

Path analysis of skin cancer preventive behaviors in rural women based on protection motivation theory

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Research article

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Abstract

Background: Determining factors affecting adopting preventive behaviors of skin cancer is helpful in designing interventions promoting these behaviors. The present study was conducted aimed to analyze preventive behaviors' path of skin cancer in rural women based on protection motivation theory. **Methods:** In this cross-sectional study, 230 rural women in the west of Iran were selected randomly. Data were collected by a valid and reliable questionnaire including demographic information and structures of protection motivation theory by interview with rural women and then analyzed using SPSS 22 and LISREL8.8. **Results:** In relation with skin cancer preventive behaviors, 27.8% of women were dressed up when working under the sun, 21.7% used sunscreen cream, 5.7% wore cap and 4.8 wore gloves and sunglasses. Protection motivation theory and per capita income explained 76% of motivation variance and 25% of the variance of skin cancer preventive behaviors. Response efficacy structure was the strongest predictor of the motivation of protection ($0/001 > p$, $\beta = -0.44$) and per capita income ($0/001 > p$, $\beta = -0.34$) and motivation ($0/001 > p$, $\beta = -0.33$) were the strongest predictors of these behaviors. **Conclusions:** This study showed that protection motivation theory is efficient in predicting preventive behaviors of skin cancer and promoting interventions of the behaviors can be designed and implemented by this theory. It is also necessary to perform proper planning in promoting these behaviors in people with low per capita income.

Background

The first and second common cancer in Iranian men and women is skin cancer, respectively (1). Skin cancer, in which epidermal layer of the skin grows abnormally, is classified into melanoma and nonmelanoma. Skin cancer has an increasing trend and 2-3 million people are affected globally (2, 3). The main environmental risk factor for skin cancer is ultra violet (UV) radiation emitted from the sun and other sources. The evidences indicate that self-examination of skin lesions and behavioral counseling could have a unique role in early diagnosis and cancer prevention (4, 5).

Although skin cancer is one of the most prevalent cancers, but, at the same time, it is one of the most preventable cancers (6). In other words, the effective factors such as race, heredity, skin color and genetics background may not be changeable, but public awareness and changeable factors can be improved through public health educations (7).

Those who are required to work in the sun hours of the day are more susceptible to skin cancer. Rural women as one of the high-risk groups have to work many hours of day in front of sun that without appropriate clothing against UV radiation make them susceptible to skin cancer. These persons should take protective measures such as limiting out of door works, avoid sun light from 10 am to 4 pm, and wear protecting equipment such as wide-brimmed hat, long sleeve dress and sunscreen with a protective factor of 15 and above (8).

High skin cancer prevalence, death and disability along with emotional and physical suffering have necessitated implementation of prevention measures. In this path, the most advancements are achieved

when, moreover recognition the present situation, consider the factors effective on the behavior. One of these factors is the person motivation to participate in risk reduction behaviors. In this regard, protection motivation theory (PMT), as one of the effective theories in health education, provides a unique framework to predict healthy behaviors. This theory assumes that adoption of a healthy behavior (a protecting behavior), recommended against a health risk factor, is a direct action of the person motivation to protect himself (9).

This theory provides a framework for fear understanding and the ways people try to protect themselves against health threats. Protection motivation theory is stemmed from the results of threat appraisal and the coping appraisal. Threat appraisal includes perceived vulnerability (a person belief that he/she is vulnerable to a health threat), perceived severity (a person belief that health threats are severe and serious) and perceived rewards (rewards that a person receive from doing unhealthy behavior or not doing healthy behavior). Coping appraisal includes perceived self-efficacy (a person belief of performing healthy behavior successfully), response self-efficacy (a person's estimate that healthy behavior work), perceived costs (a person's estimate of the costs of protective behaviors that she/he should pay). Fear resulted from these two appraisals creates the motivation to perform health protection behaviors (9, 10).

The studies performed on PMT indicate that its constructs have a high importance in predicting cancer preventing behaviors (11-13). Due to challenges in motivating women to participate in cervical cancer screening, Yang Bai et al. in china studied the role of PMT on predicting tendency toward performing cervical cancer screening. They concluded that focus on cancer knowledge, awareness and previous experience regarding screening and demographic factors are associated with the screening tendency through promoting cancer risk perception and reducing response cost (14).

In another study, Rahaei et al. assessed the predictors of cancer early detection behaviors using PMT. They indicated that PMT constructs is useful in predicting protection motivation, and passive and active behavior in the cancer early detection initiatives (15).

According to the above, and also the importance of rural women health and lack or inadequate evidences, local and international, regarding the predicting factors of skin cancer in this group, this study was designed to analyze the path of preventing behaviors of skin cancer in rural women located in the west of Iran on the basis of protection motivation theory.

