed high fat diet (lots of red meat, whole diary, butter/ margarine) at home. About 41% of the participants reported that their lifestyle was highly stressful, while 23% reported of their smoking habits. The majority of the participants reported of doing less than recommended level of exercise and consumed more than recommended calories each day. Significant positive correlation was found with personal risk, total knowledge, and individual health belief scores.

Family history had a positive weak statistically significant correlation perceived susceptibility, but very weak positive statistically significant correlation was found with lifestyle risk and epidemiology. Family history also showed negative very weak statistically significant correlation with medical knowledge. Lifestyle risk had positive weak statistically significant correlation with perceived susceptibility and barriers, whereas there was very weak positive significant correlation was found with perceived severity, exercise level, and dietary behavior. Interestingly, exercise level had negative very weak statistically significant correlation with perceived barriers and perceived susceptibility, while only dietary knowledge had very weak

positive statistically significant correlation. Dietary knowledge was not found to have statistically significant correlation with individual health beliefs and other knowledge subtypes.

Results from the multiple regression revealed that Race/Ethnicity, Age, Family History, International/National, Live on/off campus, and number of health classes were the better predictor of knowledge. Only about 14% of the variability was explained by these variables while predicting CVD knowledge. From the individual health belief subscales, perceived susceptibility was predicted by family history, lifestyle risk, exercise level, and gender with the explained variability of 12% by these variables. Perceived severity was predicted by gender, lifestyle risk, and age with explained variability of only 5% from these variables. Interestingly, perceived benefits had only one predictor that was living on/off campus, which was counted for only 1% of the variability. Perceived barrier had four significant predictors like lifestyle risk, living on/off campus, exercise level, and number of health classes, which was explained by 14% of the variability. Most of the predictors that were found significant in this study did not explained much on the variability of knowledge and health beliefs of CVD.

Conclusions

Based on the results of the study, the following conclusions were made:

1. In general, undergraduate university students have low or inadequate knowledge about cardiovascular diseases that are a leading cause of death in the United States.
2. Individual health beliefs such as perceived susceptibility, severity, and barriers regarding CVD were low; however perceived benefit about CVD was found high among undergraduate university students.

3. Most of the undergraduate university students were at risk of developing cardiovascular diseases.
4. Smoking and stress causing CVD was unknown among undergraduate university students.
5. Time to cook healthy meals and affordability of buying healthy foods were significant barriers in protecting cardiovascular health among university students.
6. There was a positive statistically significant correlation found between CVD knowledge, knowledge subtypes, and health belief subscales. Correlations between knowledge and health beliefs were weaker while comparing to correlation between CVD knowledge and knowledge subtypes.
7. Race/Ethnicity, Age, Family History, International/National, Live on/off campus, and number of health classes were the better predictors of cardiovascular knowledge among undergraduate university students.
8. Perceived barrier was the strongest predictor of health belief about CVD among undergraduate university students.

Discussion

Knowledge of CVD and University Students

Overall, general knowledge of CVD among undergraduate university students was found low as only 53% of the participants answered knowledge questions correctly averaging 16 from the maximum possible score of 30. These findings were consistent with previous researches on CVD that were done on young adults and college students (Collins, 2004; Lynch, 2006; Mooney,

2009; Munoz, 2010; Vanhecke, 2006). In contradiction to the findings of this study, studies from around the world by Akimova (2004) in Russia, Bogdanska (2005) in Poland, and Frost (2004) in USA reported findings of higher cardiovascular knowledge among younger population; however none of these studies were similar to the study population.

Among the knowledge subtype questions, 58.27% of participants correctly responded to epidemiological knowledge questions that CVD is the leading cause of death in the United States and it is considered as a long term chronic illness. Epidemiological questions ranked number one among the correctly answered knowledge subtype questions. As CVD is the number one cause of death in the United States (CDC, 2011a); it is a good finding that majority of the undergraduate university students knew about it. Jones (2010) describes that CVD knowledge is a prerequisite in order to promote healthy behavior change.

Risk factors‟ knowledge of CVD was the second most correctly answered response by 56.3 % of the participants. Previous studies on CVD risk factors showed mixed findings. Osler (1992) found that CVD risk factor knowledge was high on general population but low among younger population, while Akimova (2004) described that knowledge of CVD risk factors were low among general population, but university population were knowledgeable about it. Other studies conducted by Antal (2006), Lynch (2006), Mooney (2009), and Munoz (2010) found low knowledge about CVD risk factors. Even though university students have knowledge of risk factors, their behaviors are different which put them at risk of developing CVD (Smalley, 2004; Suminski, 1999; Vale, 2000). Perhaps by increasing knowledge of risk factors and perceived risk, university students will attend to health messages regarding CVD prevention.

Fifty-five percent of the participants answered the questions on dietary knowledge about CVD correctly. Previous studies by Irazusta (2007) and Bogdanska (2005) showed that university students have poor nutritional habits and low nutritional knowledge that can increase their chance of developing CVD. Questions such as knowledge about cholesterol content of vegetables, dietary fiber‟s role in blood cholesterol, and cholesterol in the yellow part of an egg showed higher correct responses, which means students are knowledgeable about some food items that are good for heart. A number of other studies supported the fact that importance of nutritional knowledge for college students is essential in order to protect their cardiovascular health (Brown, 2010; Chourdakis, 2011; Morrell, 2012).

