Development and Validation of Dust Exposure Prevention Questionnaire for Heart Patients Based on the Health Belief Model

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Research

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Abstract

Background: Many heart patients suffer from respiratory failures. It is necessary to prevent exposure to dust by taking educational steps to change the behaviors of heart patients.The present study aimed at developing and validating a dust prevention questionnaire based on the health belief model . Methods: A mixture of qualitative and quantitative methods was used to design and develop the desired tool in 2018. The qualitative section of the research was performed to identify the preventive behaviors needed by cardiovascular patients when exposed to dust using the expert panel's opinions and literature review. The quantitative section of the research was performed to evaluate the psychometric properties of the research tool. The research population included 417 people with heart diseases referred to a heart hospital in Bushehr, Iran. Results: The designed questionnaire included a total of 27 items divided into six domains, namely perceived susceptibility, perceived barriers, perceived severity, perceived benefits, guidance of action, and self-efficacy. The means of Content Validity Ratio (CVR) and Content Validity Index (CVI) were 0.93 and 0.9, respectively. In addition, all designed items had good correlations with the total scores of their related domains. However, the model fit indices were not suitable. Hence, to fully fit the model to the data, it was tried to improve the model by releasing some parameters based on the modification indices suggested by AMOS software. The modified model had an acceptable fit . The results of Cronbach's alpha coefficient also showed the appropriate reliability of all six domains. Conclusions: The designed questionnaire had desirable psychometric properties and appropriate validity to determine the factors involved in preventing dust complications in heart patients. Designing this questionnaire could also be considered as an effective step to evaluate the effective factors in preventing dust complications in patients with heart diseases .

Background

Cardiovascular Disease (CVD) is the leading cause of mortality in the world (48%)[1]. It is also the fifth leading cause of disability in the world. It has been estimated that mortality caused by CVD will account for 75% of common deaths in the world by 2020[2]. Despite a reduction in the number of cardiovascular deaths over the past decades, there has not been any improvement in the rate of hospitalization among the heart patients aged less than 55 years[3]. Statistics have suggested that 72% of deaths were caused by non-communicable diseases in Iran, with CVD accounting for 45% of the deaths[1]. Many heart patients suffer from respiratory failures[4]. Studies have also indicated that the particles sized ≤ 2.5 micron had a serious impact on health and increased the rate of death caused by respiratory, cardiovascular, and lung cancer. In long-term exposure, 10 $\mu g/M^3$ increase in the concentration of pollutants increased the mortality rate by 6%, CVD by 12%, and lung cancer by 14%. Moreover, a study conducted by the World Health Organization (WHO) in Berlin, Copenhagen, and Rome revealed that the particles sized ≤ 10 microns increased the risk of death caused by respiratory problems in children under one year of age and affected lung function, exacerbated asthma attacks, and caused other respiratory symptoms such as cough and bronchitis in children[5]. Another study was conducted to investigate the relationship between particles-induced air pollution and admission of patients with heart attack in seven

US states in 2006. The results showed that if the concentration of the particles sized ≤ 10 microns increased by 10 μg/M³, the rate of patient admission on the same day would increase by 10% [6].

Given what was stated above, it is necessary to prevent exposure to dust by taking educational steps to change the behavior of heart patients. Human behavior is a reflection of various factors and knowledge is a prerequisite for the change of a behavior[7].The low level of knowledge and poor performance of people in avoiding exposure to risk factors and predisposing factors of heart diseases affect the exposure, incidence, and exacerbation of these diseases[8]. Identifying the factors affecting the behavior change will make it easier to achieve change, and the confirmed models can help systematically identify the factors affecting the behavior change. Thus, it is essential to use the models that identify and strengthen the factors affecting the behavior. Health belief model is one of the most widely used models for behavior change at the individual. Based on this model, if people view themselves susceptible to a situation (perceived susceptibility), believe that it is potentially dangerous to them and have negative impacts, and strongly believe that they can reduce the risks and consequences by taking some measures and that doing these beneficiary actions and measures (perceived benefits) is more valuable compared to the barriers of doing them (such as cost and time), they will show preventive behaviors. In this regard, the presence of some stimuli can act as a trigger for behavior and guide people to do the desired action (action guidance)[7]. This causes the people to have a sense of self-efficacy in overcoming behavioral barriers Studies have also shown that people's perceptions play a major role in identifying and predicting environmental damages. For instance, a study conducted in southern Sweden demonstrated that perceived contamination and perceived health risk played a more important role in awareness and prediction of damages caused by air pollutant odors compared to direct exposure to air pollutant odors[9].

