INTRODUCTION

Health psychology is sharply emerging as a field of intensive research in the recent years. Coronary heart disease is one of the most prevalent chronic diseases. Coronary heart disease affects people at younger ages in low and middle-income countries, compared to high income countries, thereby having a greater economic impact on low and middle-income countries. Coronary heart disease is responsible for a substantial amount of early deaths, reduced quality of life and significant costs to the health and social care system and to the economy. Age, high cholesterol, high blood pressure, smoking and diabetes are the main classical risk factors for CHD (Huffman, 2010). The prevalence of CHD is increasing annually, creating a large societal burden (Foxwell, Morley, and Frizelle, 2013). CHD is the largest killer in the developed world and is rapidly becoming one in the developing countries such as Iran. CHD is a leading cause of mortality, morbidity and disability with high healthcare costs in Iran. It accounts for nearly 50 percent of all deaths per year (Pishkar, 2012). In his monumental work Mohan (2006) highlighted the role of psychological factors in heart diseases.

WHAT IS CORONARY HEART DISEASE?

**Coronary heart disease (CHD)** is a general term that refers to illnesses caused by atherosclerosis, the narrowing of the coronary arteries- the vessels that supply the heart with blood. When these vessels become narrowed or close, the flow of oxygen and nourishment to the heart is partially or completely obstructed. Temporary shortages of oxygen and nourishment frequently cause pain, called angina pectoris that radiates across the chest and arm. When severe deprivation occurs, a heart attack (myocardial infarction) can result (Foxwell, Morley, and Frizelle, 2013).

CHD is also a disease of **modernization**, due to **alterations in lifestyle**. Research has implicated immune functioning (Kop and Gottdiener, 2005), especially inflammatory processes in the rise of CHD. A particular proinflammatory cytokine (IL-6) is thought to play a role in heart disease by stimulating processes that contribute to the buildup of atherosclerotic plaque (Suarez, 2003). Low-grade inflammation appears to underlie many, if not most, cases of cardiovascular disease.
A strong predictor of heart disease is the level of C-reactive protein in the bloodstream (Surtees, Wainwright, Luben, Wareham, Bingham, and Khaw, 2008). C-reactive protein is a proinflammatory cytokine that is produced in the liver and released in the bloodstream in the presence of acute or chronic inflammation. Because inflammation can promote damage to the walls of the blood vessels, C-reactive protein is a prognostic sign that this damage may be occurring. A behavioral sign of inflammation activity is unexplained fatigue (Cho, Shin, Baek, and Kim, 2009).

Exposure to air pollution is also identified as a contributing factor (Miller, Siscovick, Shepherd, Sullivan, Anderson, and Kaufman, 2007). Identifying patients with metabolic syndrome also helps predict heart attacks. Metabolic syndrome is diagnosed when a person has three or more of the following problems: obesity centered around the waist; high blood pressure; low levels of High Deposit Lipids, the so-called good cholesterol; difficulty metabolizing blood sugar, an indicator of risk for diabetes; and high levels of triglycerides, which are related to bad cholesterol (World Health Organization, 2016). High cardiovascular reactivity may also be a component of this cluster (Waldstein and Burns, 2003). Routine screening for metabolic syndrome and inflammation (by assessing C-reactive protein) is recommended for most middle-aged adults.
Heart disease also runs in families. A person may inherit a genetically based predisposition to cardiovascular reactivity, which may emerge early in life (Yamada, Ishizaki and Tsuritani, 2002) and which is exacerbated by low socio economic status (SES) and a harsh (cold, non-nurturant, neglectful, and/or conflictual) family environment in childhood. Stress exposure and an inability to develop strong relationships may explain why these factors are related to early cardiovascular risk (Low, Snyder and Clarke, 2009). Even in young adolescents, especially those low in SES, risk factors for heart disease begin to cluster by age 14 (Lawlor, Smith, Ebrahim, Thompson, and Sattar, 2005).

**DEFINITIONS OF CORONARY HEART DISEASE**

According to WHO definition of CHD (2013), Coronary Heart Disease (CHD) occurs when the arteries of the heart that normally provide blood and oxygen to the heart are narrowed or even completely blocked.

American Heart Association (AHA) defined bypass surgery as a surgical procedure performed to relieve angina and reduce the risk of death from coronary artery disease. When one of the heart's arteries gets blocked and a person has a heart attack, one common procedure is to perform heart surgery and sew in a new piece of blood vessel to bridge over (bypass) the blockage. In many cases, the surgeon will fix not only the immediate problem, but also other arteries on the heart that are starting to look blocked. If the surgeon repairs three of the arteries, it is called a triple bypass. If four arteries are repaired, it's a quadruple bypass. The blood vessel used to create the bypass is taken from the chest or the leg because the body has several redundant vessels that can be removed without doing harm (AHA, 2013).

Angina is exceptional chest pain, pressure or discomfort caused by blockages in one or more of the heart arteries, which reduces the flow of blood.

Myocardial infarction (MI) (i.e., heart attack) is the irreversible death (necrosis) of heart muscle secondary to prolonged lack of oxygen supply (ischemia). Patients with typical MI may have the following prodromal symptoms in the days preceding the event (although typical STEMI may occur suddenly, without warning): Fatigue, Chest discomfort, Malaise. Typical chest pain in acute MI has the following characteristics (Zafari, Abdou and Taramera, 2015):
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- Intense and unremitting for 30-60 minutes
- Retrosternal and often radiates up to the neck, shoulder, and jaw and down to the ulnar aspect of the left arm
- Usually described as a substernal pressure sensation that also may be characterized as squeezing, aching, burning, or even sharp
- In some patients, the symptom is epigastric, with a feeling of indigestion or of fullness and gas
- The respiratory rate may be increased in response to pulmonary congestion or anxiety
- Coughing, wheezing, and the production of frothy sputum may occur (Zafari, Abdou and Taramera, 2015)

**Acute coronary syndrome (ACS)**, otherwise known as heart attack, occurs when a blockage occurs suddenly. ACS encompasses acute myocardial infarction (MI) with and without ST-segment elevation and unstable angina. Symptoms of an angina and ACS include: pain or discomfort in the middle of the chest, arms/shoulders/elbows (classically on the left side), jaw or back. In addition the person may feel shortness of breath, nausea, vomiting, light-headedness and appear faint, pale, and/or diaphoretic. Women are more likely to have shortness of breath, nausea, vomiting and back or jaw pain (WHO, 2013).

**Ischemia** is a condition in which the blood flow (and thus oxygen) is restricted or reduced in a part of the body. **Ischemic heart disease** is the term given to heart problems caused by narrowed heart arteries. When arteries are narrowed, less blood and oxygen reaches the heart muscle. This is also called coronary artery disease and coronary heart disease. This can ultimately lead to heart attack. Ischemia often causes chest pain or discomfort known as angina pectoris. Having an exercise stress test or wearing a Holter monitor – a battery-operated portable tape recording that measures and records your electrocardiogram (ECG) continuously, usually for 24-48 hours – are two tests often used to diagnose this problem. Other tests also may be used (American Heart Association, 2014).
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PREVALENCE OF CORONARY HEART DISEASE

Prevalence and especially incidence estimates are crucially important to the planning of public health measures. In primary and secondary prevention, developing and maintaining public health strategies are based on disease incidence and mortality. Additionally, such information is of international interest because of increasing disease trends and the regional differences, in risk factors (Huffman, 2010). According to the World Health Organization (2013) coronary heart disease is the number one cause of death globally. More people die annually from coronary heart disease than from any other cause. In particular, the Global Burden of Disease study classified ischemic heart disease as the leading cause of global mortality. Cardiovascular diseases account for approximately 30% of all deaths. Deaths caused by stroke and other cerebrovascular disorders are not considered in this count (cerebrovascular disease alone represents roughly 10% of all causes of death).