Participants in this study demonstrated lower knowledge on medical symptoms of CVD. Bachmann et al., (2007) found lack of minimal medical knowledge regarding CVD to the general population, while study by Reiner, Sonicki, & Tedeshi-Reiner (2012) and Aslam, Mahmud, & Waheed (2004) showed even medical students had low level of knowledge regarding obesity, physical activity, and inappropriate dietary intake that can lead to the development of CVD. One of the interesting finding of this study was that college students had lower knowledge about HDL as „good‟ cholesterol and LDL as bad cholesterol. As elevated blood cholesterol is one of the major risk factor for the development of CVD and previous studies by Sparling & Snow (1999) and Spencer (2002) showed higher cholesterol levels among university students, it would be beneficial for students if they know about good and bad cholesterol.

Most of the undergraduate university students were aware about CVD risk factors such as eating red meat increases heart disease risk, people with diabetes are high risk of getting heart disease, but knowledge on smoking and stress was found to be low. According to AHA (2010a),

smoking is the major risk factor and stress is the contributing risk factor for developing CVD. Most people associate smoking with breathing problems and lung cancer but did not know that smoking is the major cause of CVD. Smokers' chances of developing coronary heart disease are 2-4 times higher than that of nonsmokers and people who smoke a pack of cigarettes a day have more than twice the risk of heart attack than people who"ve never smoked (AHA, 2011c; CDC, 2011g). About 23% of the participants in our study reported that they smoke cigarettes; therefore increasing knowledge and awareness about smoking is necessary. Throughout the world, there is a gap in the smoker"s knowledge about smoking causing CVD and in the United States; almost half of the smokers do not know that smoking can cause CVD (WHF, 2012).

Generally, there is a concept that students with health majors have more health knowledge then non - health majors, and the researcher also assumed that, but findings of this study did not support that. This study revealed that there was no statistically significant difference in knowledge about CVD among undergraduate university students between the health and non-health majors. Perhaps the traditional format of teaching health classes in the universities does not make an impact on the knowledge of CVD among university students. Another significant finding of this study was that there was no statistically significant difference in knowledge about CVD among undergraduate university students between those who took one or more than one health classes. Thus, CVD should be included in the undergraduate curriculum and taught separately for undergraduate university students.

Perceived Susceptibility and CVD

Levels of participants" perceived susceptibility to CVD was low (mean score 1.95 out of 4.0), which means university students did not feel susceptible to CVD. These findings were

consistent with previous researches that showed that younger adults do not feel personally vulnerable to CVD (Vanhecke, 2006; Green, 2003; Homko, 2008; Smalley, 2004). This study supports the work of others in figuring out the lack of awareness among young adults about their susceptibility to CVD. Consistent with the literature, few participants in this study felt personally susceptible to CVD, only 25% agreed that they suffer from CVD in future. These findings are even lower than what Chiplet (2007) reported in her study about only 37% of the participants‟ felt susceptible to CVD.

According to Health Belief Model, the more susceptible a person feels about a disease or condition, the greater likelihood of his or her taking preventive measures (Champion & Skinner, 2008; Sharma & Romas, 2008), but the findings of this study suggested that as university students did not personally feel vulnerable to CVD, there is a less chance that they will take preventive measures. A little less than half of the participants disagreed and strongly disagreed with the statement that "their chances of developing CVD in the future are great." Only about 30% of the participants believed that they will have CVD sometime in their life. Almost two third of the participants disagreed and strongly disagreed their current possibility of having CVD and about the same number of participants were not concerned about developing CVD in the near future. Because of these findings, there is a great need to increase awareness regarding perceived susceptibility beliefs among university students.

As our samples were undergraduate university students and have some health knowledge, it was expected that they were more aware of susceptibility to CVD, but our finding contradicted this. Several other studies have assessed perceived susceptibility and CVD. O‟Brien (1991) found different susceptibility behaviors among Type A and Type B personalities, Edelman

(2009) discussed about the role of cultural factors on susceptibility, Kawash (1980) found relation between anxiety and perceived susceptibility, and Hayashi (2011) found that perceived susceptibility contributed to the perception of risk of CVD among Japanese adults. Perhaps there are more other factors like university culture, peer pressure, familial brought up, teachers advice etc that might play role to increase perceived susceptibility about CVD among college students.

Perceived Severity and CVD

Mean score on the levels of participants‟ perceived severity to CVD was 2.37 out of 4. This score was a little more than susceptibility scores, however this was not the highest score as higher score indicated the greater tendency to perceive CVD as serious. This means that university students were not that much worried about the severity of CVD. Previous study by Cohen, Mansoor, Langut, & Lorber (2007) found that perceived severity was the significant contributor to health related quality of life among adolescents with heart disease. Almost all (87.5%) of the participants in this study disagreed or strongly disagreed that they will die from CVD within ten years, while majority of them agreed that their life would change if they have heart attack or stroke. This indicates that participants lack knowledge on the severity of CVD, however they believe that if they suffer from CVD, their life would be impacted.

It would have been better if participants understand the physical, social, and psychological impacts of CVD. This could create more awareness toward the severity of CVD. Among the previous studies on severity, McClendon (2012) found that higher perceived CVD severity was associated with likelihood of healthy food choices and physical activity, Hayashi (2011) indicated that perceived severity was the contributing factor for developing perception of

CVD risk, and Nau et al., (2005) described about the difference in severity beliefs among man and women. Considering these findings, perceived severity beliefs are important in order to make our participants involve in health promoting behaviors.