A review of the literature suggested that the health belief model has not been used to change the behavior of heart patients. Due to the prevalence of dust in the recent years and the impact of this phenomenon on CVD as well as the high prevalence of this disease, especially in the Middle East and Iran, it is necessary to conduct further studies in this area to determine the effective factors. This requires the use of valid and dust prevention based tools in cardiac patients. The use of validated questionnaires is an important step in generalizing and completing the research implementation cycle. Thus, given the importance of the subject and lack of a valid tool in this regard, it is crucial to design a questionnaire with desirable psychometric properties. Hence, the present study aims at developing and validating a dust prevention questionnaire based on the health belief model.

Methodology

Research design and population

The current methodological research was conducted in 2018. A mixture of qualitative and quantitative methods was used to design and develop the desired tool. The qualitative section of the research was performed to identify the preventive behaviors needed by cardiovascular patients when exposed to dust by using an expert panel's opinions and literature review. The quantitative section of the research was performed to evaluate the psychometric properties of the research tool. The research population included people with heart diseases referred to a heart hospital in Bushehr, Iran. The inclusion criteria of the study were suffering from one type of heart disease and having a history of exposure to dust in the past year. Convenient sampling method was used in this study. A total of 417 heart patients referred to the hospital during the one year of study were enrolled into the research. It should be noted that the sample size was 4-10 times more than the number of items in the questionnaire to analyze the factors structure [10]. Given the number of items in the questionnaire, the number of participants was suitable for evaluating its psychometric properties.

Before distributing the questionnaire, the objectives and methodology of the study were explained to the participants and their written informed consents were obtained. In this way, the participants were ascertained that participation in the study was voluntary and that the data would only be analyzed collectively. Additionally, anonymous questionnaires were collected through face-to-face interviews. The research design was approved by the Scientific and Ethical Committee of Bushehr University of Medical Sciences.

Design of the questionnaire

This research tool was designed in four steps based on Waltz Tool Design Method[11]:

Step 1: Defining the concept of dusts complications for heart patients based on the health belief model using literature review and panel of experts. To review the texts, valid databases including SID, Iranmedex, Scopus, and Pubmed were searched using the following keywords: heart disease, cardiopulmonary problems, dust, and the health belief model. The panel of experts included cardiovascular, health education, and environmental health professionals. The concept of dust was defined based on the health belief model in different dimensions and the preventive behaviors needed by patients were identified in each dimension. The aim of the concept explanation was to present a comprehensive definition of dust problems for heart patients based on the health belief model.

Step (2): Defining the tool design goals: The design of each measurement tool is done for a specific purpose. In this step, it is determined that the designed tool is applicable in a particular setting. The operational definition of each of the desired dimensions is essential in this step [12]. This step aims to define appropriate objective indicators to measure a structure in a tool.

Step (3): Formulating the tool items: In the first step, some of the questionnaire items were formulated by examining the questionnaires designed for this purpose and using the panel of experts. The items formulated in the panel of experts, including 10 health education professors, cardiologists, and environmental health professionals, were reviewed in three sessions. After reaching a consensus on the final dimensions and based on the operational definition of each dimension, the final items were modified and selected. The initial questionnaire consisted of 30 items.