According to World Health Organization (2013):

- Over 80% of the world's deaths from CHD occur in low and middle-income countries.
- People in low and middle-income countries are more exposed to risk factors such as tobacco, leading to CHD and other non-communicable diseases. At the same time they often do not have the benefit of prevention programmes compared to people in high-income countries.
- People in low and middle-income countries who suffer from CHD and other non-communicable diseases have less access to effective and equitable health care services which respond to their needs (including early detection services).
- As a result, many people in low and middle-income countries die younger from CHD and other non-communicable diseases, often in their most productive years.
- The poorest people in low and middle-income countries are affected most. At the household level, sufficient evidence is emerging to prove that CHD and other non-communicable diseases contribute to poverty due to catastrophic health spending and high out of pocket expenditure.
At macro-economic level, CHD places a heavy burden on the economies of low and middle-income countries. Non-communicable disease including cardiovascular disease and diabetes are estimated to reduce GDP by up to 6.77% in low and middle-income countries experiencing rapid economic growth, as many people die prematurely.

Despite the lack of reliable estimates, there is some evidence to indicate that CHD is increasing in magnitude in the Islamic Republic of Iran. While age-adjusted mortality from CHD is gradually falling in developed countries, the rate has increased by 20%–45% in the Islamic Republic of Iran. It seems likely that changing lifestyles such as high consumption of processed foods rich in saturated fat and a low level of physical activity along with the rising prevalence of obesity and Type 2 diabetes and stress are leading to a progressive increase in the prevalence of cardiovascular risk factors (CVD) and CHD in developing countries (Hadaegh, 2009). According to Statistical Center of Iran report (2013), the rate of mortality caused by CHD was 39% in 2012. Most patients were above the age of 35 years and nearly 800 deaths from CHD every day are reported in Iran.

THEORETICAL MODELS OF HEALTH AND CORONARY HEART DISEASE

An individual’s adherence to healthy lifestyle choices, management of serious illness and coping can be dealt with effectively with the help of systematic conceptual models. Whitehead (2006) suggested that without a clear theoretical basis, it would not be possible to move forward or ensure that the health promotion components are being implemented successfully. There has been a shift from illness-focused priorities, such as disease prevention and health protection, to a focus on complete physical, emotional, and social well being with the advent of these models:

1. HEALTH BELIEF MODEL (HBM)

The HBM model has been one of the most commonly used theoretical models in health education and promotion (Glanz, Rimer, and Viswanath, 2008). According to the HBM, the likelihood that someone will take action to prevent illness depends upon the individual's perception that:
They are personally vulnerable to the condition;

The consequences of the condition would be serious;

The precautionary behavior effectively prevents the condition; and

The benefits of reducing the threat of the condition exceed the costs of taking action (Redding, Rossi, Velicer, and Prochaska, 2000)

The model's four key components are conceptualized as perceived: (i) susceptibility, (ii) severity, (iii) effectiveness, and (iv) cost.


**Perceived susceptibility** refers to the probability that an individual assigns to personal vulnerability in developing the condition. The concept of perceived susceptibility has been found to be predictive of a number of health-protective behaviors. It means the likelihood that individuals will engage in precautionary behaviors to prevent CHD.

**Perceived severity** refers to how serious the individual believes the consequences of developing the condition are. An individual is more likely to take action to prevent heart failure if s/he believes that possible negative physical, psychological, and/or social effects resulting from developing the disease pose serious consequences.
Perceived effectiveness refers to the benefits of engaging in the protective behavior. Motivation to take action to change a behavior requires the belief that the precautionary behavior effectively prevents the condition. For example, individuals who are not convinced that there is a causal relationship between smoking, alcohol, anger management and CHD are unlikely to quit these behaviors because they may believe that quitting will not protect them against the CHD.

Perceived cost refers to the barriers or losses that interfere with health behavior change. The combination of perceived effectiveness and perceived costs constitute the notion of outcome expectation. Belief alone is not enough to motivate an individual to act. Taking action involves cognitively weighing the personal costs associated with the behavior against the benefits expected as a result of engaging in the behavior. Benefits have to outweigh the costs involved in order to indulge in protective behaviors.

Cues to action involve stimuli that motivate an individual to engage in health behavior. The stimulus that triggers action may be internal or external. For example, angina may act as an internal cue to initiate action. External cues such as death of a parent due to CHD may also trigger health behavior changes in an individual who was not considering them. Further, individuals who believe they can look after their health can exercise regularly and control their diet experience higher self-efficacy to be able to manage their health behaviors.

Studies have been done to see the applicability of health belief model in illness perception and lifestyle choices. Glanz, Rimer and Viswanath (2008) stated that, in general, people will adopt a new healthy behavior or product (in this case, cardiovascular disease knowledge and health belief) if they consider themselves susceptible to a condition (CHD), if they think it will lead to potentially serious consequences (CHD and its complications), 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. Also, they are more likely to take precautions 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’s beliefs about health and the relative costs and benefits of actions to modify health behavior (Nutbeam and Harris, 2004).
In another study done by McClendon (2011), higher perceived cardiovascular disease severity was associated with increased likelihood for healthy food choices and physical activity. In contrast, higher perceived cardiovascular disease susceptibility was associated with decreased likelihood for healthy food choices and physical activity.

2. PROTECTION MOTIVATION THEORY

Protection motivation theory (PMT; Rogers, 1983) was originally developed to explain how people respond to fear-arousing health threat communications or ‘fear appeals.’ It can be regarded as an adaptation of the Health Belief Model. Protection motivation refers to the motivation to protect oneself against a health threat; it is usually defined operationally as the intention to adopt the recommended action (Sutton, 2002). Of the determinants of intention specified by the model, the four that have received the most empirical attention are:

- **Vulnerability**
- **Severity** (equivalent to perceived susceptibility and severity in the HBM),
- **Response efficacy** (the belief that the recommended action is effective in reducing the threat), and
- **Perceived self-efficacy**

Thus, a person will be more motivated to protect himself or herself (i.e., have a stronger intention to adopt the recommended action) if he or she believes that (i) the threat is likely to happen if the current course of action is continued, (ii) the consequences will be serious if the threat occurs, (iii) that the recommended action is effective in reducing the likelihood or the severity of the threat, and (iv) that he or she is able to carry out the recommended action (Sutton, 2002).

Bui, Mullanm and McCaffery (2013) investigated the effectiveness of the protection motivation theory in the prediction and promotion of physical activity participation. A literature search was conducted. A total of 20 studies were reviewed, grouped into four design categories: prediction, stage discrimination, experimental manipulation, and intervention. The results indicated that the PMT’s coping appraisal construct of self-efficacy generally appears to be the most effective in predicting and promoting physical activity participation.

Tulloch, Reida, D'Angeloa, Plotnikoff, Morrina, Beatona and Pipe (2009) also conducted a study to examine the utility of protection motivation theory (PMT) in the prediction of exercise intentions and behavior in the year following hospitalization for coronary heart disease. Patients with documented CHD, recruited at hospital discharge, completed questionnaires measuring PMT's threat (i.e. perceived severity and vulnerability) and coping (i.e. self-efficacy, response efficacy) appraisal constructs at baseline, 2 and 6 months, exercise behaviour at baseline, and 6 and 12 months post-hospitalisation. Structural equation modelling showed that the PMT model of exercise at 6 months had a good fit with the empirical data. Self-efficacy, response efficacy, and perceived severity predicted exercise intentions, which, in turn predicted exercise behaviour. Overall, the PMT variables accounted for a moderate amount of variance in exercise intentions (23%) and behaviour (20%). In contrast, the PMT model was not reliable for predicting exercise behaviour at 12 months post-hospitalisation. The data provided support for PMT applied to short-term, but not long-term, exercise behaviour among patients with Coronary Artery Disease. Health education should concentrate on providing positive coping messages to enhance patients’ confidence regarding exercise and their belief that exercise provides health benefits, as well as realistic information about disease severity.
3. THEORY OF REASONED ACTION PLANNED BEHAVIOR

The theory of reasoned action (TRA; Ajzen and Fishbein, 1980) assumes that most behaviors of social relevance (including health behaviors) are under volitional control, and that a person's intention to perform a behavior is both the immediate determinant and the single best predictor of that behavior.