Perceived Benefits and CVD

Perceived benefit mean score was the highest among all the subscales (3.55 out of 4), which mean that our participants were more aware of the benefits of participating in healthy behaviors. Interestingly, most of the participants knew that eating healthy and exercising regularly were good for preventing themselves from CVD, but they were not participating in health promoting behaviors. These findings were consistent with literature where various authors found that younger adults do not perform what they believe (Frost, 1992; Green, 2003; Smalley, 2004; Prue-Owens, 2007). About 94% of the participants agreed and strongly agreed that increasing exercise and eating healthy will decrease their chances of having CVD. This was a very good sign for preventing CVD among university students; however previous studies showed that exercising and healthy eating is low among many college students (Chourdakis et al., 2011; Irazusta et al., 2007; Morrell, Lofgren, Burke, & Reilly, 2012).

The foods students eat directly have an impact on controllable risk factors of CVD like cholesterol, blood pressure, diabetes, and being overweight. AHA (2011j) recommends diet rich in vegetables, fruits, whole-grain and high-fiber foods, fish, lean protein and fat-free or low-fat dairy products for the good cardiovascular health, but fruits and vegetables consumption is very low among college students (National College Health Assessment Survey, 2010). Therefore, it is important to encourage university students for healthy eating in order to protect their

cardiovascular health. World Health Organization estimated that 31% of coronary heart disease and 10% of stroke worldwide is due to low fruit and vegetable consumption.

Regular physical activity can improve the health and quality of life of Americans of all ages. Inactive people are nearly twice as likely to develop heart disease while comparing to active people (USDHHS, 2008). According to National College Health Assessment Survey (2011), only 48.3% of college students met recommended guidelines of moderate and vigorous intensity exercise. The National Youth Risk Behavior Survey (2009) data also showed increasing trends of physical inactivity among youth. Physical activity can help reduce the risk of heart disease by controlling blood cholesterol, lowering blood pressure, maintaining blood sugar levels, and decreasing obesity (AHA, 2011f). Thus, college students need to engage in regular physical activity that can help them lower their risk of developing CVD in future.

Perceived Barriers and CVD

Mean score on perceived barrier subscale was 2.03 out of 4.0, which means that participant‟s perception of barriers towards CVD were closer to the mean. Previous studies by Mahlik (2011), Shiplett (2007), Diehl, Lewis-Stevenson, Spruill, & Egan (2001), & Folta et al. (2008) explained about the perceived barrier beliefs as significant contributors to the prevention of CVD. In this study, time to exercise, facility to exercise, and knowledge about healthy food were not found to be major barriers, however affordability of healthy food and time to cook healthy meals were the significant barriers reported by majority of the participants. These findings means that providing an opportunity to buy healthy food within college campus, giving special discounts and coupons for students if they select to buy healthy foods, and by providing

readymade healthy snack, lunch, and diner items for students would help improve their eating habits.

Relationship between knowledge, knowledge subtypes, and HBM constructs

The findings of this study showed that there is strong positive statistically significant correlation between total CVD knowledge score and knowledge subtypes. Correlation ranged from 0.54 - 0.81 with p value of less than 0.01. This means that the higher the dietary, epidemiology, medical, risk factor, and symptom knowledge about CVD, the higher is the total CVD knowledge score. Various studies demonstrated the importance of knowledge for initiating the behavior change and taking prevention action for CVD (Aslam, et al., 2004; Bachmann, 2007; Jones, 2010; Reiner, et al., 2012). This study also supports these findings and results are consistent with that. Risk factor knowledge for CVD had the strongest positive statistically significant correlation with total knowledge score ($r = 0.81$, $p = < 0.01$), which proves the fact that the more knowledge on risk factors, the more people will take measures for prevention of CVD (Mosca, 2006; Mooney; 2009).

Total CVD knowledge score had positive very weak statistically significant correlation with individual health belief subscales (perceived susceptibility, severity, and benefits), while there was weak negative statistically significant correlation with perceived barrier. This means that health belief subscales did not have strong relationships with CVD knowledge scores and perceived barrier had negative relationship with knowledge scores. Previous literature on HBM suggested that perceived susceptibility beliefs were good for preventive behaviors (Janz & Becker, 1984), while perceived benefits beliefs were good for sick role behaviors (Champion & Skinner, 2008), however for this study it was found that

relationship between health belief subscales and CVD knowledge scores were weak, which means knowledge is affected by variables other than HBM subscales.

Personal Risks and CVD

One of the interesting findings of this study was that overwhelmingly majority of the participants had more than one risk factor of CVD. Mean personal risk score was 3.34 out of 12. This was not expected as our participants were young college students, however various studies by Irazusta, et al. (2007); Muñoz et al. (2009); Morrell, et al. (2012) listed the fact that college students are at risk of developing CVD and the findings of this study are consistent with that. Some of the main risk factors that were found in the participants were high blood pressure, diabetes, and high blood cholesterol, which were the major risk factors for developing CVD (AHA, 2011c, d, & e). Perhaps, controlling these major risk factors could help preventing CVD among younger population. Free screening services of major risk factors such as blood cholesterol, blood sugar, and blood pressure could help identify early CVD risk among university students.

Dietary habits of the participants were poor as it was found that they consumed high fat diet (lots of red meat, whole diary, butter/ margarine). The roles of healthy diet have been mentioned in literature for the prevention of CVD (AHA, 2011j), which described that eating healthy will reduce blood cholesterol, lower blood pressure, lower blood sugar, and reduce body weight. Therefore, information about healthy diet is critical to students and they should be taught about healthy eating in order to protect their cardiovascular health. Previous studies by Brown (2011), Chourdakis (2011), & Morrell (2012) reported that dietary habits of younger adults were not health promoting, which supports the findings of this study. Strategies that can help students

consume more heart healthy diet like eating more fish, eating more fruits and vegetables, avoiding trans fats, limiting sugar and salt intake, and increasing more grains would be helpful to promote healthy eating.