Step 4: Examining the psychometric characteristics of the tool: Tests and other measurement tools must have characteristics in order to be useful for the goal for which they have been designed. One of the most important characteristics that indicate the applicability of a tool is its reliability and validity[12]. In this step, the following measures were done:

Face validity and content validity:

Content validity was examined using both qualitative and quantitative methods in this study. Content validity refers to the extent to which the tool items are related to the studied content or conceptual dimensions[13]. To evaluate the validity of the qualitative content, the initial design of the questionnaire was provided to 10 health education professors, cardiologists, and environmental health professionals to check its grammar, wording, and proper placement of the phrases and to express their opinions. Moreover, the opinions of 10 heart patients were used to examine the ambiguities of the items and to make them comprehensible. After applying their opinions, the content validity of the tool was quantitatively evaluated. Content Validity Ratio (CVR) and Content Validity Index (CVI) were used for this purpose. According to Lawshe, CVR determined the necessity of an item based on a three-point Likert scale (necessary, useful but not necessary, and not necessary). Then, an item with a ratio higher than 0.62 (according to 10 experts) was retained using the following formula and the Lawshe table to determine the minimum value of the CVR index. In other words, the presence of an item with an acceptable level of significance ($P \leq 0.05$) was essential in the tool[14]. The following formula was used: (see Formula 1 in the Supplementary Files)

CVI aimed to determine the appropriateness, clarity, ambiguity, and relevance of the items to the research objective from the experts' points of view. For this purpose, the opinions of the relevant professors (health education, cardiology, and environmental health) on the relevance, clarity, and simplicity of each item were evaluated using a four-point Likert scale. Then, based on the following formula, the CVIs of each item and the whole questionnaire were calculated. (see Formula 2 in the Supplementary Files)

After evaluating the content validity by the experts and excluding the items that did not have appropriate index scores, the questionnaire was submitted to 10 heart patients to determine the importance of each item based on a five-point Likert scale. Considering the face validity, the validity of the questions was assessed in terms of appearance and form and the question whether the appearance of the questionnaire items was appropriate for evaluating the desired goal was answered. The impact score method was used to determine the quantitative face validity of the tool. In doing so, 10 heart patients were asked to indicate the importance of each item using a five-point Likert scale (completely important, important, moderately important, slightly important, and not important) and scores 1 to 5 were respectively assigned to the mentioned options. Then, the impact score of each item was calculated using the following formula:

“Impact Score = (% Frequency) importance” and the quantitative face validity of the questionnaire was determined. If the impact score of each item was higher than 1.5, the item was identified as appropriate and was retained for the subsequent analyses[15].

Construct validity

Construct validity examines the relationship between a measurement tool and the theoretical backgrounds or theorems. In other words, construct validity raises the question of to what extent a measurement tool reflects theorems and the higher this reflection, it will have a higher construct validity. In order to use factor analysis, there must be a correlation between the desired variables and when the matrix is significant, all correlation coefficients will be zero [12]. Confirmatory Factor Analysis (CFA) with likelihood maximal method at the level of covariance matrix was used to evaluate the construct validity using the health belief model and to identify the tool domains. CFA is a statistical method that tests hypothetical models. CFA allows models to be used both statistically and theoretically, which is not possible by conventional multivariate methods such as Exploratory Factor Analysis (EFA)[16]. It should be noted that the appropriate sample size for factor analysis is 4 to 10 times more than the number of variables and at least 100[10]. To determine the construct validity in the current investigation, the questionnaire was distributed among 417 heart patients with a history of exposure to dust. To evaluate the fitness of the CFA model, chi-square index was used first. The values smaller than the mentioned index indicate the better fit of the model. However, as this index is sensitive to the large sample size, the researchers did not rely on this index and calculated the chi-square to degree of freedom ratio, which is more statistically significant. Some studies have recommended that the chi-square to degree of freedom ratio should be less than three for the model to be accepted (14). Other used indices were Comparative Fit Index (CFI), Incremental Fit Index (IFI), Root Mean Square Error of Approximation (RMSEA), Goodness of Fit Index (GFI), and Adjusted Goodness of Fit Index (AGFI). The CFI, IFI, GFI, and AGFI take a value between zero and one. The closer the values are to one, the more appropriate the model will be [17]. Additionally, RMSEA values less than 0.08 are considered to be appropriate and those less than 0.05 are regarded as good fit [10, 15]. Finally, the GFI and AGFI values higher than 0.8 and 0.9 and the CFI values higher than 0.9 are considered to be appropriate[10, 13].