Intention in turn is held to be a function of two basic determinants: attitude towards the behavior (the person's overall evaluation of performing the behavior) and subjective norm (the perceived expectations of important others with regard to the individual performing the behavior in question). People will have strong intentions to perform a given action if they evaluate it positively and if they believe that important others think they should perform it.

But, many behaviors cannot simply be performed at will; they require skills, opportunities, resources, or cooperation for their successful execution. The theory of planned behavior (TPB; Ajzen, 1991) was an attempt to extend the TRA to include behaviors that are not entirely under volitional control, for example giving up smoking.

To accommodate such behaviors, a new variable was added called perceived behavioral control. This refers to the perceived ease or difficulty of performing the behavior, and is assumed to reflect past experience as well as anticipated obstacles. According to Ajzen (1991) perceived behavioral control is a function of control beliefs in just the same way as subjective norm is a function of normative beliefs. It is assumed to have a direct influence on intention. For desirable behaviors, greater perceived behavioral control should lead to stronger intentions.

Perceived behavioral control may also have a direct predictive effect on behavior, through two different mechanisms. First, by holding the intention constant-an individual with higher perceived behavioral control is likely to try harder and to persevere for longer than an individual who has lower perceived control. Second, people may have accurate perceptions of the amount of actual control they have over the behavior (Sutton, 2002).
The theory has also been empirically validated among coronary heart patients. A recent study by White, Terry, Troup, Rempel, Norman, Mummery and Kenardy (2012) evaluated the effectiveness of a 4-week extended theory of planned behavior intervention to promote regular physical activity and healthy eating among older adults diagnosed with cardiovascular disease and diabetes. Participants completed TPB measures of attitude, subjective norm, perceived behavioral control, and intention, as well as planning and behavior, at pre-intervention and 1 week and 6 week post-intervention for each behavior. Compared with control participants, the intervention group showed short-term improvements in physical activity and planning, with further analyses indicating that the effect of the intervention on behavior was mediated by planning. The results indicated that TPB-based interventions may encourage physical activity among diabetic and coronary heart patients.

4. SELF DETERMINATION THEORY

Self-determination theory (SDT, Deci and Ryan, 1985, 2000) is a general theory of human motivation that emphasizes the extent to which behaviors are relatively autonomous (i.e., the extent to which behaviors originate from the self) versus relatively controlled (i.e., the extent to which behaviors are pressured or coerced by intrapsychic or interpersonal forces). SDT defines motivation as psychological energy directed at a particular goal. It has offered a particularly
A comprehensive approach to studying health behavior via its conceptualization and measurement of autonomy, perceived competence, relatedness to others, and its emphasis on the role of the social context in supporting or thwarting optimal motivation.

**Self-Determination Theory (SDT)**
*(Ryan & Deci, 2000)*

- **Autonomy** - Most health-related behaviors, such as increasing physical activity, taking medications, or quitting smoking, are not intrinsically motivated or inherently enjoyable activities. Thus, if such behaviors are to be successfully enacted and maintained outside of treatment settings or controlled environments, CHD patients must come to value the behaviors and personally endorse their importance. Unfortunately, many people engage in behavioral changes only because of what in SDT is labeled controlled motivation. One common form of controlled motivation is external regulation, in which a person acts only to get an external reward, avoid a punishment or to comply with social pressures. Practitioners often create external regulation by suggesting incentives or contingencies, or by trying to motivate through mere authority. Another form of controlled motivation is introjection, in which a patient might act to receive approval or praise, or to avoid disapproval or feelings of guilt (Ryan, Patrick, Deci and Williams, 2008).


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*Introducing...*
According to SDT, both forms of controlled regulation, external and introjected regulation, are largely unrelated to long term adherence. In contrast change can be a function of autonomous motivation. One form of autonomous motivation is identified regulation, when one personally endorses or identifies with the value or importance of a behavior or health practice. Identification is facilitated when practitioners provide relevant information and meaningful rationale for change, and do not apply external controls and pressures that detract from a sense of agency or choice. The person gradually aligns it with other central values and lifestyle patterns (Ryan, Patrick, Deci and Williams, 2008).

- **Competence**—Along with a sense of autonomy, internalization requires that a person experience the confidence and competence to change. In SDT, support for competence is afforded when practitioners provide effective relevant inputs and feedback. Patients are not over challenged, but rather helped to experience mastery in terms of the health behaviour change that needs to be engaged (Ryan, Patrick, Deci and Williams, 2008).

  Once people are volitionally engaged and have a high degree of willingness to act, they are then most apt to learn and apply new strategies and competencies (Markland, Ryan, Tobin and Rollnick, 2005). Moreover, in contradistinction to self-efficacy theory (Bandura, 1989), SDT predicts that competence alone is not sufficient to ensure adherence; it must be accompanied by volition or autonomy.

- **Relatedness**—Vulnerable individuals, often lacking in technical expertise, look for the inputs and guidance of professionals. In this process a sense of being respected, understood, and cared for is essential to forming the experiences of connection and trust that allow for internalization to occur. The impact of relatedness on patients’ openness to information and likelihood of complying with recommendations is thus high (Ryan et al., 2008).

  Using self-determination theory, Russell and Bray (2010) examined relationships between cardiac rehabilitation participants’ perceived autonomy,
support, motivation for exercise, and exercise behavior. They examined the relationship between perceived autonomy support and motivation for exercise at Week 4. They also measured motivation and attendance to exercise at a 1-week follow-up, 10 weeks later. **Perceived autonomy support was correlated with self-determined motivation.** Self-determined motivation predicted total exercise volume at follow-up, as well as length of exercise session duration. Results supported Self Determination Theory and the potential for applying it in motivation and exercise behavior of CHD patients and those who have the disposition for developing CHD.

**LEVENTHAL’S SELF REGULATORY MODEL OF ILLNESS**

Understanding illness perceptions of coronary heart bypass surgery patients is very helpful in managing their illness and psychological profile. Leventhal (1980) incorporated his description of illness cognitions into his self-regulatory model of illness behaviour. This model is based on approaches to problem solving and suggests that individuals deal with illness/symptoms in the same way as other problems. It is assumed that given a problem or a change in the status quo the individual will be motivated to solve the problem and re-establish their state of normality. Traditional models describe problem solving in three stages: (i) **interpretation** (making sense of the problem); (ii) **coping** (dealing with the problem in order to regain a state of equilibrium); and (iii) **appraisal** (assessing how successful the coping stage has been). According to models of problem solving these three stages will continue until the coping strategies are deemed to be successful and a state of equilibrium has been attained. In terms of health and illness, if healthiness is an individual’s normal state, then any onset of illness will be interpreted as a problem and the individual will be motivated to re-establish their state of health (i.e. illness is not the normal state).

**Illness Perception and Coronary Heart Disease**

Leventhal and his colleagues (Leventhal et al., 1980, 1997; Leventhal and Nerenz, 1985) defined **illness cognitions** as ‘a patient’s own implicit common sense beliefs about their illness’. They proposed that these cognitions provide patients with a framework or a schema for coping with and understanding their illness, and telling them what to look out for if they are becoming ill. Using interviews with patients
Introducing suffering from a variety of different illnesses, Leventhal and his colleagues identified five cognitive dimensions of these beliefs:

- **Identify**: This refers to the label given to the illness (the medical diagnosis) and the symptoms experienced.

- **The perceived cause of the illness**: These causes may be biological, such as a virus or a lesion, or psychosocial, such as stress or health-related behaviour. In addition, patients may hold representations of illness that reflect a variety of different causal models.

- **Time line**: This refers to the patients’ beliefs about how long the illness will last, whether it is acute (short-term) or chronic (long-term).

- **Consequences**: This refers to the patient’s perceptions of the possible effects of the illness on their life. Such consequences may be physical (e.g. pain, lack of mobility), emotional (e.g. loss of social contact, loneliness) or a combination of factors.