About 41% of the participants in this study reported that their lifestyle was highly stressful. As AHA (2011c) classified stress as a contributing risk factor for developing CVD, college students are risk of developing CVD. Gholizadeh, DiGiacomo, Salamonson, & Davidson (2011) found that stress was the most significant contributor to CVD. The increased risk of CVD from chronic stress has been linked to increased plaque buildup as a result of elevated cholesterol, hardening of the arteries, change in the blood pressure, and abnormal working rhythm of the heart (Dimsdale, 2008). The largest epidemiological study to date, the "INTERHEART STUDY", with almost 30,000 participants in 52 countries, identified stress as one of the key modifiable risk factor for heart attack (Whincup et al., 2005). Similarly, the National Health Interview Study conducted by CDC reported that stress is accountable for 30% risk of heart attacks (Torpy, 2007). Living a stressful life can cause college students to adopt poor habits like smoking, overeating, and drinking, which in turn are risk factors for CVD (WHF, 2011a). Regular physical activity not only relieves stress, but also can directly lower one‟s risk of heart disease. Staying physically active, developing social support in a person‟s life, and sharing one‟s feelings and concerns with other people can help reduce stress and decrease the chance of developing CVD (USDHHS, 2005).

About 23% of the participants in this study reported of cigarette smoking habits, which was little higher than national average of 18.1% in 2011 (ACHA , NCHA Executive Summary, 2011). As CDC (2011g) described cigarette smoking as a major preventable risk factor for CVD,

lowering the smoking rate would be beneficial for the prevention of CVD among this population. Perhaps college students do not understand the fact that smoking can cause CVD, they were not much concern about their smoking habits. AHA (2011h) reported that cigarette smoking increases the risk of coronary heart disease by itself and when it acts with other factors, the risks highly increase. About 80% of the college students started smoking before the age of 18 and this is nearly equal among college men and women (Donatelle, 2011).

Smokers' chances of developing coronary heart disease are 2-4 times higher than that of nonsmokers and people who smoke a pack of cigarettes a day have more than twice the risk of heart attack than people who‟ve never smoked (AHA, 2011c; CDC, 2011g). Cigarette smoking is a powerful independent risk factor for sudden cardiac death in patients with coronary heart disease and it approximately doubles a person's risk for stroke (CDC, 2011g). Therefore, more information and awareness about smoking and CVD would be beneficial for young individuals to make healthy decision. There are already programs in colleges and universities for quitting smoking, and they should be supported more in order to reduce the risk of CVD among college students.

Majority of the participants in this study reported of doing less than recommended level of exercise and consumed more than recommended calories each day, which is another alarming sign for the development of CVD. These findings were consistent with previous research which showed that exercising and healthy eating were low among many college students (Chourdakis, et al., 2011; Irazusta, et al., 2007; Morrell, et al., 2012). Perhaps, more information about cardiovascular exercise, following surgeon general‟s recommendation of moderate intensity

exercise at least 30 minutes a day for five days a week, and eating more than five servings of fruits and vegetables a day would help college students reduce their chance of developing CVD.

Predictors of CVD Knowledge

Results from the multiple regression revealed that Race/Ethnicity, Age, Family History, International/National, Live on/off campus, and number of health classes were the better predictor of knowledge. Only about 14% of the variability was explained by these variables while predicting CVD knowledge, which means that there are more other variables that need to be studied in order to predict knowledge. The finding of race/ethnicity predicting knowledge is interesting as it is difficult to tell how race/ethnicity can impact someone"s knowledge. It is well known that there is disparity in CVD among various race/ethnicities as CVD is higher among African Americans while comparing to Caucasians and it is also high among Mexican Americans, American Indians, Native Hawaiians, and some Asian Americans (AHA, 2011c; Thomas, Eberly, Smith, Neaton, & Stamler, 2005).

Age is the most powerful independent risk factor for CVD and the risk doubles every decade after age 55 (WHO, 2011d). Even though CVD can happen at any age, the risk of having CVD increases with age (AHA, 2011c). As people age, heart also diminishes its functions. The wall of the heart thickens and arteries may get stiff making hard for pumping the blood. All of these changes in the heart make people vulnerable for developing CVD when they age. AHA recommends everyone to undergo cardiac risk assessment at the age of 40 and every five years thereafter. Different studies on heart disease demonstrated that risk factors for heart disease begin to develop at the young age (Berenson, 2009; Pencina, et al., 2009; Strong, et al., 1999).

Thus, knowledge and awareness about age impacting on CVD would help college students reduce their chance of developing CVD.

As CVD runs in the family, people who have a close family member with a CVD may have a higher risk of developing that disease than those without such a family member (CDC, 2011c). A family history of heart disease appears to increase significantly the risk of heart disease (Murabito et al., 2005). The risk for heart disease can increase even more when heredity/family history is combined with unhealthy lifestyle choices, such as smoking cigarettes and eating a poor diet (CDC, 2011c). Patients with positive family history of CVD were found to have higher recurrent cardiovascular events (Mulders et al., 2011). The presence of family history of CVD among patients prompts physicians and clinicians to recommend necessary preventive actions (Zlot, Valdez, Han, Silvey, & Leman, 2010). Many people know that their relatives died at young age, but most of them are unaware about the reason of death of their family members (Kwiterovich, 1998). If college students know about their family history and tell their doctor about it, the doctor can find their risk of developing CVD.

