

Behavioral determinants of cardiovascular diseases risk factors: A qualitative directed content analysis

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Original Article

Abstract

BACKGROUND: The PRECEDE model is a useful tool for planners to assess health problems, the behavioral and environmental causes of the problems, and their determinants. This study aims to understand the experiences of patients and health care providers about the behavioral causes of cardiovascular diseases (CVDs) risk factors and their determinants.

METHODS: This qualitative study utilized content analysis approach based on the PRECEDE model. The study was conducted for over 6 months in 2012 at the diabetes units of health centers associated with Alborz University of Medical Sciences, which is located in Karaj, Iran. Data were collected using individual semi-structured interviews with 50 patients and 12 health care providers. Data analysis was performed simultaneously with data collection using the content analysis directed method.

RESULTS: Stress, unhealthy eating, and physical inactivity were the behaviors, which predict the risk factors for CVD. Most of the patients considered stress as the most important underlying cause of their illness. In this study, 110 of the primary codes were categorized into seven subcategories, including knowledge, attitude, perceived susceptibility, severity, perceived benefits, barriers, and self-efficacy, which were located in the predisposing category of the PRECEDE model. Among these determinants, perceived barriers and self-efficacy for the mentioned behaviors seemed to be of great importance.

CONCLUSION: Identifying behavioral determinants will help the planners design future programs and select the most appropriate methods and applications to address these determinants in order to reduce risky behaviors.

Keywords: Behavior, Cardiovascular Diseases, Risk Factors, Qualitative Research

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Introduction

Cardiovascular diseases (CVDs) are the number one cause of death globally, more people die annually from CVDs than from any other causes.¹ It is predicted that By 2030, almost 23.6 million people will die from CVDs, mainly from heart disease and stroke.¹ In Iran, CVDs are the leading cause of mortality and morbidity, with the high cost of

health care.² The Inter Heart study showed that nine modifiable risk factors (abnormal lipids, smoking, hypertension, diabetes, abdominal obesity, psychosocial factors, consumption of fruit and vegetables, regular alcohol consumption, and regular physical activity) were associated with more than 90% of the risk of an acute myocardial infarction in this large global case-control study.³

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Evidence shows modifiable risk factors and behaviors related to unhealthy lifestyle are major determinants of CVD morbidity and mortality. If all forms of CVD were eliminated, the life expectancy will increase by approximately 7 years.⁴

To develop effective interventions, it is important to understand the behaviors of the target population. Qualitative methods are most ideal for gathering in-depth information to help develop this understanding.⁵ On the other hand, qualitative methods can help the health educators to more fully understand the health problems, behavioral and environmental causes, and determinants from the perspective of the people involved.⁶ Various studies have used qualitative methods to examine participants' "perceptions, awareness, and attitude" toward CVD risk factors. The participants in focus group discussion demonstrated different levels of understanding and attitudes toward lifestyle risk factors of CVD.⁷⁻⁹ Most participants were aware of modifiable CVD risk factors.⁹ In this study, the barriers to improve the lifestyle in regards to physical activity and diet included lack of information such as how to cook and prepare healthy food, food preferences,⁷ financial, love of food, stress and uncontrollable appetites,⁸ concern about wasting food, lack of time.⁹ These studies did not use theories related to individual health behavior in order to identify health problems, behavioral causes and their determinants. Health behavior theories are important in understanding the particular behavior. Furthermore, they are important in finding interventions to improve health behavior.¹⁰

The PRECEDE model that is often used in health education and health promotion is a logical model that describes the causes of health problem.¹¹ Based on the study by Green and Kreuter, the behavioral causes can be classified to factors as predisposing, enabling and reinforcing. These factors act as determinants for particular behavior, the most effective interventions for improving health can be expanded for each factor.¹² The predisposing factors are antecedents to behaviors that include knowledge, attitude, belief, values, perceptions, existing skills, and self-efficacy. The enabling factors are antecedents to behavioral and environmental change include the availability, accessibility, laws, and policies. The reinforcing factors are those factors following a behavior that provide continuing reward or incentive, which include social support and significant others. The planners may see determinants as the processes of change that must be activated or set in motion if the

necessary behavioral and environmental changes are to occur.¹³ This study aims to understand the experiences of patients and health care providers about the behavioral causes of CVD risk factors and their determinants based on PRECEDE model.