- **Curability and controllability**: Patients also represent illnesses in terms of whether they believe that the illness can be treated and cured and the extent to which the outcome of their illness is controllable either by themselves or by powerful others (Ogden, 2004).

**Strong illness identity, severe perceived consequences, low perceived controllability, and chronic perceived time-line of illness have been shown to be related to poor well-being** in various chronic illnesses (Aalto, Heijmans, Weinman and Aro, 2005). Illness perceptions have also been associated with self-care behaviours (Hagger and Orbell, 2003). Leventhal, Leventhal and Contrada (1998) proposed that a wide range of individual, contextual, and cultural factors influence illness perceptions. It has been found that the contents of illness perceptions are influenced by the personal experience of the illness and its management, and by cultural and social factors such as aspects of self, vicarious experiences of illness in the social environment, social comparison processes, as well as the mass media (Aalto et al., 2005).
Another factor influencing illness perception may be generic **psychosocial resources**, which can be personal, such as **perceptions of control or mastery**, or external resources, such as **social networks and support**. General feelings of self-efficacy and competence may modify perceptions of the specific situation, such as the controllability of an illness or its consequence. Theories of social support suggest that one of the pathways through which social support affects health is by modifying the persons’ appraisal of the stressfulness of the situation, and **social support** has been related to perceptions on stress (Maclennes, 2013). A chronic illness can be seen as a stress factor due to its adjustment demands for sufferers; therefore, appraisals of illness may also be influenced by support received from others (Ogden, 2004). Feedback from significant others may also be a source for interpretation of cardiac symptoms. Those seeking out **social support** have been shown to delay less in seeking treatment for myocardial infarction (MI) symptoms.

**Self-care** is a key principle in the management of chronic heart failure (HF) and is greatly affected by illness cognitions. A study done by Maclennes (2013) determined the relationships between illness representations, treatment beliefs and the performance of self-care in community heart failure patients. Perceived medication knowledge, beliefs about the necessity of medication and illness coherence were moderately correlated with self-care. Multiple regression analysis revealed that 46% of the variance in self-care could be explained by illness representations and treatment beliefs. Three factors were significant **predictors of self-care** – **medication knowledge, a belief in the illness having serious consequences and the impact of medication use on lifestyle**. This study has serious implications for patients recovering from bypass surgery and coronary heart disease and should be used to design interventions to correct misconceptions and enhance self-care (Skovholt and Trotter-Mathison, 2014).

**RISK FACTORS IN CORONARY HEART DISEASE**

Coronary heart disease (CHD) is caused due to a number of risk factors – modifiable and non-modifiable. Non modifiable classical risk factors include heredity, age, gender, elevated hypertension and diabetes. According to American Heart Association (AHA, 2013), the main modifiable risk factors for CHD are: smoking,
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obesity, stress, physical activity, temperament and alcohol intake. When several such risk factors exist together, the risk of CHD is much increased. Santulli (2013) reported that three leading risk factors for global disease burden were (in this order) arterial hypertension, tobacco smoking (including second-hand smoke) and household air pollution from solid fuels. The reason for the enormous burden of hypertension has been reported in numerous studies, showing that hypertensive disease is strongly associated with overall cardiovascular risk. Epidemic obesity, often triggered by multifaceted dietary imbalances, with its consequences, including rampant incidence of type 2 diabetes mellitus and other obesity-driven metabolic cardiovascular risk factors represents another major health problem in the industrialized world. According to AHA (2013), 8.3% of the adult population in United State has diabetes and 38.2% has abnormal fasting glucose levels or prediabetes.

Hatmi, Tavildari, Motlag, and Kashani (2007) illustrated with the help of clinical and para-clinical data that Iranian adult population was at a high level of CHD risk. They conducted a descriptive cross sectional survey involving 3000 healthy adults at 18 years of age or above who were recruited with cluster random sampling. The risk factors were found to be: smoking (21.6%), positive familial heart disease history (15%) and diabetes (6.3%). The respondents possessing them were declared to be high ‘at risk’ for developing CHD.

A lot of research has been done on health compromising behaviors, which lead to the emergence of heart diseases. These factors are particularly associated with lifestyle practices of the individual and mainly include the following elements (Doyle, 2011; Swetz, 2015):

1. Poor Diet
2. Use of Tobacco/Alcohol
3. Physical inactivity
4. Obesity

These four lifestyle behaviors are among the biggest contributors to most preventable diseases. They are responsible for 42% of deaths (Bernstein et al., 2010). According to Doyle (2001) there are six major lifestyle diseases, such as, coronary
heart disease, stroke, lung cancer, colon cancer, diabetes and chronic obstructive pulmonary disease. The rationale for CHD being included in lifestyle disease is traced to ‘imprudent living’ (Doyle, 2001).

1. **POOR DIET**

   Diet is an important and controllable risk factor for many of the leading causes of death. Experts estimate that unhealthful eating contributes to more than 400,000 deaths per year (Centers for Disease Control and Prevention, 2009). Globalization of food production and marketing has contributed to increasing consumption of energy-dense foods poor in dietary fiber and several micronutrients (Lang, 1997).

   The dietary patterns that increase risk are low in a variety of plant foods and higher in fatty meats, solid fats and added sugars. Dietary patterns that increase the risk of CHD include (Fleming, Holligan, and Kris-Etherton, 2013):
   
   - Saturated fats
   - High intake of red meat
   - High intake of sweets
   - Low fiber diet
   - High sodium intake

2. **USE OF TOBACCO/ALCOHOL**

   Several factors complicate the interactions between tobacco and alcohol on cardiovascular disease. Firstly, the relationship between smoking and risk of cardiovascular disease is dose dependent—more tobacco leads to more intensity of disease. For alcohol consumption, however, the issue is more complex. The relationship of alcohol to overall mortality and cardiovascular mortality has generally been J-shaped.

   According to Mukamal (2006) consumption in the range of 3 to 10 drinks per week is associated with lower risk of heart attack (i.e., myocardial infarction) and possibly of other forms of cardiovascular disease, such as blockage in an artery that supplies blood to the brain, resulting in a deficiency in blood flow (i.e., ischemic
stroke) or failure of the heart to pump blood sufficiently throughout the body (i.e., congestive heart failure). However, intake of three or more drinks per day clearly increases the risk of ischemic stroke, and heavier drinking may well increase the risk of myocardial infarction (Mukamal, 2006).

Moderate drinking has been associated with a consistently lower risk of myocardial infarction, but only a modestly lower risk of ischemic stroke, and a higher risk of hemorrhagic stroke. Alcohol consumed to excess over several years can produce an alcoholic cardiomyopathy, in which alcohol acts as a toxin to weaken the heart muscle directly and hence may improve with abstention. Cigarette smoking also is a strong risk factor for congestive heart failure in the general population (Klatsky, Chartier, Udaltsova, Gronningen, Brar, Friedman and Lundstrom, 2015), and research with dogs has shown that oral nicotine administration increases the degree of scarring that accompanies alcoholic cardiomyopathy (Edmondson, Kronish, Shaffer, Falzon, and Burg, 2013). Genetic variations which slow alcohol metabolism have been shown to increase HDL cholesterol and reduce the risk of myocardial infarction. While the specific advantages of red wine over other alcoholic beverages are unproven, the claimed beneficial effects of flavonoids on lipoprotein oxidation are available from grape juice as from wine (Arranz, Chiva-Blanch, Valderas-Martínez, Medina-Remón, Lamuela-Raventós, and Estruch, 2012).

3. PHYSICAL INACTIVITY

“Inactivity physiology” is separately studied from “activity physiology.” In part, this stems from the realization that if one walks briskly for 30 minutes every day but doesn’t do much physical activity in the rest of the waking hours is still leading a sedentary lifestyle. Several studies have shown that sedentary behavior such as the amount of time watching television, using a computer, playing games is associated with increased risk of developing CHD (Shiroma and Lee, 2010).

