REVIEW ARTICLE

Usage of Health Belief Model (HBM) in Health Behavior: A Systematic Review

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ABSTRACT

Introduction: The Health Belief Model has gained widespread popularity and acceptance in the community, yet little is known about its effectiveness as a basis for health behavior intervention. The purpose of this study is to systematically review the evidence on the use of the model in health behavior for Chronic Kidney Disease and the effectiveness of Health Belief Model as a model intervention for facilitating health-related behavioral changes. **Methods:** The databases were manually searched for references and gray literature. Overall, the methodological quality of trials was variable, and there was limited evidence for the effectiveness of Health Belief Model in improving health behavior. **Results:** There are few new trials published that describe the application of Health Belief Model. Limited evidence supports any benefits of Health Belief Model for improving health behavior. **Conclusion:** Studies on the usage of Health Belief Model need to be explored in depth to assess the importance of Health Belief Model.

Keywords: Health Belief Model, Health Behavior Intervention, Systematic Review, Illness Perceptions, Chronic Kidney Disease

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INTRODUCTION

Historically, public health plays an important role in the prevention and treatment of diseases (1). Nonetheless, the main requirement for public health concerns is early detection through screening and so that many forms of preventive measures can be implemented at a very low cost. In addition, Health Belief Model is easily understood and can be used in cases of both communicable and non-communicable diseases (2).

Perception is characterized as the psychophysical assessment of the perceived quality of something based on experience. It is also defined as a response that could not be produced by a naive person with a total lack of motivation (3). Bartlett in 1928 found four expectations within the theoretical constructs that serve as the key framework of the model; perceived seriousness, perceived susceptibility, perceived benefits and perceived barriers (1,4).

Each of these perceptions can be used to describe health behavior. In the meantime, illness perception has been identified as a predictor of the non-adhesion, depression and mortality in patients with dialysis, there is a lack of research of patients with CKD who do not require renal replacement therapy (1, 4, 11). This qualitative study summarizes the current literature on the role of illness perception and the related literature. A narrative analysis summarizes the existing literature on the role of illness interpretation and related clinical and psychosocial outcomes in non-dialysis CKD patients (1).

There are many model theories available to address the lack of tools for the study of health behavior in order to measure patient perceptions. Four Model Theories are discussed in the articles reviewed. The first model, the Protection Motivation Model (PMM), was developed by Hovland et al. in 1953 (6). Roger in 1975 reported that the objectives had two stages (7). In 1983, Roger agreed to update the PMM by expanding the theory to provide

more general knowledge of the impact of persuasion on the patient's cognitive processes and on the behavioral functions of transition from fear (7-9). The revised version included a wider range of factors that can stimulate the cognitive processes to convincingly communicate either past experiences, personality or observational learning (10).

PMM provides an alternate theoretical interpretation of the effects of fear appeals and indicates that additional variables can affect behavioral intentions. PMM is an effective model which integrates these variables and has been updated in four ways. The emotion aspect has emphasized rather than ignored. The follow-up of the evaluation procedures take place in a well-organized way. Depending on the issues concerned, ill-adapted coping strategies can arise from the propensity of the threatened person to practice handling reactions that minimize his/her fear, but do not reduce the actual danger. Finally, due to the fact that many adaptive behaviors are affected by normative components, it has been noted that the social context of the hazard has been incorporated into the model and the improvements and theoretical guidance offered by the literature have been identified (11).

The Trans Theoretical Model (TTM) found by Prochaska & Velicer in 1977 was used during the transition stage to combine the most influential philosophies and approach from the leading related theories from the psychology of behavioral change. The main component of TTM found that people make a series of changes through modifying their behavior. Resistance can be minimized by certain values and procedures that promote change and to avoid relapse. These values are decision-making alignment, self-efficacy and change processes. More than 20% of the population at risk were thus prepared for the worse. TTM has the potential to increase the involvement of the community in process changes rather than just the minority being ready to take action. The fundamental concept established over the last 35 years of scientific research - intervention development and the recordings of empirical studies - has been used by practitioners around the world (12).

The TTM introduced by Prochaska & DiClemente in 1983, aims at improvements to decision-making skills. TTM reflected five stages of change: precontemplation, reflection, intervention, maintenance, and relapse. The transition processes were required to obtain differential focus at particular transition stages (13,14). It was suggested that self-changers: (i) using the fewest mechanisms of improvement during pre-contemplation; (ii) prioritize consciousness raising during the contemplation stage; (iii) prioritize self-reassessment in both contemplation and action stages; (iv) emphasize self-liberation, improving partnership, and enhancing management during the action stage; and (v) using counter-conditioning and relaxation (14,15) . Relapses were found to react as a combination of contemplators and acting people (13). James et al. in 1997 found that there were few basic assumptions of the TTM relevant to the essence of behavioral change and population health intervention to promote progress (12).