Materials and Methods

A qualitative method with directed content analysis approach was selected. The goal of a directed content analysis approach is to validate or extend conceptually a theoretical framework or theory. Existing theory or research can help focus the research question and it can help researchers begin by identifying key concepts or variables as initial coding categories. This approach was employed by Hsieh and Shannon in 2005.¹⁴

Data collection

Data were collected through semi-structured in-depth interviews from September to March 2012. Totally, 62 face-to-face interviews with 50 patients and 12 healthcare providers were conducted. Each interview lasted between 30 and 60 min and all the interviews were conducted in a private room. The interview guide consisted of open-ended questions based on subcategories of predisposing category of PRECEDE model to allow respondents fully explain their own experiences. To begin, the participants explained their individual experiences on "their risk factors, such as diabetes, hyperlipidemia, and hypertension", "the factors influencing it/them, for example, if they point out to unhealthy diet/inactivity or stress, it was asked what means unhealthy diet/inactivity or stress? How does poor diet/inactivity/stress affect their illness?", "benefits of healthy diet/regular physical activity and control stress", "the factors inducing they maintain or stop healthy diet/regular physical activity and control stress" and "confidence in their ability to do healthy diet/regular physical activity and control stress" and "effective ways to prevent risk factors".

Setting and participants

The participants were 50 patients with a mean age of 46.5 ± 6.0 . The main researcher look at documents of blood test results of patients performed by diabetes unit, if patients had at least one or more biochemical CVD risk factors such as pre-diabetes, type 2 diabetes (T2D), metabolic syndrome, hyperlipidemia, and hypertension for at least 1-month and previously had received advises of healthcare providers in order to change lifestyle, the main researcher contacted each of the potential participants to explain the objectives and the

research questions, and if the participant agreed to take part in the research, an interview was carried out. The patients were chosen using purposive method to consider the maximum variation sampling based on (sex, age, level of education, occupation, and the type of risk factor) from four health centers associated with Alborz University of Medical Sciences, which is located in Karaj, Iran. The four centers were chosen with the aim to obtain an understanding over an extensive range of socio-economical states. Patients with previous heart attack, stroke, open heart surgery or angioplasty patients, also newly diagnosed patients (< 1 month) and all type 1 diabetes were excluded from the study (Table 1). In addition, 12 health care providers from the diabetic units of four health centers, including three general practitioners, three nurses, and three dieticians were individually interviewed. The mean age of health care providers was 38.4 ± 9.8 and 10 of them were female.

Ethical considerations

Before data collection, ethics approvals were obtained from Ethics Committee of Shahid Sadoughi University of Medical Sciences. All participants were informed that participation in the study was voluntary, so they could refuse to participate or withdraw from the study at any time without being penalized or losing any benefits. Moreover, the participants were reassured about confidentiality and anonymity of their information.

Table 1. Patients' characteristics

Variables	Number	Percent
Sex		
Female	31	62
Male	19	38
Educational level		
Illiterate	5	10
Primary	14	28
High school	16	32
Diploma	7	14
College degree	8	16
Occupation		
Housewife	29	58
Retired	6	12
Employed	15	30
Disease		
Diabetes	28	56
Hyperlipidemia	45	90
Hypertension	12	24
Pre-diabetes	14	28
Metabolic syndrome	10	20

Data analysis

All interviews were conducted, recorded,

transcribed verbatim, reviewed, coded, and immediately analyzed by the first researcher. According to the directed content analysis process, at first, each interview was read several times carefully to gain a deep understanding the data. Later, important statements were underlined to identify the initial codes or meaning units that exist in the interview text. In the next phase, these similar meaning units (codes) were placed initially in subcategories of the PRECEDE model and then into its three main categories (predisposing, enabling, and reinforcing). Any text that could not be categorized with the initial coding scheme would be given a new code. The data collection process was continued until data saturation—when adding further data showed no new information and the extra collected data were redundant. When the new code was not produced in the last three interviews, saturation was achieved and data collection was stopped. Due to the large volume of data obtained in this investigation, only predisposing categories reported as behavioral causes and the enabling categories will published as environmental causes as soon as. An example of coding and placement in subcategories and categories is shown in table 2. The participants were reassured about confidentiality and anonymity. The authors of this manuscript have certified that they comply with the principles of ethical publishing.