The amount of physical activity recommended, at least 150 minute per week of moderate intensity aerobic physical activity or 75 minute per week of vigorous intensity aerobic physical activity, is associated with reduced risk of CHD
(Physical Activity Guidelines Committee, 2008). Beneficial changes in cholesterol and lipid levels, including lower LDL ("bad" cholesterol) levels, occur even when people perform low amounts of moderate- or high-intensity exercise, such as walking or jogging 12 miles a week. However, more intense exercise is required to significantly change cholesterol levels, notably increasing HDL ("good" cholesterol) (Taylor, 2012).

Some studies suggest that for the greatest heart protection, it is not the duration of a single exercise session that counts but the **total weekly amount of energy expended.** Regular exercise helps keep arteries elastic (flexible), even in older people (Hunter, 2013). This, in turn, ensures good blood flow and normal blood pressure. **Sedentary** people have a **35% greater risk** of developing high blood pressure than physically active people do.

4. **OBESITY**

Obesity increases the risk of cardiovascular disease and premature death. Adipose tissue releases a large number of bioactive mediators that influence not only body weight homeostasis but also insulin resistance — the core feature of type 2 diabetes — as well as alterations in lipids, blood pressure, coagulation, fibrinolysis and inflammation, leading to endothelial dysfunction and atherosclerosis (Van Gaal, Mertens, and Christophe 2006; Huxley, 2014). **Obesity induces several cytokines and inflammatory markers** that might contribute to the cardiovascular outcome in overweight and obese people. Insulin resistance often clusters with various classical cardiovascular risk factors such as lipid abnormalities, glucose intolerance and high blood pressure. It influences the body weight homeostasis and also **insulin resistance, diabetes, lipid levels, tension, coagulation, fibrinolysis, inflammation and atherosclerosis** (Lau, Dhillon, Yan, Szmitko, and Verma, 2005; Pasandideh, 2011; Huxley, 2014).

**PROTECTIVE FACTORS IN CORONARY HEART DISEASE**

Australian Institute of Health and Welfare (2013) reported that risk factors are defined as those factors which make it more likely that a person will develop a health
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problem or disorder. Protective factors on the other hand, reduce the likelihood of a person suffering from a disease or improve their capacity to respond should a disease occur. A protective factor can therefore be described as one that contributes positively to an individual’s health and well-being. Factors which protect against CHD can vary from levels of HDL cholesterol in the bloodstream to behavioral factors, such as doing regular physical activity, eating plenty of fresh fruits and vegetables, having a strong social support network and an adequate level of income.

There is growing evidence to indicate that health belief systems have significant potential to change health behaviors and improve health. Cardiovascular disease is highly correlated with a number of health related behaviors, such as smoking, a diet high in saturated fats and lack of physical exercise. It has been demonstrated that changes in any or all of these behaviors would bring clear health benefit and it is at the junction between health beliefs and health behaviors that health education, which is sensitive to the interplay of individual, cultural and structural factors, can play a strategic role (Beishon and Navroo, 2013). According to World Health Organization Regional Office for Europe (2013) there is significant evidence that, the beliefs of individuals, communities and population is one of the major determinants of their health outcomes. One of the success theory to promote protective factors in Coronary Heart patients is Health Belief Model (HBM). The Health Belief Model (HBM) is a psychological model that attempts to explain and predict health behaviors. This is done by focusing on the attitudes and beliefs of individuals. The HBM was first developed in the 1950s by social psychologists Hochbaum, Rosenstock and Kegels working in the U.S. Public Health Services. The model was developed in response to the failure of a free tuberculosis (TB) health screening program. Since then, the HBM has been adapted to explore a variety of long and short-term health behaviors, such as, Smoking, Cardiovascular Disease and HIV/AIDS (Green and Murphy, 2014). In addition positive emotions, stable stress resistant personality, optimism and adequate coping with stress act as the protective.

Factors affecting coronary heart disease can be broadly classified into four areas:
PHYSICAL PROTECTIVE FACTORS/ HEALTH PROMOTING BEHAVIORS

The good news is that consciously making healthy lifestyle choices reduces the risk for CHD. Weinstein, Kwitel, McCaul, Magnan, Gerrard, and Gibbons (2007) have argued that perceived vulnerability, which can be conceptualized as a cognitive-affective state, might be a better predictor of healthy behavior. As per the Protection Motivation Theory (Rogers, 1983) once people have the realization that their lifestyle choices may predispose them towards illness or diseases, they become motivated to protect themselves by altering a few behaviors and by showing response efficacy (the belief that the recommended action is effective in reducing threat) and perceived self efficacy (the belief that one can perform the necessary action).

1. HEALTHY DIET

A diet high in fiber may protect against obesity and cardiovascular disease by lowering insulin levels. A diet high in fruits, vegetables, whole grains, peas, beans, poultry, and fish and low in refined grains, potatoes, and red and processed meats lowers the risk for CHD (Fung, Willett, Stampfer, Manson, and Hu, 2001). Modification in diet can lower blood cholesterol levels and these modifications, may in turn reduce the risk for atherosclerosis. The best-known finding is the relation of dietary factors to total serum cholesterol levels in general and to low-density lipid
proteins in particular (Taylor, 2012; Dasgupta, Quinn, Zarnke, Rabi, Ravani, Daskalopoulou, and Prebtani, 2014).

Dietary patterns that reduce the risk of CHD include (Fleming, Holligan, and Kris-Etherton, 2013):

- Non saturated fat
- Whole grain breads and cereals
- Moderate sodium intake
- High fiber diet
- Low intake of processed meat
- Plant proteins and Fruits and vegetables - they contribute to cardiovascular health through a variety of psycho-nutrients, potassium and fiber.
- Potassium - dietary intake of potassium lowers blood pressure and is protective against stroke and cardiac arrhythmias (Reddy and Katan, 2004)
- Milk and milk products are important contributors to dietary fat and can be high in saturated fat and cholesterol. They are also sources of minerals like potassium, magnesium and calcium. Dairy consumption has been correlated positively, in an ecological study, with blood cholesterol as well as coronary mortality. Milk consumption beyond a certain limit correlates positively with coronary mortality rates (Reddy and Katan, 2004).
- Eggs are unique because of their high cholesterol content. A large observational study suggested that there was no increase in the risk of CHD up to one egg per day (except in a diabetic subgroup) (Hu, Stampfer, Rimm, Manson, Ascherio, Colditz, and Hennekens, 1999; Fernandez, 2006). In terms of global recommendations, it may still be prudent to limit the intake to 3 – 4 eggs per week.

Certain kinds of diet are considered as highly protective against CHD and other illnesses. The traditional Mediterranean diet has been described to have eight components: (i) high monounsaturated-to-saturated fat ratio, (ii) moderate ethanol
consumption, iii) high consumption of legumes, (iv) high consumption of cereals (including bread), (v) high consumption of fruits, (vi) high consumption of vegetables, (vii) low consumption of meat and meat products and (viii) moderate consumption of milk and dairy products (Trichopoulou, Katsouyanni, Stuver, Tzala, Gnardellis, Rimm, and Trichopoulos, 1995; Reddy and Katan, 2004). The main component is olive oil, and many equate a Mediterranean diet with consumption of olive oil. Based on ecological comparisons, Fung, Rexrode, Mantzoros, Manson, Willett, and Hu (2009) hypothesized that traditional Mediterranean diet conferred protection against CHD and several other disorders, principally because of a low saturated fat content (Reddy and Katan, 2004).

Moreover, the Japanese diet is well known for its impact on healthy living because of the highest life expectancy in Japan and low CHD mortality rates among the Japanese. Their diet is low in fat and sugar and includes soy, seaweeds, raw fish and a predominant use of rice. Regular fish consumption on a weekly basis acts as a protective factor against CHD.