Next, behavioral change is a phenomenon that occurs through a series of stages over time. Health community services need to help people move forward over time. Second, persistent behavioral risk factors are not stable and are subject to change (16). Third, improving the understanding of the advantages and removing the significance of the disadvantages may motivate change in population health initiatives. Third, most of those in high-risk groups have not been trained for immediate action or for conventional action-oriented preventive measures. Finally, in order to make progress at different points, it is important to demonstrate the process of change and have goals for the processes that will take place during the time period (12).

Social Psychologists developed the Common Sense Model (CSM) in the late 1960's, which and was expanded in the following decade. The objective of the CSM was to determine how the perception of illness could be directly influenced by coping strategies and improve outcomes (4). Specifically, the CSM reports that a wide variety of experiments with a high degree of fear would have a more powerful impact than low fear on improvements in attitudes towards suggested health behavior (17). Finally, shifting attitudes could not last longer than 24-48 hours after exposure to the message of fear, but most importantly, when participants were exposed to messages of fear, they were encouraged to undertake the process of making an action plan as a response, and the response was the same if they received extreme (high fear) or moderate message of fear (18, 17).

Nevertheless, the CSM, which presents the patient as the problem-solver, coping with two phenomena, can refer to health treatment or emotional health. The three underpinnings of the model are: first, the participants are active problem-solvers who seek information and rely on their symptoms and physical condition as information which helps them to tackle health risks. Second, illness identification is the core cognitive structure of the framework in order to evaluate intervention outcomes. Lastly, the statements made by those involved are not in competition with medical facts. Cognitive reasoning is central to CSM so that disease representations can interact within the graphical framework of past health and disease experiences (18,19).

Although evaluating the most commonly used approaches for researching health behaviors (e.g., TTM, HBM, and PMM) offers a common-sense alternative model, providing evidence across a broad variety of disease domains illustrates the utility of CSM as a self-regulatory strategy (17). CSM is a valuable minority

health research tool. This article contains descriptions of disease representation operationalization in previous research and guidance for future research (20).

Finally, the HBM developed by Becker and Rosenstock in 1984 aims to explain and predict individual health behavior. Based on the HBM, the change in health behavior has a six-domain impact on health behavior; perceived susceptibility, perceived severity, the perceived benefits of an action, perceived barriers, the cue to action and self-efficacy using practices that can prevent CKD, all in response to the barriers to avoiding disease, and which also respond to obstacles that might spring up and affect a person's ability to act (21,22).

Hochbaum in 1958, has conducted a study in the United State of America (USA) showed that HBM was originally developed as a comprehensive method of understanding and predicting preventive health behavior (3,12). It focused on the relationship between health behaviors, practices and the use of health services. The HBM has been updated to include general health support for the purpose of separating disease and illness-related behavior from healthy behavior. In general, HBM was the starting point for systematic, scientifically based research into health behavior (3).

MATERIALS AND METHODS

The aim of this study is to systematically review research on the use of HBM in the health behavior of CKD and the efficacy of HBM as a model intervention for promoting health-related behavioral changes. The research aimed to identify both published and unpublished studies to produce this report based on the Preferred Reporting Items for Systematic Review and Meta–analysis (PRISMA) guidelines (16,18,19). A three-step search strategy was utilized in this review (Fig.1). Initially, a limited search of COCHRANE Library and PubMed was undertaken followed by an analysis of the key concepts in the title and abstract and of the index terms used to describe the article. A second search was carried out in the included databases using both the keywords and index terms (23).

The reference list of all the identified reports and articles was then searched for additional studies. Articles published in 2000 and after in English were considered for this review. Studies investigating the role of illness perceptions in patients with CKD without RRT were found by searching the following databases: AMED, BNI, CINAHL, EMBASE, Health Business Elite, HMIC, Medline, PsycINFO and Google Scholar (24).