Consideration of rigor

Prolonged engagement in the field from September to March 2012 helped to establish some trust and rapport with participants, providing an opportunity to collect the data. To make sure that the analysis reveals the patients and health care providers' experiences, member checking was performed during the data collection, and where needed, some changes were done. To confirm dependability and conformability of the data, the interviews and results of the analyses, that is, the initial codes, subcategories and the categories of PRECEDE model, were audited by some experts, the external check method using two authors (LS and MAS) expertise in health education and familiarity with PRECEDE model. Professor Green, the designer of PRECEDE model, were contacted regarding this study and peer checked by two PhD students in health education who had previous experience with PRECEDE model. Maximum variation of sampling also confirmed the conformability and credibility of data. Sampling strategies allowed for maximum variation to occur and a vast range of views and perspectives to be considered.

Table 2. Example of the analysis process

Meaning unit	Codes	Subcategory	Category
“I see myself at risk of heart disease because my mother had history of high blood pressure, diabetes and stroke”	Belief about the chances of getting heart disease/stroke	Susceptibility perceived	Positive predisposing
“When I cook for the family, I eat it myself too. I cannot resist eating, it is hard making normal and dietary food”	Belief about the compatibility of patients food with family members	Perceived barriers	Negative predisposing
“The diet recommended to patients was not followed for a long time, they tend to follow it for some time and then give it up”	One’s disability for performing healthy diet in a regular basis	Self-efficacy	Negative predisposing

Results

In this study, 110 codes, classified in seven subcategories of predisposing factors, were found. These include; knowledge, attitude, perceived susceptibility and severity, perceived benefits and barriers and self-efficacy.

Predisposing factors

Knowledge

Often patients by dieticians at the diabetes units found the beneficial and harmful foods for controlling their illness; they also felt to know how much of physical activity per week is needed for them to manage their disease; furthermore the most understood stress as an important factor in causing their disease, but did not know how to control their stress: “I didn’t know how to control my lipid level using diet. Since I attended the diabetic unit, the dietician improved my awareness, also I know have to walk half an hour to managing diabetes and hypertension but I not doing it, I feel stress is an important factor in causing my disease, but I do not know how to control my stress”. (Female–Aged 43, metabolic syndrome).

Most healthcare providers felt that the majority of patients say that they understand healthy foods; however when questioned about them in detail, their understanding was only partial and sometimes wrong: “Patients understanding of healthy foods is not enough, they don’t understand what to eat, they don’t understand how to reduce their intake, for example they say I understand what to eat but when you speak to them we realize they don’t understand much (Nurse)”.

Attitude

The healthy eating was considered to be important by the majority of patients, but few of them believed that healthy foods were enjoyable. Most of the patients liked sugar, cookie, and sweet foods and also they preferred oily and fried foods to boiled and steamed foods. Some of them preferred salty foods to low salt foods and the others did not

like the taste of liquid oil and also some ladies were believed that because liquid cooking oil is more difficult to clean from the stove, they should be harmful for their body and felt that it sticks to heart vessels too. “Fried foods are much more delicious, steamed foods do not taste good, one does not like eating them, I really like sweets, also I don’t like low salt foods; I am used to add salt to food. I always use solid oil as it is much easier clean from stove, in old days when people were using solid oil no one was sick, now that people use liquid oil everyone is sick”. (Female–Aged 47, pre-diabetics and hyperlipidemic).

Some patients believed animal oil is the healthiest fat available, and even felt that after using animal fat their lipid level will be dropped “I mostly use animal fat, since I started using animal fat, I feel like both mine and my husband lipid leaves have been normalized” (Female–Aged 52, diabetic and hyperlipidemic).

Most patients were interested in walking and preferred group sports to individual ones. “I mostly like to play sports in group with friends, which unfortunately is not possible due to the lack of resources, I don’t like individual sports” (Male–Aged 49, metabolic syndrome).

Some patients believed that their daily activities at work and at home are a kind of sport “I have so much work at home too and to do that I don’t have any free time to do any other sports, after all housework will burn fat too” (Female–Aged 41, pre-diabetics, hypertensive, and hyperlipidemic).

Most patients found the role of diet and physical activity in controlling their illness, however considered diet more important. A few believed that if they do enough exercise they can eat whatever they like. Furthermore, patients with low socio-economic status, who were on medication, believed that because they are on medication, they do not need to control their diet or do any physical activity, whereas patients with high socio-economic status

were more inclined to follow a healthy diet, involve in physical activity such as walking and control their stress and did not like to take medication for a long time: “I try not to take medication because medications make you addicted and prevent you from doing exercise and follow a healthy diet” (Male – Aged 50, diabetic and hyperlipidemic).