2. PHYSICAL ACTIVITY AND WEIGHT MANAGEMENT

Health psychologists have studied the impact of exercise on cognitive functioning and found beneficial effects, especially on well-being and cardiovascular fitness (Taylor, 2012). Active people have lower rates of CHD than inactive ones (Sofi, Capalbo, Cesari, Abbate, and Gensini, 2008). These findings have also been supported by biological mechanisms. The collective body of evidence led the American Heart Association in 1992 to recognize physical inactivity as a risk factor for CHD and led to the conclusion that regular physical activity or cardio respiratory fitness decreases the risk for CHD (Shiroma, 2010). In clinically stable people with CHD who respond to treatment, the benefits of physical activity far outweigh the risks. Indeed regular exercise appears similarly effective in secondary prevention as many drug interventions without the side effects they may produce (Naci and Ioannidis, 2013). Regular moderate-intensity exercise has the following benefits for people with CHD (Australia CHD Factsheet, 2014):

- It prevents the blood vessels from narrowing further (anti-atherosclerotic),
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- Prevents blood clotting (anti-thrombotic),
- Helps deliver blood to the heart (anti-ischemic), and
- Helps to maintain a normal heart rhythm (anti-arrhythmic). These changes reduce the load on the heart at rest and during exercise, which helps to lessen some of the symptoms as well as decrease the risk of death from CHD (Taylor, 2012).

The typical exercise prescription for a normal adult is 30 minutes or more of moderate-intensity activity on most, if not all, days of the week or 20 minutes or more of vigorous activity at least 3 days a week (U.S. Department of Health and Human Services, 2009). A person with low cardiopulmonary fitness may derive benefits with even less exercise each week. Because it is difficult to get sedentary adults to commit to a full-fledged exercise program, a lifestyle intervention aimed at increasing physical activity may represent a good start for aging sedentary adults (Conn, Valentine, and Cooper, 2002) and for the obese (Levine and Sartee, 2005), thus, curbing the risk for CHD through the following protective outcomes:

- Increased efficiency of the cardio respiratory system,
- Improved physical work capacity,
- Optimization of body weight,
- Improvement or maintenance of muscle tone and strength,
- Increases in soft tissue and joint flexibility,
- Reduction or control of hypertension,
- Lower levels of inflammation,
- Improved cholesterol level, improved glucose tolerance, improved
- Tolerance of stress, and
- Reduction in poor health habits, including cigarette smoking, alcohol consumption, and poor diet.
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In summary, benefits of weight management and regular exercise enhance all those protective factors, which act as a shield against CHD and other heart diseases (Taylor, 2012; Lavie, McAuley, Church, Milani, and Blair, 2014).

PSYCHOLOGICAL RISK FACTORS IN CORONARY HEART DISEASE

There are multiple causes of emergence of serious illness as identified in health psychology. Those psychological variables, which have been extensively reviewed as a predisposing factor for CHD, are listed as the following:

1. **DEPRESSION**

There has been strong and consistent evidence across majority of review that depression is an independent risk factor for clinical CHD and its prognosis. Furthermore, CHD risk factor is directly related to severity of depression, such as, **1-2 fold increase in CHD leads to minor depression and 3-5 fold increase in CHD leads to major depression** (Bunker, Colquhoun, Esler, Hickie, Hunt, Jelinek, and Tonkin, 2003). Depression is also a risk factor for morbidity and mortality in patients with coronary heart disease, especially following acute coronary syndrome (Stapelberg, Hamilton-Craig, Neumann, Shum, and McConnell, 2012). Most studies have shown depression to be an important disorder that leads to an increase in cardiovascular events, re-admission to hospital and CHD mortality (Jiang, Klein, Niederacher, Du, Marx, Horlitz, and Gülker, 2002).

There is ample evidence that **prevalence of depression is 20% higher in patients with heart failure** than in healthy individuals (Nekouei, Yousefy and Manshaee, 2012). Further, empirical evidence shows that **depressed people are 64% more at the risk of suffering from CHD** than non-depressed people (Lett, Blumenthal, Babyak, Sherwood, Strauman, Robins, and Newman, 2004).

Pessimism is also a negative risk factor for CHD, which is largely related to depression. There is a negative relationship between **CHD risk, decreased quality of life, pessimism and negative mood** (Cohen, Neumann, and Weinstein, 2008). **Alexithymia**, or inability to express emotions, is another risk factor for CHD. Alexithymic people are usually unable to identify, understand and describe their emotions. They have **limited ability to cope with stressful situations**, non-
compliance with conditions, disability to express emotions that lead to increasing negative emotions, such as, depression and anxiety. These emotional states consequently lead to decreased quality of life among heart patients (Nekoui, Yousefy, Doost, Manshaee, and Sadeghei, 2014). In this way, depression and pessimism turn out to be an obstacle in improvement of CHD.

2. SOCIAL ISOLATION

Social isolation and lack of quality social support have also been identified as independent risk factors for CHD. In many studies lack of social support was indicated as a predictor of onset and prognosis of CHD, and mortality among both sexes; however, it was more consistent in males. The risks are increased 2–3-fold and 3–5-fold for females and males, respectively. A study aimed to investigate and identify psychological factors in patients with ischemic heart disease within 4 months after discharge (Nekouei et al., 2012). This study indicated that coping style, social network and social support, within 4 months after discharge, caused these patients to be less focused on their illness and feel less threatened in comparison with the control group that did not have these types of support. These patients benefited more from the health services provided by the professionals.

Moreover, people who suffered from this disease for the first time were seeking social support more in comparison to those who had previous history of hospitalization due to ischemic heart disease (Lofvenmark and Mattiasson, 2009). Social support reduces stress hormones by making the person feel cared for.

3. TYPE A PERSONALITY

Early research data indicated that Type A behavior pattern, which is primarily characterized by hostility, intense ambition, competitive drive, constant preoccupation with deadlines, and a sense of time urgency, was related to the development of CHD. However, these original findings were not supported by subsequent research (Izawa, Eto, Yamada, Nakano, Yamada, Nagayama, and Nomura, 2011).

Studies on American and European populations have demonstrated that high levels of anger and hostility are predictive of coronary heart disease (CHD) mortality (Hintsa, Shipley, Gimeno, Elovainio, Chandola, Jokela, and Kivimäki, 2010).
Moreover, a Japanese study indicated that higher levels of cynical hostility increased the risk of acute myocardial infarction syndrome (AMIs), and that anger-control strategies could have some benefit in reducing the risk of AMIs in middle-aged Japanese men (Izawa et al., 2011). However, another review indicated that there was no evidence of such an association (Kuper, Singh-Manoux, Siegrist, and Marmot, 2012).

4. TYPE D PERSONALITY

There is increasing evidence that cardiac patients with a distressed (Type D) personality comprise high-risk patients, and that Type D is an important determinant of patient-centered and clinical outcome (Pedersen and Denollet, 2006). A high score on the two stable personality traits, negative affectivity and social inhibition defines patients with this personality type (Denollett, 2005). Type D patients tend to experience increased negative emotions and generally feel sad and have a gloomy view of life (i.e. high negative affectivity) paired with the tendency not to share these emotions with others due to fears of how they may react (i.e. high social inhibition) (Denollett, 2005). Type D has been associated with a 4-fold increased risk of morbidity and mortality in patients with Ischemic Heart Disease independent of established biomedical risk factors (Grande, Romppel, and Barth, 2012).