The search terms used to identify relevant studies concerning health behavior patterns were: illness representation(s); disease representation(s;) illness perception(s); treatment perception(s);treatment belief(s) disease perception(s) illness cognition(s); disease cognition(s); 'illness belief(s). The terms used to identify articles with the topic of kidney disease were chronic kidney disease; CKD; pre-dialysis; early-stage chronic kidney disease; early-stage CKD; late-stage CKD; late-stage chronic kidney disease; CKD; moderate chronic kidney disease. The databases were searched individually using both sets of search terms (above) and then combined. The references of the identified studies were also scanned to find further studies and duplicates were then deleted (Figure 1 shows the flow of information through the search and selection process) (16). Data from patients with CKD stages 1–5 not involving RRT were considered for the English-language publications. Due to the extreme planned limited evidence base, no time-period or research design search constraints were enforced (24).

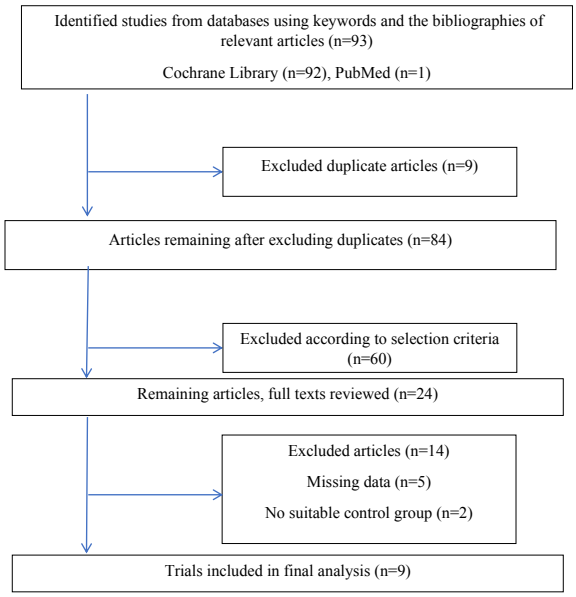

Figure 1 : Flow diagram showing the procedure for identifying the relevant studies on the usage of Health Belief Model to influence health behavior.

RESULTS

93 related papers were collected through systematic searches, of which 9 were omitted as duplicate studies. The final review of the literature listed 13 papers for further evaluation after their selection on the basis of the inclusion and exclusion criteria in Figure 1 (16). Looking at those papers, only three were included for research related to HBM; the others, two PMM articles, one TTM-based articles and three CSM-related studies, were excluded.

Table I compares the main research models developed included in this analysis by reference to goals, advantages and limitations. The reason for choosing HBM as a successful indicator of health-related behavior is due to its five domains prior to the behavioral level. While there are variables that may affect individual behavioral characteristics

Table I : Summary of Model Theories

S	Name of first author & Year	Title	Objectives	Limitations	Advantages
1	Hovland 1953	Protection Motivation Model (PMM)	1st Stages (Roger 1975) - Framework for understanding the impacts of fear 2nd Stages (Roger 1983) - Extended the theory to provide more general knowledge of the impacts of persuasive communications on cognitive process that regulate behavior changes	Covers ONLY 3 domains: 1. Perception of severity 2. Perception of vulnerability 3. Perception of responses efficacy	1. Manipulation through persuasion communication toward effects on protection motivation and behavior 2. Social cognition model to predict behavior
2	Prochaska & DiClemente 1983	The Trans Theoretical Model (TTM)	Intention to change the focus of decision-making abilities	1. Health population programs need to assist for progress over time 2. Specific principles and processes of change need specific stages for recovery 3. Those at risk are not prepared for fast action and traditional-action oriented prevention programs. 4. Population health triggers motivation change by enhancing the understanding of the pros and reducing the value of cons.	Unique (Change over Time)
3	Leventhal 1984	Common Sense Model (CSM)	Illness perceptions directly influence coping strategies, which in turn influence outcomes.	1. Causal relationship exists between illness cognition and outcomes	Shows moderate to strong relationship exists between illness cognition, coping behaviors and illness outcome
4	Becker & Rosenstock, 1984	Health Belief Model (HBM)	To explain and predict health behavior of individual	1. Modified by other variables such as culture, experience, skills and motivation 2. Individual characteristics influence personal perception	Cover 5 domain: 1. Perceived susceptibility 2. Perceived severity 3. Perceived benefit 4. Perceived barriers 5. Perceived Cue To Action

either through culture, education, past experience, ability or motivation, all the models have their own focus and researcher purpose in their field of study.

The PMM was developed to respond to the lack of a model, by considering limitations and advantages. Roger took 8 years to develop an expanded theoretical framework that would be useful for general information on the communication-based impact of the rational process of behavioral changes in individuals. The effects of PMM can be managed by persuasive communication in order to motivate sufferers to produce their behavioral security. Even though the social perception model predicts behavioral changes, it covers only three domains - perception of severity, perception of vulnerability, and perception of the efficacy of the response (7,8).