Belief

In PRECEDE model, belief consisted of four parts: perceived susceptibility, perceived severity, perceived benefits, and perceived barriers.

Perceived susceptibility: Some patients, particularly females, based on their level of risk factors considered themselves at risk of developing CVD. Most patients with pre-diabetes, diabetes and hyperlipidemia were more worried that they develop hypertension than CVD. Some patients with diabetes did not understand the relationship between diabetes and CVD. Compared to pre-diabetic patients, diabetes and hyperlipidemia, patients with hypertension and metabolic syndrome saw themselves at higher risk of developing stroke or CVD. Patients with hyperlipidemia considered themselves mainly at risk of developing stroke and though high lipids mean stroke, patient with pre-diabetes were mainly worried that they develop diabetes. It should be noted that if patients had a family history of these risk factors, they considered themselves at higher risk of the disease. “A lot of them don’t understand the relation between diabetes and hyperlipidemia with CVD. They see the link between hypertension and CVD very strong, when their blood pressure goes up they think they are going to have heart attack or stroke” (dietician).

Perceived severity: Patients with diabetes and metabolic syndrome considered their illness as very dangerous and believed that diabetes is more dangerous than cancer, these patients were scared of consequences of diabetes such as losing the limbs, blindness and renal failure, in particular if they saw the consequences of diabetes in their relatives, as a result of fear from its consequences they were paying more attention to their illness and were following the health related behaviors. “I am mainly worried of my diabetes as my father also had diabetes. He suffered a lot and lost his legs and went blind, and died because of it” (Male–diabetic and hyperlipidemic).

Patients with pre-diabetes, hypertension and low lipids were not paying too much attention to their problem however patients who had very high lipids (triglyceride and cholesterol <350 mg/dl), were

more worried and followed the given instructions more seriously. “Among patients presented to us, those with hyperlipidemia don’t care at all. Unless it’s very high or it is causing problem for them. Pre-diabetic and hypertensive patients also don’t pay too much attention to these conditions. Those with diabetes pay more attention and follow the medical advices as they see the complications” (Physician).

Pre-diabetic and hyperlipidemic patients believed that if their problem was important, their doctors should have prescribed medications for them, and because no medication has been prescribed, they did not think their disease is important and hence they did not follow the prescribed diet or exercise regimen. “I still haven’t really started to follow my diet as my glucose level and lipid level are not that high, my doctor has told me the levels are not high enough to get medication” (Female–Aged 48, pre-diabetic and hyperlipidemic).

Patients who were suffering from physical symptoms of their illness were more likely to follow the recommended behaviors, however if they did not feel any physical symptoms from their illness, they were less likely to be compliant with the diet, physical activity, control of stress and medication. “Some patients say we don’t feel any problem from our disease or say we don’t have any symptoms, they stop following their diet and stop taking their medications” (Nurse).

Perceived benefits: Most patients believed that control of stress, regular physical activity, and following healthy diet have an important role in controlling their hyperlipidemia, hyperglycemia, and decreasing their CVD risk. They believed that physical activity, more than anything else, help them to feel refreshed, improve their mood and reduce their stress. Most patients believed having a healthy diet and enough physical activities will result in CVD prevention, less need to take medication, weight reduction, and morbidity reduction associated with disease, increasing life and reducing health costs. “We recommend physical activity and a healthy diet to our patient, we tell them about the benefits, most of them know about these benefits, for example they know healthy diet and exercise can control sugar, lipids, blood pressure, reduce weight and reduce the health care costs. However, unfortunately they don’t follow the instructions” (Dietician).

Perceived barriers: Most patients understood factors such as not having a partner, being busy at work, looking after children, having physical problems such as knee pain, arthritis, leg pain, back

pain, having more important things to do in life, psychological problems such as depression and anxiety, tiredness and laziness as barriers to do physical activity. Patients, who were unable to do physical activities due to physical problems, were recommended by healthcare providers to perform swimming. However, most of them perceived high cost of swimming pools as a barrier. Some patients, in particular obese female patients felt shy to attend swimming pools or gyms. "Most patients say they don't have time for doing physical activity, females who are housewife use tasks such as looking after home and children as an excuse not to exercise. A factor that most patients mention is knee pain, which is due to overweight, most patients here are obese. Most female patients who say they have bone pain have osteoporosis, arthritis or joint problems, we advise them to go to swimming pools and walk in the pool; however they say they can't go to the pool due to the high cost" (Nurse).