Type D comprises a risk factor on par with left ventricular dysfunction. This subgroup of patients is not only at increased risk of adverse prognosis, but is also more likely to experience symptoms of anxiety and depression and impaired quality of life (Pederson and Denollett, 2003). A recent study has also shown that Type D personality comprises a risk factor for posttraumatic stress disorder (PTSD) following a first myocardial infarction (Pederson and Denollett, 2004). Patients with a Type D personality may be more inclined to engage in disease-promoting health behaviors, such as smoking, drinking alcohol, not exercising, and not adhering to dietary advice as advocated by their physician. Therefore, lack of compliance, including non-modification of risk factors, and non-adherence to cardiac rehabilitation and medication regimens, directly increase the risk of recurrent cardiac events (Pederson and Denollett, 2006; Grande, Romppel, and Barth, 2012).
5. ANGER AND HOSTILITY

Since antiquity, people have been intuitively aware of a harmful association of anger with health. Buddhism actually refers to this as one of the Three Poisons of the Mind (i.e., greed, anger, and foolishness) (Okawa, 2006). In the psychosomatic field, anger, hostility, and related constructs have received considerable attention as personality types that seem to relate to coronary heart disease (CHD). Early research data seemed to demonstrate that type A behavior pattern— which is primarily characterized by hostility, intense ambition, competitive “drive,” constant preoccupation with deadlines, and a sense of time urgency—was related to the development of CHD, but these original findings were not supported by subsequent research (Everson-Rose and Lewis, 2005; Mohan, 2006). A meta-analysis of prospective studies between 1966 and 1998 failed to show an association between type A behavior pattern and CHD (Myrtek, 2001), and since then there has been no evidence showing such an association.

Some researchers therefore changed their focus to investigate whether anger, hostility, and related constructs—one of the key dimensions of Type A behavior pattern—would be more closely linked to the development of CHD. In a study done by Chida and Steptoe (2009), the harmful effects of anger and hostility were slightly greater in the CHD patients than the healthy population studies, making it possible that frequent anger episodes related to trait anger and hostility trait might accelerate recurrence of CHD (Strike and Steptoe, 2005; Mostofsky, Penner, and Mittleman, 2014).

It is also interesting that the harmful effects of anger and hostility on CHD events in the healthy populations were greater in men than women, suggesting that men are more responsive to anger and hostility factors in relation to CHD. In line with this sex difference, a recent meta-analysis further showed that anger and hostility and related constructs were more strongly associated with cardiovascular responses to psychological stressors in men than women, suggesting that the accumulation of greater stress responses in daily life might have patho-physiological significance for CHD in men (Chida and Hamer, 2008). Therefore, anger and hostility are psychological risk factors commonly found among male patients of CHD (Whalley, Thompson, and Taylor, 2014).
6. **ANXIETY**

Roest, Martens, De Jonge and Denollet (2010) in their meta-analysis studied the connection between anxiety and the risk factors of coronary artery disease, and found that anxiety is an independent risk factor for CHD and cardiac deaths. However, the association between anxiety and CHD was somewhat less than the corresponding association between depression and CHD, but this connection was stronger than the relationship between anger and CHD occurrence (Roest et al., 2010). A survey conducted about physical and psychological symptoms of anxiety in CHD patients revealed that anxiety is correlated with physical factors such as palpitation without any physical exercise, anger and redness in the face, abnormal heart beat, and muscle tension that increases the risk of CHD especially in women (Suls and Bunde, 2005; Nekouei, Yousefy, and Manshaee, 2012). In another study, it was indicated that high and low levels of trait anxiety do not have a different effect on cardiovascular reaction. Expressing and inhibiting styles of anger did not have a different effect on cardiovascular reactions, but anger expression and management styles and trait anxiety levels had an opposite effect on cardiovascular reactions. This means that the outward (behavioral) expression of anger with high level of anxiety is associated with low cardiovascular reaction (heart beat), and the outward expression of anger with low level of anxiety is associated with high cardiovascular reaction. In contrast, inner expression of anger with high level of anxiety is associated with high cardiovascular reaction, and inner expression of anger with low level of anxiety is associated with low cardiovascular reaction (Farhadi, 2009).

7. **STRESS**

Chronic stress, both at early life and adulthood, has been associated with 40-60% excess risk of CHD (Steptoe and Kivimaki, 2012). Much of the evidence on early life stress discusses **childhood adversities**, such as sexual abuse, parental substance use, parental disease, and chronic stressors, such as poor socioeconomic circumstances. Death of a child, marital problems, stress at work and social isolation have also been linked to stressors for CHD risk (Mohan, 2000, 2001; Steptoe and Kivimaki, 2013).
Extended exposure to stress leads to hypertension and adult coronary risk factors, such as high BP, obesity, high-glycated hemoglobin concentration. Individuals with high BP commonly show enhanced cardiac sympathetic activity, whereas increased norepinephrine spillover into blood draining from the brain, heart and other tissues is observed in hypertension. Stress therefore, increases sympathetic nervous system reactivity (Edwards, 2014).

Animal research has shown links between stress and CVD. Studies show that higher biological stress reactivity and longer exposure to stressors leads to CHD. On the other hand, low reactivity and shorter duration of exposure to stressors doesn’t lead to CHD (Bandana-Steff, 2015).

Work stress may affect CHD through direct activation of neuroendocrine responses to stressors, or more indirectly through unhealthy behaviors which increase the risk of CHD, such as smoking, lack of exercise, or excessive alcohol consumption. One of the main axis of neuroendocrine stress responses is the autonomic nervous system (ANS) (Hemingway, Shipley, Brunner, Britton, Malik, and Marmot, 2005). Repeated activation of ANS is characterized by lowered heart rate variability, which is associated with work stress among men in various cross sectional studies (Chandola, Heraclides, and Kumari 2008). Accumulation of work stress is linked to other risk factors of CHD such as incidental obesity and metabolic syndrome (Brunner, Chandola, and Marmot, 2007).

A study on the association between adverse psychosocial characteristics at work and risk of coronary heart disease among males and females with low job control, reported a higher risk of newly reported coronary heart disease during follow up. Subjects with low job control on both follow-ups had an odds ratio for any subsequent coronary event compared with subjects with high job control at both follow-ups. One study characterized occupational cohort of British men well. This study reported that the association between psychosocial factors at work and CHD was largely independent on family history of CHD, education, paternal education and social class, number of siblings, and height (Hintsa, Shipley, Gimeno, Elovainio, Chandola, Jokela, and Kivimäki, 2010).
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Job strain—the combination of high job demands and low control at work—is one of the most widely studied definitions of psychosocial stress (Steptoe and Kivimaki, 2012). Although some studies have shown that job strain is associated with a more than doubling in risk of coronary heart disease, findings from a meta-analysis of cohort studies suggest that this excess risk is probably modest, at about 40% (Mäntyniemi, Oksanen, Salo, Virtanen, Sjösten, Pentti, and Vahtera, 2012). Moreover, the importance of job strain as a risk factor for coronary heart disease continues to be debated because of several methodological shortcomings (Kivimaki, Lors and Eric, 2012).

PSYCHOLOGICAL PROTECTIVE FACTORS IN CORONARY HEART DISEASE

As a defense shield and in parallel with CHD risk factors, protective factors in the field of positive psychology can prevent or moderate the impact of risk factors on patients’ quality of life through increasing abilities and positive experiences (Nekouei, Yousefy, Doost, Manshaee, and Sadeghei, 2014). Some of the widely reviewed examples of protective factors are mentioned as follows:

1. **OPTIMISM/ POSITIVE ATTRIBUTIONAL STYLE**

   The way an individual perceives the world and assigns causes to events determine his or her psychological as well as physical well being greatly. Since a decade, research has investigated the health effects of low levels of positive attributes. One attribute that has received particular attention is **dispositional optimism**, defined as the general expectation that good things, rather than bad things, will happen in the future (Tindle Chang, Kuller, Manson, Robinson, Rosal, and Matthews, 2009). Specific positive emotions such as **contentment** (i.e., the sense of feeling safe and serene, motivating inactivity) and **joy** (i.e., a sense of happiness, which elicits free-activation or the urge to “play”) can buffer the deleterious physiological impact of negative emotions (Fredrickson, 2002). This may occur because **positive emotions help restore flexible thinking** in individuals experiencing narrowed attention to a negative emotion promoting stimulus and associated action tendencies, because these states would be incompatible (Fredrickson, 2000).
Evidence shows that **optimistic individuals** have a **lower risk of hospitalization after bypass surgery and are at reduced risk of mortality** (Giltay, Geleijnse, Zitman, Hoekstra, and Schouten, 2004). Research shows that optimistic people, compared to those more pessimistic in outlook, **report less pain** (Smith and Zautra, 2004), **better physical functioning** (DeRidder, Fournier and Bensing, 2004), experience **fewer physical symptoms**, and are **less likely** to be **re-hospitalized** following coronary artery bypass surgery (Rasmussen, Scheier, and Greenhouse, 2009). Optimism plays a major role in mortality, survival, cardiovascular outcomes, physiological markers (including immune function), immune function only, cancer outcomes, outcomes related to pregnancy, physical symptoms, or pain (Rasmussen, Scheier, and Greenhouse, 2009).