CVD was thought to be the disease of the developed world; however it is seen in the developing countries as well (WHO, 2011b). If we have examined domestic and international students separately, there would have been a different result. Therefore, future studies should examine these populations separately. Living on an off campus would have impacted in the knowledge of students regarding CVD. Students living in the campus might not have chance to interact with other older people, they might not be eating healthy foods, and there is none to guide and regulate them; while students living off campus might have other challenges like not having time to cook and enough money to buy healthy foods. Even though numbers of health

classes were significant predictor of CVD knowledge in this study, there was no difference found in the CVD knowledge among students who took one or more than one health classes.

Predictors of Health Beliefs and CVD

Among the Health Belief Model subscales, perceived barrier was the strongest predictor of health belief regarding CVD. Perceived barrier had four significant predictors which were lifestyle risk, living on/off campus, exercise level, and number of health classes, and it explained 14% of the variability. Perceived susceptibility was predicted by family history, lifestyle risk, exercise level, and gender with the explained variability of 12% by these variables. Perceived severity was predicted by gender, lifestyle risk, and age with explained variability of only 5% from these variables. Interestingly, perceived benefits had only one predictor that was living on/off campus, which was counted for only 1% of the variability. This result means perhaps there are other variables that are accountable for individual health belief of CVD as most of the predictors that were found significant in this study did not explained much of the variability of knowledge and health beliefs regarding CVD.

Limitations

While interpreting the findings of this study, there were some limitations that need to be considered. The sample population in this study had majority of white students (64.8%), therefore the findings may not be generalizable to other diverse group of students in the university. Sample including broader group of students with equal participants among all ethnic groups might be good in order to better understand students‟ knowledge and health beliefs about CVD. Another limitation of this study was the use of survey method for data collection. As there

was no incentive to fill out the survey, the researcher was not sure if students filled out the survey accurately and honestly. Previous research (Dillman, 2000; Duffer et al., 1994) showed that offering incentives motivated people to participate in the survey, which might help to get more accurate data.

The use of existing instruments was another limitation. During the data analysis process, the researcher found that questions on perceived barriers and perceived severity needed to be modified in order to get more accurate results on those health belief constructs. This research was also limited by timeframe in the distribution of the surveys from March, 2012 through May, 2012 as some of the classes might already have covered the topic of cardiovascular disease and it might have impacted on the knowledge and health belief of students‟ participating in this study. Finally, the use of convenience sample was another limitation of this study; however sample size of 522 was adequate and representative for the population studied.

Recommendation for Health Education Practice

While considering the findings of this research, the following recommendations were made:

- The findings of this study showed that college students were more concerned about the perceived benefits about CVD, therefore more programs should be targeted to increase college student‟s perceived benefit beliefs about CVD like benefits of practicing healthy behaviors, exercising regularly, eating more fruits and vegetables, and caring about their health at early age in order to protect their cardiovascular health from young age.

- Overall knowledge about CVD was found low among university students; therefore health education practice should focus on improving cardiovascular knowledge among university students by including this topic in the curriculum. The time and effort given now to cover this topic in health education curriculum is not enough to have some impact on students‟ knowledge about CVD. Perhaps some workshops, trainings, social networking, and use of other medias to disseminate health information about CVD will increase students‟ knowledge in this topic.
- Low knowledge about smoking causing CVD and higher smoking rate among students was of concern for university students in this study, therefor future health education should target messages that can reach students about the risk of smoking causing CVD and overall reducing the smoking rates among the younger university populations could significantly impact in lowering CVD rate in this population.
- Stress was the significant contributor for development of CVD; however participants in this study did not realized this factor. Therefore, programs for stress management should be included in the health education curriculum.
- This study showed that an increasing number of health classes did not increase students‟ health knowledge; therefore future health education reparation should be not just offering more health classes, but specific classes targeting CVD that covers all the risk factors and discusses the consequences of this disease.
- Time to cook healthy meal and affordability of buying healthy foods were major barriers for university students in this study. Therefore, health education should target by providing options about healthy meals to students. Ideas for making healthy recipes for

lunch and snacks, decision making to choose healthier options, and ideas about buying healthier foods in a cheaper price should be discussed in the health education classrooms. Also, health educators should fight for making healthy options in vending machines, cafeteria, and other eating places in the university.

- Channel efforts should be made for heart disease prevention targeting younger adults as the disease begins at early age. Findings of this study suggests that health education should focus on primordial prevention where we prevent the risk factors from happening and if there are still risk factors, primary and secondary prevention should take place. Twenty first century health education should focus on the prevention of heart disease at the broader level that is at the local, community, state, and federal level.
- Explore the possibilities of risk factor screening for college students in order to find their blood cholesterol, blood sugar, and blood pressure levels so that they can take early measures to prevent these risk factors. As participants in this study had more than two risk factors, efforts should be channeled to control each of the major and contributing risk factors for the prevention of CVD.
- Health education professionals should collaborate with other local, governmental, non-governmental, and non-profit agencies in order to better understand the problem of heart disease and work collaboratively to reduce them. Emphasis on social marketing about the risk factors of heart disease, use of social media to disseminate information for younger adults, and campaign through social networking like Facebook and Twitter will be helpful to reach younger people.