Reliability

To determine the internal stability of the questionnaire, the internal consistency method was used for each of the domains as well as for the whole questionnaire. In this regard, using the Cronbach’s alpha coefficient is one of the most common methods based on the internal consistency of the scales within a questionnaire[18].

Statistical analysis:

The data were analyzed using the SPSS software, version 23 and AMOS software, version 23.

Ethical considerations:

After obtaining the necessary legal permissions from the Research Committee and obtaining the ethics code from Bushehr University of Medical Sciences (IR.BPUMS.REC.1395.62), the data were collected by direct referral of the researcher to Bushehr Heart Hospital. After expressing the research goals and reassuring the participants about the voluntary nature of the research and confidentiality of the information, the researcher invited the heart patients who were interested in participating in the study.

Results

Based on the results, 224 participants (53.5%) were male and the rest were female. Besides, most of the participants (n=162, 39%) had elementary education and only 73 ones (17.5%) had academic degrees. Duration of heart disease was less than one year in almost half of the patients (46%), and more than half (54%) of the patients were under chemotherapy. Based on the dimensions of the health belief model, the operational definition of each item was as follows:

Perceived susceptibility: One's belief that s/he should not be exposed to dust due to heart disease.

Perceived severity: One's belief that exposure to dust may exacerbate their heart disease and may even lead to hospitalization.

Perceived barriers: One's belief that there are difficulties on his/her path in taking preventive measures.

Perceived benefits: One's belief that s/he will benefit by performing the preventive behaviors.

Perceived self-efficacy: One's belief in his/her capabilities in performing the preventive behaviors.

Guidance of action: The presence of internal (individual signs and symptoms) or external (external persons or warning signs) factors that act as guides for the person in performing the preventive behaviors.

In the next step, the questionnaire items were designed based on the articles, books, and questionnaires related to the health belief model as well as the panel of experts. The initial version of the questionnaire included 30 items. The items were designed concerning the consequences of dust among heart patients based on the constructs of the health belief model using a five-point Likert scale.

1- Perceived severity measurement domain: For this purpose, a scale was designed that consisted of five items responded through a five-point Likert scale (very high, high, moderate, low, and very low). The scores ranged from one for very low to five for very high. Accordingly, the minimum score in this domain was five and the maximum score was 25.

2- Perceived barriers measurement tool: For this purpose, a scale was designed that consisted of four items responded via a five-point Likert scale (very high, high, moderate, low, and very low). The minimum score was four, while the maximum score was 20.

3- Perceived susceptibility measurement tool: A scale was deigned that included four items responded through a five-point Likert scale (strongly agree, agree, disagree, disagree, and strongly disagree). The scores ranged from one for strongly disagree to five for strongly agree. Thus, the minimum and maximum scores were four and 20, respectively.

4- Perceived benefits tool: For this purpose, a scale was designed that consisted of four items with a five-point Likert scale (strongly agree, agree, disagree, disagree, and strongly disagree). The scoring was exactly the same as that of perceived susceptibility.

5- Guidance of action: For this purpose, a scale was designed that contained nine items responded via a five-point Likert scale (always, most often, sometimes, rarely, and never). The scores ranged from one for never to five for always. Accordingly, the minimum score of this dimension was nine and its maximum score was 45.

6- Self-efficacy measurement tool: A scale was designed that contained four items responded by a five-point Likert scale (always, most often, sometimes, rarely, and never). Therefore, the minimum score was four and the maximum score was 20.