Methods

Participants and Procedures

This cross-sectional study was carried out in 2017 in the city of Nahavand, located in the western part of Iran with a population of 72000, among rural women. This city was selected using random digits method from the list of all cities in the west of Iran. Rural women in this district are usually in front of sun to perform household affairs. In other words, many of affairs near and outside houses are performed using women as their duty description.

Rural population refers to people living in rural areas as defined by national statistical offices. A rural area is a geographic one that is located outside towns and cities. Villages are often located in rural areas. In other word, all population, housing, and territory not included within an urban area form villages (16). Through cluster sampling method, 4 villages were selected from Nahavand city, randomly. Then, using the documents of health centers located in the villages, the women were selected through random sampling method. All demographic information of Iranian rural populations is recorded in health centers. Rural health centers provide this information through annually census by their employees. This operation is supervised by district health authorities. This census help planning and developing primary health care in rural areas (17). The lowest sample volume by attention to the previous studies (11, 14), considering the maximum standard deviation of 5.4, acceptable error of 0.7, confidence interval of 95% and using $n = z^2 s^2 / d^2$ formula, was estimated 230 persons.

The written informed consent form was collected from the participants. This form included the items of study purpose, expected duration of the subject's participation, a description of the procedures, risks or discomforts and benefits, confidentiality, and a statement regarding voluntary participation and freely to leave out the study at any time (18). If one of the selected persons was not willing to participate the study, another person was invited to the study.

Inclusion criteria included rural women with at least minimum literacy, age higher than 18 years old, and no diagnosis of skin cancer. The exclusion criteria included were not continuously present at the training sessions and tendency to leave out during of the study. The training sessions regarding the importance of study, how to answer the questions, freely to leave out the study and so on were held for each participant separately which lasted 20 minutes.

Measures

The study instrument included a standard questionnaire for skin cancer based on PMT which have 2 sections of socio-demographic variables and PMT theoretical constructs (19). The participants were interviewed by one of the research team members at their homes.

The socio-demographics variables included age, gender, marital status (single/ married/ widow), education level (illiterate/ elementary/ secondary/ high school/ diploma/ collage degree), job (household/ worker/ employee/ self-employment), number of hours working under sun, history of sunburn, number of family members and family monthly income level. Existence of a cancer patient in the participants or their relatives was asked.

The second part of the questionnaire included questions measuring PMT theoretical constructs including perceived vulnerability (e.g., If I have been exposed to sunlight for a long time, my skin will be damaged) (4 items), perceived severity (e.g., Skin cancer is not too concerning) (3 items), perceived rewards (e.g., It's a pleasure to be under the sunlight) (3 items), perceived fear (e.g., I feel bad about skin cancer) (3 items), perceived response (e.g., If I use hats and sunglasses, I reduce the risk of skin cancer) (3 items), perceived

costs (e.g., It's time-consuming to wear a hat and sunglasses) (6 items), perceived self-efficacy (e.g., I can prevent of skin cancer) (5 items) and protection motivation (e.g., I decided to be less exposed to sunlight) (5 items) and also skin cancer preventing behaviors (8 items). The responses in the theory constructs were scored using 5-points Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). The responses in the behavior assessment questions were scored ranged from 0 (never) to 4 (always). Some questions were scored reverse.

Validity and reliability

To confirm face validity of the instrument, 10 experts reviewed level of difficulty, the extent of inappropriateness, phrase ambiguity and failure in the meaning of words and presented their corrections.

To assess content validity, a panel of experts, consisting 10 university professors in the area of health education were asked to assess the questions quantitatively and qualitatively. In the qualitative method, the experts were asked to assess the instrument on the basis of grammar compliance criteria, using the right words, putting the items in the right place, and scoring. Finally, their feedbacks, which were mainly related to the wording and phrasing of the items, were used to revise the instrument.

In the quantitative method, content validity ratio (CVR) and content validity index (CVI) were confirmed. To this, 15 experts were requested to state their views for each item on the basis of 3 parts spectrum of "it is necessary", "it is useful but not necessary" and "it is not necessary". By attention that the number of experts was 15, so CVR amount on the basis of Lawshe table should be 0.49 to its content validity become confirmed. As CVR for all questions was higher than 0.49, so content validity was confirmed.

To assesses CVI, the experts reviewed each item on the basis of relevance, simplicity and clarity. The results were applied in the questionnaire. The questionnaire reliability was assessed through Cronbach Alpha on 40 rural women with similar demographic characteristics with the study population. The questionnaire Cronbach Alpha was higher than 70%.

Path analysis

Path analysis was used to assesses PMT and predict preventive behavior of skin cancer. The used indices were χ^2 which its insignificant amount indicates theoretical fitness with the data, the ratio of χ^2 to degree of freedom in which the amount lower than 3 is preferred, and comparative fit index (CFI), goodness of fit index (GFI), adjusted goodness of fit index (AGFI), normed fit index (NFI) which amounts higher than 0.9 is favorable for all these items. Regarding root mean square error of approximation (RMSEA) and root mean square of residuals (RMSR), the amounts lower than 0.05 is very good and 0.08 is acceptable (20).