Recommendations for Future Research

Based on the findings of this study and experience learned while conducting this study, the following recommendations were made for future research:

- Future study on CVD should be conducted with broader sample of students like younger adults those who are not enrolled in college, who lived in diverse part of the country, and represent various race and ethnicities. Perhaps that kind of sample will give more information about the knowledge and personal health beliefs about CVD representing this younger age population.
- There is a need to conduct research which includes other variables of HBM like self-efficacy or cues to action and see if that has an impact on the knowledge and health beliefs about CVD among younger adults. Future studies should focus how health beliefs are formed and how knowledge can impact in this process. Perhaps qualitative study targeting this younger population will give significant results.
- Future studies could be done by utilizing other theoretical models used in Health Education and Promotion practice like Theory of Planned Behavior, Theory of Reason Action, Social Cognitive Theory, in order to find different perspective on the issue of CVD among younger populations.
- More research needs to be done to investigate perceived barriers and find what motivating factors can help students to engage into health promoting behaviors in order to improve their cardiovascular health.

- The use of existing instrument and convenience sample was one of the limitations of this study, therefore revising the current instrument and utilizing random sampling technique might give data that can be generalizable to the entire population.
- It is important to study how perceptions are formed and why university students do not perceive themselves susceptible to CVD, and why they do not practice behaviors that could reduce their chance of developing CVD and promote overall wellness and optimal health.
- Conduct longitudinal studies among college students and see how their beliefs will change when they grow older and look whether that can impact on their knowledge and health promoting behaviors.

Personal Reflection

This study confirmed that majority of the college students have low level of knowledge regarding CVD and few perceived themselves at risk of developing CVD. Even though awareness of CVD has increased over time, still more work needs to be done to disseminate CVD prevention messages among university students. Plenty of information for the prevention of CVD is available on the internet and other health resources, but it is not reaching to the students unless they fell susceptible to this disease. Therefore, health educators could play vital role in understanding students‟ beliefs and design appropriate programs, awareness messages, and community campaigns to increase knowledge and health belief about this disease and its consequences.

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APPENDICES

APPENDIX A

EMAIL PERMISSION FOR THE USE OF KNOWLEDGE INSTRUMENT.

Instrument in American Journal of Health Education

CVD Research x

Hannah Bergman heb38@case.edu 9/28/11

to me

Hi Yuba,

You can use the instrument (I purposefully published the entire instrument so that people could use it without needing permission, however I appreciate you asking). Thank you.

Yuba Gautam 9/28/11

to Hannah

Thank you so much Hannah.

Yuba

APPENDIX B

EMAIL PERMISSION FOR THE USE OF HEALTH BELIEF INSTRUMENT.

Permission to use your Cardiovascular Instrument

Yuba Gautam 10/10/11

to egres2

Hi Dr. Tovar,
I read your article published in Journal of Advanced Nursing about development of HBM scale regarding CVD. I am doing similar kind of research and trying to assess CVD knowledge and health beliefs about CVD among undergraduate students. After discussing with my advisor Dr. Dale Ritzel, he recommended to contact you to ask for permission to use your instrument. I will be happy to share the results of my study with you. Will you please send me a copy of your instrument so that I can use for our study. I will update you the progress of our study. Thank you so much and hope to hear from you soon.

Yuba Gautam 10/17/11

to egres2

Hi Dr. Tovar,
I am sending you a follow up email regarding your HBM Instrument. Looks like my previous email did not reach to you.
Iread your article published in Journal of Advanced Nursing about development of HBM scale regarding CVD. I am doing similar kind of research and trying to assess CVD knowledge and health beliefs about CVD among undergraduate students. After discussing with my advisor Dr. Dale Ritzel, he recommended to contact you to ask for permission to use your instrument. I will be happy to share the results of my study with you. Will you please send me a copy of your instrument so that I can use for our study. I will update you the progress of our study. Thank you so much and hope to hear from you soon.

Gressle, Elizabeth elizabeth.gressle@uky.edu 10/22/11

to me

Hi Yuba,
Yes, you may use my instrument. I have attached it here as a word file and pdf. I would be interested in your findings – especially with this population of undergrad students who are most likely healthy. I'll look forward to updates. Thanks and good luck! Elizabeth

Elizabeth Gressle Tovar, PhD, RN, FNP-C
University of Kentucky College of Nursing
Office: (859) 323-6611
Pager: (859) 330-3909
egres2@email.uky.edu

APPENDIX C

Cardiovascular Disease Knowledge and Health Belief Survey:

Knowledge Questionnaire:

Instructions: Please respond to the following 30 brief questions by placing a check mark (√) in the appropriate box below.

S. No.	Question	True	False	Don't Know
1.	Polyunsaturated fats are healthier for the heart than the saturated fats.			
2.	Women are less likely to get heart disease after menopause than before.			
3.	Having had chicken pox increases the risk of heart disease.			
4.	Eating a lot of red meat increases heart disease risk.			
5.	Most people can tell whether or not they have high blood pressure.			
6.	Trans-fats are healthier for the heart than most other kinds of fats.			
7.	The most important cause of heart attacks is stress.			
8.	Walking and gardening are considered types of exercise that can lower heart disease risk			
9.	Most cholesterol in an egg is in the white part of the egg.			
10.	Smokers are more likely to die due to cancer than heart disease.			
11.	Taking an aspirin each day decreases the risk of getting heart disease.			
12.	Dietary fiber lowers blood cholesterol.			
13.	Heart disease is the leading cause of death in the United States.			
14.	The healthiest exercise for the heart involves rapid breathing for a sustained period of time.			