Although overall quality of life in heart transplant patients improves after transplant, many studies reveal poorer mental health outcomes after transplant. Jowsey, Cutshall, Colligan, Stevens, Kremers, Vasquez, and McGregorb (2012) aimed to determine whether transplant recipients with an optimistic explanatory style had improved quality of life, fewer depressive symptoms, and increased survival. Optimism was **significantly associated with higher quality of life**. Furthermore, a pessimistic explanatory style was significantly associated with self-reported depressive symptoms, even after depression before transplant was adjusted for. Pre transplant patients with a pessimistic explanatory style reported depressive symptoms nearly 5 years later. Furthermore, over the same time span, patients with an optimistic explanatory style described a significantly higher quality of life than the pessimists described.

2. **SELF EFFICACY**

Self-efficacy is an important precondition for health behavior change in patients with chronic disease. In the context of illness management, self-efficacy beliefs refer to patients’ confidence in their capability to successfully execute specific health behaviors, such as **compliance** to diet and exercise regimes (Bandura 1997, 2000, 2004). Several studies have shown strong associations between self-efficacy
beliefs and a wide range of effective **health-promoting behaviors**, such as diet, exercise and medication adherence, alcohol consumption, smoking cessation, and weight maintenance (Steca, Greco, D’Addario, Monzani, Pozzi, Villani, and Parati, 2013).

Sarkar, Ali, and Whooley (2009) performed a cross-sectional study of 1024 outpatients with CHD, who were recruited between 2000 and 2002 for the Heart and Soul Study. They assessed **cardiac self efficacy, exercise and depressive symptoms** using the Patient Health Questionnaire. Health status outcomes (symptom burden, physical limitation, and quality of life) were assessed using the Seattle Angina Questionnaire, and overall health was measured as fair or poor (versus good, very good, or excellent). Among patients with CHD, **low cardiac self-efficacy was associated with poor health status**, independent of CHD severity and depressive symptoms. The increased risk of Heart Failure associated with lower baseline self-efficacy was explained by worse cardiac function. These findings indicate that measuring cardiac self-efficacy provides a rapid and potentially useful assessment of cardiac function among outpatients with CHD (Sarkar, Ali, and Whooley, 2009).

In an observational cohort study, 125 patients who had recently been referred for cerebrovascular disease, coronary heart disease, or peripheral arterial disease participated in a 1-year self-management intervention. They completed self-efficacy questionnaire and questions about their cardiovascular lifestyle at baseline and after 1 year. Logistic regression analyses were performed to quantify the impact of change in self-efficacy on physical activity, smoking behavior, alcohol consumption, and food choices. Improved self-efficacy was associated with improved adherence to guidelines for physical activity and food choices. Therefore, in patients with vascular diseases, improvements in self-efficacy are associated with an improvement in cardiovascular lifestyle, namely, more exercise and better food choices (Sol, Graaf, Petersen, and Visseren, 2011).
3. SPIRITUALITY

Many individuals with coronary heart disease (CHD) experience disease-related anxiety, depressive symptoms, and anger. Spirituality reduces psychological stress, which is known to influence the speed of wound healing. Research shows that it can delay healing after cardiac surgery by up to 60% in older animals and humans (Marucha, Kiecolt-Glaser, and Favagehi, 1998). Research conducted by Ikedo, Gangahar, Quader, and Smith (2007) examined the effects of listening to prayer during surgery. They randomized 78 cardiac surgery patients to one of three groups: (1) patients who listened to a CD that played a generic prayer, (2) patients who listened to a CD with a standard relaxation technique, or (3) patients who listened to a tape (placebo). The prayer was the following: “Dear God, Please come to my aid. Help me to be at peace during this surgery and in my recovery. Strengthen me and help me to remember you are always present, that your healing love and spirit surround me at all times, and that I am held in your tender care. Amen.” Mortality, sepsis, supraventricular tachycardia, and amount of pain medication (assessed in hospital and 30-days post surgery) were compared between the three groups. No significant differences were found on any outcome between groups. Since the tapes were played while patients were under anesthesia, they were not conscious of the tapes’ contents. The mechanism by which Religiosity/Spirituality is thought to influence health outcomes is through conscious cognitive processes that reduce stress levels and improve coping.

Ginting, Näring, Kwakkenbos, and Becker (2014) examined the associations between seven dimensions of spirituality (i.e. meaningfulness, trust, acceptance, caring for others, connectedness with nature, transcendent experiences, and spiritual activities) and negative emotions among individuals with CHD after controlling for perceived social support as well as demographic and clinical characteristics. In total, 293 individuals with CHD were recruited. They completed the Spiritual Attitude and Involvement List, the Beck Depression Inventory-II, the Trait Anxiety Scale of the State Trait Anxiety Inventory, the Multidimensional Anger Inventory, and the
Multidimensional Scale of Perceived Social Support. Hierarchical linear regression analyses indicated that a **higher overall level of spirituality was associated with lower levels of depressive symptoms, less anxiety, and less anger.** Higher levels of caring for others and spiritual activities were associated with less anxiety, and a higher level of connectedness with nature (Ginting et al., 2014).

4. **RESILIENCE**

Psychological resilience refers to effective coping and adaptation although faced with loss, hardship, or adversity (Tugade and Fredrickson, 2004). This definition captures a psychological frame of mind that is associated with a variety of behavioral and psychological outcomes. A convergence across several research methodologies indicates that resilient individuals have **optimistic, zestful, and energetic approaches to life, are curious and open to new experiences, and are characterized by high positive emotionality.** Additional evidence suggests that high-resilient people proactively cultivate their positive emotionality by strategically eliciting positive emotions through the use of humor (Posadzki, Stockl, Musonda, and Tsouroufli, 2010), relaxation techniques (Gross, 2015) and optimistic thinking (King, Shade-Zeldow, Carlson, Feldman, and Philip, 2015).

One study investigated the impact of personal resilience (a composite measure of optimism, perceived control and self-esteem) on outcome measures in 67 Chinese coronary heart disease patients in response to an 8-week rehabilitation programme. The effect of personal resilience on posttraumatic growth attributed to the onset of heart disease was also examined (Chan, Lai, and Wong, 2007). Results indicated that coronary heart disease patients high in personal resilience achieved better outcomes than those low in personal resilience, as indicated by higher physical and mental summary measures, lower cholesterol levels and better performance on the 6 min walk test. Moreover, personal resilience was demonstrated to be a significant predictor of the level of posttraumatic growth. One possible explanation of high personal resilience yielding positive adjustments to traumatic events is the operation of optimism. Agarwal, Dalal, Agarwal, and Agarwal (1995) argued that positive life
orientation (PLO) contributed to recovery from myocardial infarction through higher expectations of recovery, greater sense of personal control, and more positive mood states in adverse situations (Chan, Lai, and Wong, 2007).

Hardiness is another trait that is highly related with coronary heart disease and acts as a protective factor. Individuals who are high on hardiness are high on three C’s: Challenge, Control and Commitment (Kobasa, Maddi and Pucceti, 1985). These kinds of individuals are not stress prone. Rather, they are stress-resistant personalities (Sabayan, Oleksik, Maier, Buchem, Poortvliet, Ruijter, and Westendorp, 2012).

STATEMENT OF THE PROBLEM

The aim of the present investigation was to study the relationship of recovery from bypass coronary surgery with well-being, optimism, marital adjustment, stress and coping styles.