The advantage of the TTM is that it adjusts the purpose to assessing the decision-making ability and the unique characteristics of individuals due to their tendency to change over time (23). There are a few limitations to this model, such as the need for assistance through health population programs as progress over time. In addition, it has the purpose of making practical adjustments that involve the recovery at different phases. In addition, the trajectory of prevention through traditionally oriented and non-customary response in vulnerable populations is rapid. Finally, the health community can create positive improvements by enhancing the understanding of the advantages and minimizing the importance of the disadvantages.

Ultimately, the CSM affected results dependent on the understanding of disease, which had a real impact

on coping strategies. There was a moderate-to-strong correlation between illness cognition, coping actions and illness outcomes (24). However, this model is constrained by the pre-existing causal relationship between disease cognition and outcomes. Variations of the theoretical concepts within CSM, HBM and other Theories of Planned Health Behavior have been identified as multi-level ideas and developed as self-reported, by contrast CSM emphasizes the cognitive and behavioral context of abstract ideas and domain experiences.

In addition, each model takes a different approach to modeling development and longer to improve the understanding of health issues. By looking at the disadvantages and advantages, researchers need to consider their needs according to the purpose of their respective research studies.

The articles were analyzed thoroughly from every aspect of HBM components concerning health behavior in both communicable and non-communicable diseases. This study was chosen following an in-depth discussion with health care professional's expertise on the use of HBM, support for the health problems of the countries concerned, in order to improve their information for future efforts. Table II is a description of the use of the key model theories based on their application to health behavior. There are nine studies involved, after careful consideration, in a number of related factors that met the main model components. Articles have been selected from 2002 to 2015 for many types of behavior related to health issues after considering based on suitable findings for models and health behavior.

Table II : Models and their Illness/Behavioral Concerns

Model	Behavior	Authors
Protection Motivation Model (PMM)	Smoking behavior	Johannes et al.2013
	Coronary Heart Disease	Sarah Milne et al.2002
The Trans Theoretical Model (TTM)	Physical activity and exercise	Simon et al. 2001
Common Sense Model (CSM)	Illness Perceptions	Mueleman et al. 2015
	Illness Perceptions Individual	Knowles et al. 2014
	Illness Represen-tation	Pagels et al. 2015
Health Belief Model (HBM)	Cancer Screening	Ihsani et al. 2016
	Risk Factors of condom usage	Zhao et al. 2012
	Knowledge, attitude and behaviors of tobacco users	Piddennavar and Krishnappa 2014

Thrul et al. focused on only two domains: perceived severity and perceived behavioral intention (11). Some of the concurrent behavior based on the perceived severity of health threats are vulnerability, self-efficacy, response-efficacy and response cost, from a study of the capability of adolescents with smoking habits (15). The perceived behavior intentions covered behavioral attention (5,22). Furthermore, the study by Milne et al on promoting exercise to prevent Cardio Heart Diseases (CHD) that focused on threat appraisal and coping strategies. Perceived vulnerability, perceived severity and fear are the concurrent behaviors measured in threat appraisal. The coping strategies appraisal covered response efficacy self-efficacy, response cost, intention and behavior (5,22,26).

In addition, TTM empirical evidence reported individuals need time to change their physical activity behavior, a period known as "willingness to change". They need to go through a series of processes before they started to change their lifestyle. The way to overcome public health issues in community is by changing its members' daily lifestyles or exercise behavior and reported very few lived active lives (26). The period before expected changes in behavior is estimated to be 6 months, that is before they start to maintain the new behavior. The most difficult part is before they take the first step towards starting the little changes in their daily routine with the intention of becoming physically active. The contemplation phase is when they keep thinking of starting to become active within the next 6 months and prepare themselves for making small changes in their behavior, but not yet fulfilling the criterion for physical activity. They might have reached the criteria but only recently. This phase is followed by action to meet the criteria; however, if another obstacle is encountered, they either want to stay with the maintenance phase or stop immediately.