15.	Turning pale or gray is a symptom of having a heart attack.			
16.	A healthy person‟s pulse should return to normal within 15 minutes after exercise.			
17.	Sudden trouble seeing in one eye is a common symptom of having a heart attack.			
18.	Cardiopulmonary resuscitation (CPR) helps to clear clogged blood vessels.			
19.	HDL refers to „good‟ cholesterol, and LDL refers to „bad‟ cholesterol.			
20.	Atrial defibrillation is a procedure where hardened arteries are opened to increase blood flow.			
21.	Feeling weak, lightheaded, or faint is a common symptom of having heart attack.			
22.	Taller people are more at risk for getting heart disease.			
23.	„High‟ blood pressure is defined as 110/80 [systolic/diastolic] or higher.			
24.	Most women are more likely to die from breast cancer than heart disease.			
25.	Margarine with liquid safflower oil is healthier than margarine with hydrogenated soy oil.			
26.	People who have diabetes are at higher risk of getting heart disease.			
27.	Men and women experience many of the same symptoms of a heart attack.			
28.	Eating a high fiber diet increases the risk of getting heart disease.			
29.	Heart disease is better defined as a short-term illness than a chronic, long term illness.			
30.	Many vegetables are high in cholesterol.			

Health Beliefs related to Cardiovascular Disease scale

Instructions: Please respond to the following 25 brief statements by placing a check mark (√) in the appropriate box below. You have no time limit, but please work as quickly as you can. Please be as open and honest as possible and answer based on how you feel and what you do <u>most</u> of the time.

	Strongly Agree	**Agree**	**Disagree**	**Strongly disagree**
1. It is likely that I will suffer from a CVD in the future	☐	☐	☐	☐
2. My chances of suffering from a CVD in the next few years are great	☐	☐	☐	☐
3. I feel I will have a CVD sometime during my life	☐	☐	☐	☐
4. Having a CVD is currently a possibility for me	☐	☐	☐	☐
5. I am concerned about the likelihood of having a CVD in the near future	☐	☐	☐	☐
6. Having a heart attack or stroke is always fatal	☐	☐	☐	☐
7. Having a heart attack or stroke will threaten my relationship with my significant other	☐	☐	☐	☐
8. My whole life would change if I had a heart attack or stroke	☐	☐	☐	☐
9. Having a heart attack or stroke would have a very bad effect on my sex life	☐	☐	☐	☐
10. If I have a heart attack or stroke I will die within ten years	☐	☐	☐	☐
11. Increasing my exercise will decrease my chances of having a heart attack or stroke	☐	☐	☐	☐
12. Eating a healthy diet will decrease my chances of having a heart attack or stroke	☐	☐	☐	☐
13. Eating a healthy diet and exercising for 30 minutes most days of the week is one of the best ways for me to prevent a heart attack or stroke	☐	☐	☐	☐
14. When I exercise I am doing something good for myself	☐	☐	☐	☐
15. When I eat healthy I am doing something good for myself	☐	☐	☐	☐

	Strongly Disagree	Disagree	Agree	Strongly Agree
16. Eating a healthy diet will decrease my chances of dying from cardiovascular disease	☐	☐	☐	☐
17. I do not know the appropriate exercises to perform to reduce my risk of developing cardiovascular disease	☐	☐	☐	☐
18. It is painful for me to walk for more than 5 minutes	☐	☐	☐	☐
19. I have access to exercise facilities and/or equipment	☐	☐	☐	☐
20. I have someone who will exercise with me	☐	☐	☐	☐
21. I do not have time to exercise for 30 minutes a day on most days of the week	☐	☐	☐	☐
22. I do not know what is considered a healthy diet that would prevent me from developing cardiovascular disease	☐	☐	☐	☐
23. I do not have time to cook meals for myself	☐	☐	☐	☐
24. I cannot afford to buy healthy foods	☐	☐	☐	☐
25. I have other problems more important than worrying about diet and exercise	☐	☐	☐	☐

Demographic variable and other personal variable questions:

5. What is your age?

_____yrs.

6. What is your gender?

☐ Male

☐ Female

7. What is your height in feet and inches?

_____ft_____inches

8. What is your weight in pounds?

_____lbs

9. Where do you live?

☐ On Campus

☐ Off campus

10. Are you an international student?

☐ Yes

☐ No

11. How many health classes have you taken at SIUC? (1, 2, 3, or more than 3)

_____

12. Race/ Ethnicity

☐ Native American

☐ African American

☐ Asian

☐ Pacific Islander

☐ Hispanic/Latino

☐ White

☐ Other

13. Do any of your primary relatives (parents, grandparents, siblings) have a history of heart disease?

☐ Yes

☐ No

☐ Not Sure

14. Do any of your primary relatives (parents, grandparents, siblings) have diabetes?

☐ Yes

☐ No

☐ Not Sure

15. Do any of your primary relatives (parents, grandparents, siblings) have high blood pressure?

    ☐ Yes

    ☐ No

    ☐ Not Sure

16. Do any of your primary relatives (parents, grandparents, siblings) have a history of high cholesterol?

    ☐ Yes

    ☐ No

    ☐ Not Sure

17. Would you say that your family consumed a high fat diet (lots of red meat, whole diary, butter/margarine) during your time spent at home?