Patients and health care providers also understood factors such as lack of compatibility of patients food with family members, the high cost of healthy food, being tired of the taste of healthy foods, not feeling full and feeling weak after taking healthy diet (especially diabetic patients), psychological problems such as depression and anxiety, having problems more important than diet in their life, feeling hungry beyond control, particularly when angry, and laziness as barriers to being compliant with a healthy diet. One of the barriers to being compliant with a healthy diet was a contradiction in recommendations regarding to diet by healthcare workers and media, which confused the patients. The only barrier to control of stress, which most patients, particularly females, mentioned was the lack of stress control skills; most health care providers also confirmed these issues. "I one wants to follow the diet, one has to be rich. For example my dietician has told me eat white meat, but I can't regularly buy it, fish is also very expensive, olive oil is also very expensive. (Female-Aged 43, diabetic).

"Many of our patients are depressed, particularly among diabetics, many of them are depressed and are anxious, this led them to believe not being able to control their disease" (Physician).

Self-efficacy

In regard to self-efficacy in following healthy diet, most patients with TD2, metabolic syndrome and very high blood lipids (cholesterol and triglyceride above 350 mg/dl), felt their ability relatively good in this regard, however most of them in parties, trips,

when eating with family or when very hungry or when they see a tempting food, they felt their ability to avoid the food or to adhere diet low. However, most patients with pre-diabetes, hypertension, and low hyperlipidemia (triglyceride and cholesterol less than 350 mg/dl), felt their ability to adhere to diet relatively weak in most instances. Some patients felt that they eat more when angry or stressed and do not have the ability to be compliant with their diet; some felt that when they do not have anything to do at home they eat more and cannot be compliant with their diet.

"Unfortunately when we have party I get forced to eat more, also anger and stress makes me eat more, the food that my wife cooks for herself is very tempting. When I have nothing to do at home, I can't stop myself to go and eat something to make my stomach full. The family just tell me be compliant with the diet, however they don't help me, if my wife cooks a low fat food the family complain, they say why should we spoil or diet for father, sometimes when I get really hungry I eat a lot" (Male-Aged 49, metabolic syndrome).

In regards to regular physical activity most patients thought that they have the ability to perform physical activities however most of them felt that when they have physical problem such as knee pain, back pain or leg pain, or when they are not supported by family and friends, or when they have psychological problems such as depression or stress, when the weather is not good, when they are busy with work, when they go to holiday or when they have guests or when they are very tired, they do not have the ability to do exercises such as walking at all, or had very limited ability. "I love walking, however because of my leg pain I cannot maintain it, on the other hand if someone comes with me to go walking, I will be more motivated to continue it. However, no one comes" (Female-Aged 53, diabetic and hyperlipidemic).

Most patients could commence a healthy diet or start physical activity; however, they have problem to continue it on a regular basis. "The diet instructions we give to patients does not last long, I always tell them that it should be permanent but they follow it for some times then give it up, same thing with physical activity" (Dietician).

Most patients found stress and daily stressors such as unemployment, addiction, divorce, death of a relative, arguments with their partner/children and stress at work as the main cause of their illness. Most patients, particularly females, felt it difficult to control their stress under these situations and most

were unsure of their ability to control stress. Most healthcare providers also believed that patients cannot cope with their stress, or if they can only for a limited time and to some extent.

“Patients felt life stressors which resulted in their blood sugar, lipid level and blood pressure to go high. For example they say their sons or husbands are unemployed and stays at home, or they are addicted, or their daughter has divorced. Some mention they have problem with their partner, he/she doesn’t understand them, these are the problems most patients perceived as the cause of their illness” (Dietician).

Discussion

The experiences of patients and healthcare providers showed that, lack of behaviors such as stress control, healthy diet, and physical activity were the main underlying roots of CVD. Li et al.¹⁵ reported, high proportion of their respondents had unhealthy diet and most did not have enough physical activity, also they considered work stress as a risk factor for CVD. According to previous studies^{7,16-18} most patients perceived stress as the most important factor in causing their risk factors. A study reported that stress can directly affect coronary heart disease and indirectly impact on it by affecting behaviors such as low physical activity and poor diet.¹⁹ It can be concluded that stress may have an effect on patient’s diet, physical activity and compliance with medications, to the extent that most patients felt that at times of stress they eat more, could not follow their diet and could not be motivated enough to do physical activity. However, in some studies patients did not find stress as cause of their disease.^{9,20,21} This can possibly be explained by different socio-economic situation in our country compared to developed countries. Patients in our study mainly pointed out psycho-social stressors such as unemployment, low income, and addiction, divorce and family problems as cause of their stress.