Surprisingly, patients' beliefs change in order to relate to their illness in various aspects of their health condition. The common-sense model (CSM) shows that patients' beliefs change according to their emotional and cognitive perceptions in reaction to their illness, bear with their illness and familiarize themselves with the health outcomes in different patients' population (27). This study was done by Knowles et al. 2014 reported patients with CKD found the significance of the clinical diagnosed treatment in increasing their anxiety and depression levels. The worse the CKD condition was, became associated with the distress level of the patients (25). This study focused on patients as the main problem-solvers and responders to their illness situation, i.e. the Common-Sense Model of Self-Regulation (7). Furthermore, even patients with the same diseases, their Illness Representation (IR) might be different as well as the care they get from different health care providers (24). Looking at the potential IR reported by Petrie and Weinman in 2006, a patient's beliefs can change based

Table III : Application of Health Belief Model (HBM) to Health-Related Behavior

Authors	Study Method	Sample Details	Focal Behavior	Measure of Intention	Measure of Concurrent Behavior	Measure of Subsequent Behavior
Mohd Ihsani Mahmood, Shamsul Azhar Shah, Norfazilah Ahmad and Norazman Mohd Rosli	Cross Sectional	N=300 patients Age 18-73 yrs old	-Development and construct validation of Cancer Screening Perception Scales (CSPS) -Perception of cancer screening	Demonstrate the construct validity of a newly developed cancer screening perception scale as a measure of the perception of cancers screening in general among high risk but healthy asymptomatic groups	Focus on 5 domains of HBM Perceived severity Perceived susceptibility Perceived benefits Perceived barriers Perceived cues to action	Perceived severity: - 7 items Perceived susceptibility -9 items Perceived benefit -5 items Perceived barriers -15 items Perceived cues to action -17 items
Jinzhu Zhao, Fujian Song, Shuhua Ren, Yan Wang, Liang Wang, Wei Liu, Ying Wan, Hong Xu, Tao Zhou, Tian Hu, Lydia Bazzano and Yi Sun	Cross Sectional	N=427 FSWs	Investigate the risk factors of condom usage among FSWs	Assess whether condom usage reduces the threat of STD's/ AIDS or pregnancy.	Focus on 4 domains of HBM Perceived severity Perceived benefits Perceived susceptibility Perceived barriers	- risk of threat - seriousness of contacting an illness or leaving one untreated - condom usage during commercial sex -confident of condom use with clients
Piddennavar Renuka and Krishnappa Pushpanjali	Quasi experimental study	N=88 20-35 yrs old	Motivating to enroll in stop smoking programs and improve knowledge, and attitude of young people and to use the dental oral health services yearly	To assess knowledge, attitude and behaviors of tobacco users	Focus on 5 domains in HBM Perceived severity Perceived susceptibility Perceived benefits Perceived barriers Perceived cues to action	Questionnaire Steps: -Identification of domains. -Deciding what information is required in each domain from current literature on tobacco and its ill-effects. -Determining the type of questions. -Determining the sequence of items. -Pretesting the questionnaire Intervention planned in two stages: 1. Health education module development 2. Leaflet and Health education video development

on the opportunities offered to improve the patient's needs according to their illness (25).

Self-efficacy is the belief in one's own ability to perform an action. Attempting to do new things lessens unless people are confident, they can perform according to their expectations (8). The HBM model has three parts: (i) individual perception, (ii) modifying factors and (iii) likelihood of action. Individual perception contains two related domains: perceived susceptibility and perceived severity (10). These domains are linked to the modifying factor known as perceived threat. Modifying factors like the socio-demographic and socio-economic background can contribute to perceived threat and the likelihood of action within the domains of perceived benefit and/ or perceived barrier. Cues to action within modifying factors can also contribute to perceived threats and the likelihood of certain behavior patterns (15).

The important models for health behavior cover all aspects in patients' perceptions of CKD. Ihsani et al. in 2018 reported incidents of cancer cases increasing drastically over time and is still far from reaching its zenith; more than half the average population is at risk of developing cancer, and not having been screened can lead to late diagnosis and death (20). The main barriers are the perceptions of cancer screening as either embarrassing, inconvenient or unpleasant. Those with symptoms and concerned with their health status are more co-operative about being screened but high-risk populations and those who are asymptomatic are the groups who would benefit from changing perceptions in terms of reducing cancer suffering.

The increasing number of HIV cases reported in China raises alarm and suggests the need to educate their citizens about HIV transmission. Even though most cases are the result of intravenous drug use, heterosexual transmission cases have increased recently. One of the main reasons for the rapid spread in Asia is prostitution, which has become an attraction for tourists and transmitted by female sex workers and their clients and has subsequently spread to the general population (26,28). China allows the commercialization of sex and imposes only fines to individuals even if alerted to the threat they pose. The urgency resulting from contracting an illness or leaving one untreated, spreads viruses to others. The government promotes condom usage during commercial sex with prostitutes. They need to ensure that prostitutes use condom with clients (21).