Validity

Based on the qualitative content validity and according to the recommendations of the experts as well as the ambiguities raised by the patients, changes were applied to the questionnaire items. The means of CVR and CVI were 0.93 and 0.9, respectively (Table 1). In the face validity process, the results obtained by calculating the item impact index showed that the impact score of all items was greater than 1.5. Thus, all items were appropriate for determining the content validity. In this step, all items had the minimum score for construct validity. Therefore, all 30 items were used for construct validity through CFA. Before implementing the factor analysis, the correlation between the score of each item and the scores of all items in each domain was examined. The results revealed that all designed items had a good correlation with the total score of their related domains (Table 2). In other words, these items had the necessary discrimination power to measure the desired domains.

The results of CFA on the default model showed that all factor loadings of the items in all three domains were significant. However, the factor loads of three items in the guidance of action domain, including Cta 7, “I pay enough attention to the mass media warnings regarding the use of masks when the air is dusty” (β=0.28), Cta 8, “I pay enough attention to the mass media warnings regarding not leaving the house when the weather is dusty” (β=0.29), and Cta 9, “I have friends who inform me through different ways when the air is contaminated” (β=0.25), were low. Therefore, these three items were deleted. Furthermore, the results showed that the model fit indices were not suitable. Hence, to fully fit the model to the data, it was tried to improve the model by releasing some parameters based on the modification indices suggested by AMOS software. The CFA path chart after the release of these parameters with standardized factor loadings of the items has been illustrated in Figure 1. Indeed, the results of the fit indices of the default and modified models have been presented in Table 3. Based on the standardized fit indices and coefficients and the critical rate index (Table 4), the modified model had an acceptable fitness.

Reliability

The results of Cronbach’s alpha coefficient showed that the reliability of all six domains was appropriate. The results also revealed an appropriate correlation between the items and the total score of each domain. The Cronbach’s alpha, mean score, corrected item-total correlation, and Cronbach’s alpha of the deleted items for each domain have been depicted in Table 2.

Discussion

The present study aimed at designing and developing a tool for prevention of the impact of dust on heart patients based on the health belief model. The designed questionnaire included a total of 27 items divided into six domains of perceived susceptibility (five items), perceived barriers (four items), perceived severity (four items), perceived benefits (four items), guidance of action (six items), and self-efficacy (four items). The results of analyzing the validity and reliability, including face and content validity, construct validity, and internal consistency, indicated that the psychometric properties of the designed questionnaire were appropriate. As no tool has been designed regarding the prevention of the impacts of dust among heart patients so far, the present instrument was considered to be an innovation. Measurement and reporting of content validity are essential for the use of research tools[14]. Among the three issues of validity, reliability, and generalizability of the findings, validity is the most important issue and provides the basis for scientific research. It has been often stated that if the research tool is not valid, it will be ineffective[19]. In the present study, CVR and CVI were measured. The values of both indices were higher than 0.7 in all items. The content validity of the total items of the final questionnaire also suggested that the instrument was valid. As validity refers to the purpose of designing a tool, a valid test possesses the necessary adequacy to measure the subject of study. It seems that less attention has been paid to the validity of tools in many studies, while much attention has been paid to the research methodology or data analysis. In other words, provision of sufficient information on the validity and reliability of the tools has been overlooked in some studies conducted on the area of designing a tool based on the health belief model. However, this issue was taken into account in the present study, which could be addresses as a strong point.