The behavioral determinants were included knowledge, attitude, perceived susceptibility, perceived severity, perceived benefits, perceived barriers, and self-efficacy. Some patients did not understand how diabetes influences CVD risk factors and few had not adequate understanding about hyperlipidemia and its association with CVD risk which has also been reported in other studies.^{18,22} According to Andric and Vuletic patients with increased understanding and high level of health literacy, had better perception of importance of a healthy diet and physical activity in

controlling their disease and were motivated to adopt such behaviors. The current study demonstrated that patients with good understanding and positive attitude towards healthy diet and physical activity were unable to change their behavior.²³ The present findings are consistent with other studies concluding that knowledge, understanding and attitude alone do not necessarily alter behavior.^{8,9,24-26} While a minimum knowledge threshold is needed to achieve long-term healthy behavior patterns²⁷⁻²⁹ addressing patients’ own perceptions of barriers, as well as their values, motivations and goals, has been found to be more effective than knowledge alone in changing behavior.³⁰

The concept of perceived susceptibility involves one’s own opinion of the probability of developing a condition.³¹ According to the literature, perceived susceptibility is instrumental in motivating behavior change.³² The beliefs concerning the significance of contracting an illness or condition and the subsequent medical consequences (i.e., pain, disability, and death) and the social costs (the effect on an individual’s work, family, and social relationships) were identified as perceived severity.³¹ Some studies have found an inverse relationship between perceived seriousness and behavior change and reported a high perceived severity causing treat and avoiding of action.³³ This study showed despite the fact that participants had good understanding of perceived severity of their chronic illness complications, their perceived susceptibility of getting stroke and CVD was low. The patients with T2D, metabolic syndrome, very high blood lipids (cholesterol and triglyceride above 350 mg/dl), and systolic blood pressure (above 160 mmHg), were perceived their condition as a serious problem. Due to fear of their disease complications, they had perceived severity more than the patients with pre-diabetes, moderate hyperlipidemia (< 350 mg/dl) and systolic blood pressure (< 160 mmHg), but most of patients did not perceive their susceptibility of getting stroke or CVD. This finding is in accord with the findings of the study by Morowatisharifabad,³⁴ indicating, among diabetic patients deteriorating eyesight, aching legs and blurred vision were more than getting CVD, despite the fact that they had perceived severity of diabetes complications. An important difference between the findings of the current study and the study conducted by Folta et al.,⁹ was lack of perceived severity among participants. Subjects believed, they could live with CVD or overcome it. The reason for low perceived severity among participants was that they have no present risk factors or symptoms. This

suggests that as patients get closer to developing cardiovascular risk factors, the perceived severity increases. The findings showed that the patients, who had both perceived susceptibility and severity together, were more likely to follow the health-related behaviors advised to them. The combination of susceptibility and severity has been labeled as perceived threat.³¹ It may be that perceived susceptibility is a stronger predictor of engagement, if severity of health-related behaviors is perceived higher than lower.³⁵ The previous studies showed high perceived susceptibility and severity in patients with diabetes results in increased healthy behaviors among them.^{34,36-38} Moreover, findings of this study is similar to Avis et al.,³² who showed females had higher perceived susceptibility and severity towards CVD compared to men.

Perceived benefits can be defined as one's belief that undertaking a recommended action could decrease the risk or severity of potential illness.³¹ In their study Kelly et al.³⁹ found that perceived benefits are a strong predictor of health behavior change, more explicitly in the areas of stress management, diet and physical activity. Their findings showed that high benefits of health-related behaviors were perceived by subjects. The physical and psychological health was mainly perceived to be improving by getting involved in regular physical activity which is similar to other studies.^{27,40-42}

The most significant perceived benefit was related to feeling happy and refreshed as well as helping with control of blood sugar, lipid level, and blood pressure. Perceived benefits have also been reported as an important factor to adhere a healthy diet. This study showed that the benefits of adhering to healthy diet such as living longer, controlling hyperlipidemia and hyperglycemias, losing or maintaining weight, preventing complications and feeling healthier were perceived more than other benefits statements that were consistent with those reported by others.^{43,44}