The tobacco study was the main cause of oral cancer, especially in India, where it is the most common form of make cancer, but only the fourth most common for women. HBM has been shown to offer a good model for the prevention of problem behavior that raises health concerns (21,22). Oral cancer increase is reported to be due to the increasing number of tobacco users among the younger generation. Health education based on HBM has been able to motivate tobacco users to attend stop smoking programs to improve their attitude, knowledge and behavior and to use utilized oral dental health services. The intervention stages involved health training module progress along with leaflets and commercial health videos.

DISCUSSION

The thorough investigation of all the models revealed the HBM domains were the most powerful and fulfilled the criterion for health preventive behavior. Several studies also indicated that HBM procedures were beneficial for improving health-related behavior, which has been recognized as an independent risk factor. A set of questionnaires constructed based on five domains of HBM reported that CSPS was a new tool to improve the health of a population by covering the major aspects of the cancer, which are universal. Most patients were not aware of cancer screening and did not believe in their own susceptibility, especially those identified by cancer screening (20). However, this study might be useful to help the validation process with a larger number of respondents and use CSPS to spread new perceptions about cancer screening not only to high-risk groups, but also to the healthy population. In order to predict the number of high-risk group patients that could have CKD, HBM might be a useful tool to predict health behaviors. HBM was developed in 1950's due to explain the drop in public involvement in health screening and prevention programs (28). The study reported that the spread of HIV/AIDS and the causes involved some domains identified by the HBM such as the severity of diseases, patient susceptibility, the benefit of prevention, perceived barriers and self-efficacy in order to educate female sex workers. FSWs that showed a higher level of perception and realized the importance of condom use were more likely to used condoms. This study found that the perceived severity of HIV/AIDS is important but insufficient to improve condom use by FSWs. In addition, the perceived barriers had a greater impact than the perceived benefits, as the concern was not only condom use, but also on improving other aspects such as using good quality condoms (21). Self-efficacy was the main factor contributing to the frequency, consistency and intention of condom use. Zhao et al. in 2012 suggested looking of the high self-efficacy of FSWs with a positive perception of using condoms will indicate the main factors of perceived severity, perceived benefits and perceived barriers to the spread of HIV/AIDS in China (21,28).

Several of the behavioral models used attempted to predict the medication noncompliance of patients related to health behavior. The HBM originally proposed by Becker et al. states that the individual's action is influenced by their perception of their illness, either in the level of severity, the consequences, or the potential benefits of the action weighed against the physical, psychological, and financial costs of following the recommended action. The overall significance of patient behavior model components has been summarized. Latest research on the use of HBM in predicting non-compliance in hemodialysis patients. As reported by Wiebe and Christensen in their examination of the relationship between health beliefs and personality on hemodialysis patients' ability to adhere to diet and fluid restrictions. More studies are required to classify these dynamic interactions. Control model

locus is the precept that patients interpret spectrum behavioral reinforcement, from predominantly internal to predominantly external (21).

The HBM is a means to identify potential perceptions of seriousness, susceptibility, benefits and barriers that can explain the need to engage in particular behaviors to prevent the CKD and provide cues to action by modifying the variables that influence health behavior. The modifying variables are culture, education level, past experience, skills and motivation. In addition, the past experiences could influence their perceptions for making a good decision (14).

Limitations and suggestions

There are several drawbacks to HBM that can restrict possible public health benefits. In the first place, it does not include the behaviors, values or other determinants related to identifying and recognizing a person's health behavior. In particular, it is difficult to change the normal patterns of behavior of an individual, which may affect the decision-making process involved in deciding to accept the proposed course of action. In addition, HBM used for non-health related reasons like social acceptability, may not be suitable due to environmental or economic factors, which may prohibit the recommended action. HBM assumes that everyone has equal access to information on disease and, that certain behaviors are commonly used to persuade people to act, and that "health" acts are normal (28).

CONCLUSION

In summary, the goal was to evaluate the use of HBM for health-related determinants in order to prevent the need for CKD through understanding patients' perceptions of the severity of their condition, their susceptibility, the benefits, their self-efficacy and cues to action (10) and decreasing the importance of the barriers they perceived in order to encourage certain behavior and actions. Additional studies are needed to explore the use of HBM as well as other behavioral theories for the design and implementation of CKD prevention behavior in high risk groups.

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