In order to examine the validity of the tool, the researchers did not consider the opinions of health education professionals to be adequate and made use of the opinions and suggestions of cardiologists and environmental health professionals. In the validation step, various and valuable opinions were collected. This implies that the validity of the tool was evaluated from various angles. The results showed that different factors of the questionnaire, including perceived susceptibility, perceived severity, perceived barriers, perceived benefits, and perceived self-efficacy, had high internal consistency (0.70 to 0.90). This was in line with the acceptable values presented in statistical texts. For example, some studies have reported Cronbach's alpha of 0.7 as an acceptable value in assessing the reliability of the tools[20]. The findings of credible international articles also confirmed the results of the current study[21]. In this study, CFA was employed to examine the construct validity of the instrument. Before performing the principal components analysis, the fitness of the data for factor analysis was assessed. The study aimed to evaluate the validity of the research tool based on the psychometric process with relevant details as far as possible in order to provide appropriate evidence to ensure the tool's validity.

The present study, similar to other studies, had some limitations. The limited literature in this field was one of the limitations. Moreover, as research on health education has mainly focused on behavior and the nature of the behavior is complex, items are recommended to be added to this area in order to evaluate the individuals' behaviors in the prevention of dust. Furthermore, this study was conducted on the patients of only one hospital in Bushehr.

Conclusion

The present study tried to not only design a valid tool to prevent dust complications in heart patients, but to also inform the readers regarding the validity status of the designed tool and the way of its assessment by providing sufficient information about its validity and reliability. The results showed that the designed questionnaire had desirable psychometric properties to determine the factors involved in preventing dust complications among heart patients. It could be used by other similar cases, as well. Designing this questionnaire could also be an effective step towards evaluating the effective factors in preventing dust complications among patients with heart diseases.

Abbreviations

CVR: Content Validity Ratio; CVI: Content Validity Index; CVD: Cardiovascular Disease; WHO: World Health Organization; CFA: Confirmatory Factor Analysis; EFA: Exploratory Factor Analysis; CFI: Comparative Fit

Index; IFI: Incremental Fit Index; RMSEA: Root Mean Square Error of Approximation; GFI: Goodness of Fit Index; AGFI: Adjusted Goodness of Fit Index

Declarations

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Availability of data and materials: The datasets used and/or analysed during the current study are available from the corresponding author on reasonable request.

Ethics approval and consent to participate: The research design was approved by the Scientific and Ethical Committee of Bushehr University of Medical Sciences. Before distributing the questionnaire, the objectives and methodology of the study were explained to the participants and their written informed consents were obtained. In this way, the participants were ascertained that participation in the study was voluntary and that the data would only be analyzed collectively. Additionally, anonymous questionnaires were collected through face-to-face interviews.

Consent for publication: Not applicable

Competing interests: The authors declare that they have no competing interests.

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Tables

Table 1: The primary values of Content Validity Ratio (CVR) and Content Validity Index (CVI) of Items

Scope	Question	CVR	CVI
Perceived sensitivity	1. To what extent does dust in the air exacerbate heart diseases?	0.9	0.8
	2. To what extent does dust in the air exacerbate heart attack?	1	1
	3. To what extent does dust in the air trigger a heart attack?	0.9	0.8
	4. To what extent does dust in the air increase the mortality rate of heart patients?	1	0.9
	5. To what extent does dust in the air reduce the effectiveness of treatments?	0.9	0.9
Perceived barriers	6. It is difficult for me to use a mask during air pollution.	0.9	0.8
	7. It is difficult for me to use a filtered mask during air pollution.	1	1
	8. Staying home on dusty days is boring for me.	1	0.9
	9. On dusty days, despite the worsening symptoms, visiting a doctor or medical center is difficult for me.	0.9	0.7
Perceived severity	10. Airborne dust can aggravate heart disease.	0.9	1
	11. Existence of dust in the air can trigger dangerous heart attacks in patients.	0.8	0.9
	12. Existence of dust in the air can increase the mortality rate of heart patients.	0.9	0.9
	13. Existence of dust in the air can reduce the effectiveness of treatments.	1	0.8
Perceived benefits	14. Wearing a filter mask on high dust days can reduce the risk of complications.	1	0.8
	15. Not getting out of the house on a very dusty day is good for maintaining health.	1	1
	16. Immediate referral to a doctor can prevent heart problems if symptoms occur on dusty days.	0.9	0.9
	17. Paying attention to the air pollution announcements is beneficial to protect the health of the community.	0.7	0.9
Cues to action	18. My doctor advises me to use a mask when the air is dusty.	1	0.9
	19. My doctor advises me not to get out of the house when the weather is dusty.	1	0.8
	20. Health center staff advise me to use a mask in dusty weather.	0.9	1
	21. Health center staff advise me not to get out of the house when the weather is dusty.	1	0.9
	22. My Family members and friends advise me to use a mask when the weather is dusty.	1	1
	23. My Family members and friends advise me not to get out of the house when the weather is dusty.	1	0.9
	24. I pay enough attention to the mass media warnings about using a mask when the weather is dusty.	0.9	1
	25. I pay enough attention to the mass media warnings about not getting out of the house when the weather is dusty.	1	0.9
	26. I have friends who inform me in different ways when the weather is dusty.	0.8	1
Self-efficacy	27. I can still wear a mask even when it is difficult to use in air pollution.	1	0.9
	28. Even if I have to do the necessary work during air pollution, I can stay home.	0.8	1