    ☐ Yes

    ☐ No

    ☐ Not Sure

18. Is your cholesterol level higher than it should be?

    ☐ Yes

    ☐ No

    ☐ Not Sure

19. Do you have high blood pressure?

    ☐ Yes

    ☐ No

    ☐ Not Sure

20. Have you been diagnosed as pre-diabetic or diabetic?

    ☐ Yes

    ☐ No

    ☐ Not Sure

21. Would you describe your life as being highly stressful?

    ☐ Yes

    ☐ No

    ☐ Not Sure

22. Do you smoke?

    ☐ Yes

    ☐ No

    ☐ Not Sure

23. How would you describe the level of exercise that you get each day?

□ Less than what I should be exercising each day
□ About what I should be exercising each day
□ More than what I should be exercising each day

24. How would you describe your dietary behavior?

□ Eating only the recommended number of calories each day
□ Eating less than recommended number of calories each day
□ Eating more than the recommended number of calories each day

APPENDIX D

IRB APPROVAL

SIU Southern Illinois University
CARBONDALE

OFFICE OF SPONSORED PROJECTS ADMINISTRATION
MAIL CODE 4709
900 SOUTH NORMAL AVENUE
CARBONDALE, ILLINOIS 62901

siuhsc@siu.edu
618/453-4533
618/453-8038 FAX

HSC Approval letter (exempt)

To: Yuba Gautam

From: Jane L. Swanson, Ph.D
Chair, SIUC Human Subjects Committee

Date: March 2, 2012

RE: Protocol 12101

Title: *A study of assessing knowledge and health beliefs about cardiovascular disease among selected undergraduate university students using Health Belief Model*

The revisions to the above referenced study have been approved by the SIUC Human Subjects Committee. The study is determined to be exempt according to 45 CFR 46.101(b)2. This approval does not have an expiration date; however, any future modifications to your protocol must be submitted to the Committee for review and approval prior to their implementation.

Your Form A approval is enclosed.

This institution has an Assurance on file with the USDHHS Office of Human Research Protection. The Assurance number is FWA00005334.

JS:kr

Cc: Dale O. Ritzel

APPENDIX E

CONSENT FORM

My name is *Yuba Gautam*. I am a graduate student at Southern Illinois University-Carbondale.

I am asking you to participate in my research study. The purpose of my study is to determine overall knowledge and health beliefs about Cardiovascular Disease among selected undergraduate university students.

Participation is voluntary. If you choose to participate in the study, it will take approximately 10-15 minutes of your time. You will be asked to answer the survey questions. Please read carefully all the questions and give your best response.

All your responses will be kept confidential within reasonable limits. Only those directly involved with this project will have access to the data.

If you have any questions about the study, please contact me or my advisor.

Principal Investigator- Yuba Gautam, Telephone: 507-382-7343

Advisor: Dr. Dale O. Ritzel, Telephone: 618-453-2777

Thank you for taking the time to assist me in this research.

Participant Signature and Date

This project has been reviewed and approved by the SIUC Human Subjects Committee. Questions concerning your rights as a participant in this research may be addressed to the Committee Chairperson, Office of Research Development and Administration, SIUC, Carbondale, IL 62901-4709. Phone (618) 453-4533. E-mail: siuhsc@siu.edu

APPENDIX F

COVER LETTER

Dear Participants:

I am a graduate student seeking my PhD degree in the Department of Health Education and Recreation at Southern Illinois University Carbondale.

The purpose of the enclosed survey is to gather information about health knowledge and belief about cardiovascular disease among undergraduates.

The survey will take 10 to 15 minutes to complete. All your responses will be kept confidential within reasonable limits. Only people directly involved with this project will have access to the surveys.

Completion and return of this survey indicate voluntary consent to participate in this study. Please use the return envelope provided.

Questions about this study can be directed to me or to my supervising professor,

Dr. Dale O. Ritzel,

Department of Health Education, SIUC, Carbondale, IL 62901-4632.

Phone (618) 453-2777

Thank you for taking the time to assist me in this research.

Name: Yuba Gautam

Phone number: 507-382-7343

E-mail (optional): yuba2005@siu.edu

This project has been reviewed and approved by the SIUC Human Subjects Committee. Questions concerning your rights as a participant in this research may be addressed to the Committee Chairperson, Office of Research Development and Administration, SIUC, Carbondale, IL 62901-4709. Phone (618) 453-4533. E-mail: siuhsc@siu.edu

CURRICULUM VITAE OF YUBA R. GAUTAM

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II. EDUCATION:

Ph.D. Candidate in Health Education March 2011 - Present
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Health Education Program
College of Education and Human Services
Southern Illinois University in Carbondale, Illinois, USA

M.S. in Community Health 2005 - 2007
Minnesota State University, Mankato, MN, USA

Bachelor of General Medicine 1994 - 2000
Saint Petersburg State Medical Academy, St. Petersburg, Russia

III. PUBLICATIONS

Ritzel, D. O., **Gautam, Y. R.,** & Alexandriva, M. (2012). Human and Environmental Health Action Plan: Smart Strategies for a Sustainable Future. *Umwelt and Gesundheit Online (Environment and Health Online), 5,* 6-12.

Posser, T., & **Gautam, Y. R.** (2011). Role Delineation in Health Education. *The Health Education Monograph Series, 28*(3), 60-65.

Gautam, Y. R. (2010). Wiki in Kittleson, M. *Teaching with Web 2.0.* Benjamin Cummings - Pearson Education, San Francisco, CA.

IV. DISSERTATION

Dissertation title *"A study of assessing knowledge and health beliefs about cardiovascular disease among selected undergraduate university students using Health Belief Model"*. Advisor: Dr. Dale O. Ritzel.