The perceived barriers, or one's belief around the tangible and psychological costs of the advised action, are noted to be the strongest predictor to make change in health behavior.³¹ However, despite the fact that patients understood the high benefits of controlling stress, following healthy diet and increasing physical activity, they perceived high barriers in performing and engaging in such behaviors. The barriers related to regular physical activity in this sample were consistent with those reported by previous studies,^{8,9,40,45} that difficulties in finding time to exercise were due to work or

home duties, laziness and not having a partner. An important barrier mentioned by our participants, which was not highlighted in the previous studies, was physical problems such as leg pain, knee pain, and back pain. A factor that can be attributed to physical pain among patients at the time of walking was the fact that most patients were overweight.

In addition, Barriers to adhering to healthy diet were similar to the findings reported by previous studies,^{8,9,43,44,46} that the high cost of healthy food, unacceptability of patients' diet with other family members, being tired of the taste of healthy food and lack of will were among the most important barriers for following a healthy diet. Unlike study by Roberts,²⁶ lack of time as barrier of healthy eating did not perceived by patients in current study because majority of the women were housewives and men were retired. In a study by Folta et al.,⁹ wasting food came up as a barrier to change; women reported eating more than they want because they do not want to throw food away. It should be noted that avoiding throwing the food away was not found in our study to be one of the barriers to a healthy diet, which may be due to cultural differences. The study by Ard⁴⁷ found, that despite the knowledge and beliefs as well as low value of perceived barriers to eat healthy foods and high value of perceived benefits, acculturations are important factors in consumption of fruits, vegetables and the amount of fat intake. Findings reported by Airhihenbuwa et al.,⁴⁸ also seem to support the influence of culture on food preferences. If the perceived barriers are minimal as compared with the perceived susceptibility to or perceived severity of the disease, there is greater likelihood that the recommended health related action will be taken.⁴⁹

In the present study, most patients, to some extent believed to their ability to stress management, performing regular physical activity, especially walking, and following a healthy diet. This concepts refers to self-efficacy, that is, one's confidence in being capable of performing a difficult or novel behavior.⁵⁰ The role of self-efficacy in starting and retaining healthy behaviors has been reported before.^{51,52} For a behavior change to be successful, an individual must have confidence in own ability to overcome perceived barriers and have a strong belief that a specific action will result in a positive outcome.⁵³ Aljaseem et al.⁵⁴ had reported that self-efficacy was the most important predictor of diabetes self-care behaviors. A study remarked that self-efficacy had a strong effect on

older adults' participation rates in physical activity, especially sustain a lifelong exercise pursuits.⁵⁵ Williams⁵⁶ indicated, that women with high self-efficacy and absence of perceived barriers to healthy eating (time and cost) were more likely to consume components of a healthy diet and less likely to consume components of an unhealthy diet. Findings from present study showed, that the more the individuals believe in his or her ability in performing behavior, the more they follow that behavior. Despite the ability of most patients in starting to control their stress, performing physical activity and following healthy diet, the problem that most patients was not being able to do these behaviors on a regular and continuous basis, this concept refer to maintenance of self-efficacy. This means one's confidence in being capable of keeping up a difficult behavior and focus on coping with imminent barriers.⁵¹ According to the findings of previous studies,^{57,58} maintenance self-efficacy was the most important predictor of physical activity and healthy diet behaviors.

Limitations

Participants of the study belonged to different socio-economic backgrounds, were of various degrees of CVD risk factors, and were of both genders and the variety of ages, It increase applicability of findings. Furthermore, findings of current study could support the predisposing category of PREEDE model. Moreover, data were analyzed appropriately and results were corroborated by using multiple reviewers, especially correspondence with Professor Green, the designer of PRECEDE model, to ensure that participant's viewpoints were adequately interpreted.

Conclusion

Among determinants, the importance perceived barriers and self-efficacy seemed to be unique to our population. Identifying the determinants of these behaviors will help the program planners in designing of future programs to select the most appropriate methods and applications to address these determinants in order to decrease unhealthy behaviors. An intervention can be designed to change behavioral factors related to health, but the most immediate impact of an intervention is usually on a set of well-defined determinants of behavior.

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Conflict of Interests

Authors have no conflict of interests.

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