	29. I am able to pay more attention to my symptoms until the air is heavily polluted.	0.9	0.7
	30. The days when I can’t get out of the house due to air pollution, I can entertain myself at home.	1	0.8

Table 2: Corrected Item-Total Correlation and Cronbach's Alpha Items

Dimension	Item	Mean (SD)	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted	Cronbach's Alpha
Perceived susceptibility	Psu1	3.86 (1.0)	.660	.774	.825
	Psu2	3.97 (.99)	.683	.768	
	Psu3	3.75 (1.0)	.651	.777	
	Psu4	3.56 (1.0)	.585	.796	
	Psu5	3.46 (1.0)	.506	.819	
Perceived barriers	Pba1	3.09 (1.2)	.601	.617	.727
	Pba2	3.20 (1.3)	.613	.607	
	Pba3	3.22 (1.3)	.470	.694	
	Pba4	3.24 (1.2)	.394	.734	
Perceived severity	Pse1	4.34 (.76)	.530	.688	.757
	Pse2	4.10 (.81)	.655	.617	
	Pse3	3.95 (.83)	.599	.646	
	Pse4	3.61 (1.0)	.407	.777	
Perceived benefits	Pbe1	4.16 (.77)	.368	.664	.678
	Pbe2	4.34 (.71)	.557	.547	
	Pbe3	4.16 (.84)	.460	.607	
	Pbe4	4.25 (.77)	.453	.610	
Cue to action	Cta1	3.80 (1.3)	.646	.815	.842
	Cta2	3.72 (1.3)	.652	.815	
	Cta3	3.69 (1.3)	.678	.812	

	Cta4	3.47 (1.4)	.638	.816	
	Cta5	3.68 (1.2)	.599	.822	
	Cta6	3.69 (1.1)	.595	.822	
	Cta7	3.66 (1.1)	.404	.840	
	Cta8	3.64 (1.1)	.463	.835	
	Cta9	2.95 (1.3)	.331	.850	
Self-efficacy	Se1	3.51 (1.1)	.578	.736	.785
	Se2	3.42 (1.1)	.574	.738	
	Se3	3.80 (.97)	.610	.722	
	Se4	3.72 (1.1)	.598	.724	

Table 3: Fit indices of the CFA of the questionnaire

Model fit index	Default model	Modified model
Chi-Square/Degrees Of Freedom Ratio *(X^2/Df)*	1446 / 390 = 3.708	674/306 = 2.20
	$P < 0.001$	$P < 0.001$
Goodness-Of-Fit Index (GFI)	.80	.90
Adjusted Goodness-Of-Fit Index (AGFI)	.75	.90
Incremental fit index (IFI)	.79	.92
Comparative Fit Index (CFI)	.77	.92
Root Mean Square Error of Approximation (RMSEA)	.08	.05

Table 4: Items loading factor and critical rates of dimensions of questionnaires

Dimension	Item	Standardized Regression Weight	Critical Rate	*p*
Perceived susceptibility	Psu1	.757	10.79	< .001
	Psu2	.796	11.06	< .001
	Psu3	.732	10.59	< .001
	Psu4	.639	9.76	< .001
	Psu5	.556	-	-
Perceived barriers	Pba1	.840	-	-
	Pba2	.857	11.92	< .001
	Pba3	.432	8.20	< .001
	Pba4	.336	6.36	< .001
Perceived severity	Pse1	.726	8.56	< .001
	Pse2	.767	8.72	< .001
	Pse3	.711	8.49	< .001
	Pse4	.460	-	-
Perceived benefits	Pbe1	.499	-	-
	Pbe2	.718	8.17	< .001
	Pbe3	.583	7.57	< .001
	Pbe4	.574	7.51	< .001
Cue to action	Cta1	.746	-	-
	Cta2	.801	20.20	< .001
	Cta3	.895	17.55	< .001
	Cta4	.826	16.62	< .001
	Cta5	.496	9.76	< .001
	Cta6	.441	8.65	< .001
Self-efficacy	Se1	.677	-	-
	Se2	.639	10.62	< .001
	Se3	.739	11.69	< .001
	Se4	.705	11.38	< .001

Figures

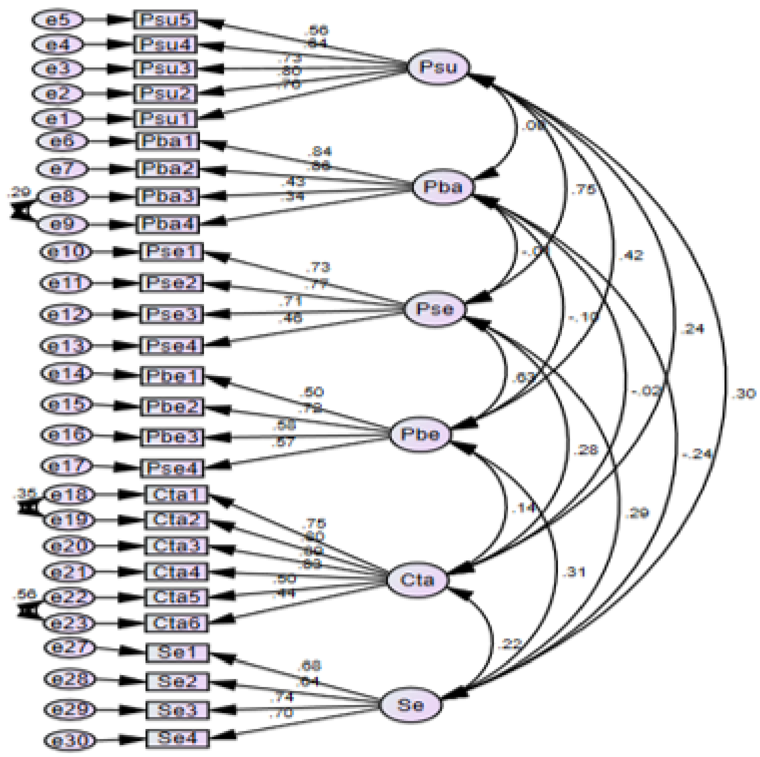

Figure 1

Confirmatory factor analysis factor for Dust Exposure Prevention questionnaire for heart patients. Chi-Square/Degrees Of Freedom Ratio (X2/Df) = 2.2, P < 0.001; Goodness-Of-Fit Index (GFI) = 0.90; Adjusted Goodness-Of-Fit Index (AGFI) = 0.90; Incremental fit index (IFI) = 0.92; Comparative Fit Index (CFI) = 0.92; Root Mean Square Error of Approximation (RMSEA) = 0.05.

Supplementary Files

This is a list of supplementary files associated with this preprint. Click to download.

- Formula1.jpg
- Formula2.jpg