Statistics

The collected data were analyzed using SPSS 22 and LISREL8.8 through intraclass correlation coefficient, maximum likelihood method and correlation matrix. The linear structural relations model (LISREL) was used to determine whether the data fit the model.

Results

Mean age of the participants was 30.55 ± 7.50 , most education level was elementary (42.6%), most of them were housekeeping (87%) and married (87.8%). The job and education level of most of the participants' husbands were manual worker (28.7%) and elementary (29.6%). Most households' monthly income was lower than 125 USD. Mean working in front of sun was 2.72 ± 1.46 and most of the participants (67%) had a history of sunburn (Table 1).

Regarding skin cancer preventing behaviors, 27.8% of the participants were always wearing dress up clothes, 21.7% sunscreen, 5.7% caps and 4.8% gloves and sunglasses (Table 2).

Assessment of skin cancer preventing behaviors in rural women indicated that mean score of "less exposure to sunlight" and "visiting physician when observing suspicious symptoms" behaviors were higher than other behaviors and "using sunglasses" and "using gloves" were lower than other behaviors.

The results of path analysis indicated that PMT explain 76% of motivation variance and 25% of skin cancer preventing behaviors. Response efficacy construct was the most powerful predictor of protecting motivation with β 0.44 and protecting motivation with path coefficient of 0.33 were the most powerful predictors of skin cancer preventing behaviors. The self-efficacy constructs, perceived costs (inversely) and perceived severity have predicted motivation significantly, and perceived severity and fear were predictors of these behaviors. The perceived vulnerability constructs and perceived rewards were not the predictors of motivation and behavior. However, household income with path coefficient of 0.34 more powerful than all of PMT constructs predicted protecting behaviors (Table 3, Figure 1).

Outer variables including perceived severity, fear, perceived costs, response efficacy and self-efficacy, excluding income variable, were correlated. This indicates that the selection of variables was not as mosaic form, but there was interaction between them and the variables have been selected by attention to the theoretical model. The income variable had not significant correlation with fear and response efficacy. Two-way arrows and correlation coefficient amounts due to high numbers have not been indicated in the figure. Table 4 indicates model fitting indices in which the amount of all indices are acceptable.

Discussion

To the best of our knowledge, this is the first of such behavioral epidemiological study assessing effective factors on preventing behaviors of skin cancer in Iranian rural women using PMT. Rural women due to outdoor working have more exposure to sunlight and harmful UV radiation than other women. So they need to do more sun-protection behaviors than the usual population. The results of this study extend the

previous performed studies regarding skin cancer preventive behaviors (21, 22). The importance of this extension is in its effective role on developing the necessary evidences to design better interventional programs. This finally leads to higher participation of rural women in screening and preventive programs.

The study results indicated that wearing sunglasses, gloves and caps have been performed lower than other preventing behaviors of skin cancer such as visiting a physician when observing suspicious symptoms, lower exposure to sunlight, using sunscreen, wearing dressed up clothes, and working in the early morning by rural women. 18-29 years old Australian women were wearing sunscreen, gloves, caps and sunglasses lower than other measures (23). A study on high school female students in Yazd city of Iran indicated that the most performed protective method was using sunscreen. Also, they have used all other protecting behaviors more than rural women. This indicates that rural women due to lower knowledge, attitude and behavior, have used skin cancer protective behaviors lower than high school students. This result in rural women is in line with other Iranian study in rural men farmers in which a small proportion of them reported using sunscreen, hats, gloves, sunglasses, and protective clothing (24).

The results of path analysis indicated that PMT explain 76% of motivation variance and 25% of skin cancer preventing behaviors. In Baghiani-moghadam et al. study on high school students, this theory, using regression model, has predicted 54% of motivation and 41% of skin cancer preventing behaviors and Dehbari et al. study on girls university students has predicted 39% of intention and 31% of sunlight protection behavior (20, 25). Difference in the theory predicting power may be due to the studies population and statistics methods.

The results indicated that the motivation construct is the most powerful predictor of sunlight protecting behavior against skin cancer which is similar to other studies (23, 25). This indicates motivation or intention to perform a behavior is a mediator between theory and behavior constructs. The role of protection motivation is undeniable in undertaking recommended skin prevention and control behaviors. Design of educational programs on the basis of PMT can increase cancer protective behaviors (26).

The perceived severity and fear predict skin cancer preventing behavior, directly. This indicates that whatsoever people perceived severity of the disease, more they fear it which leads to adopting more preventive behaviors. The role of fear appeals in producing behavior change is a proven fact. However, this fear appeals don't work in isolation and may cause defensive responding. So, it should be accompanied with efficacy messages (27, 28).

Per capita income was the only demographic and background variable that predicted skin cancer preventing behaviors. It seems that people with higher incomes have high probability of performing these behaviors. Low income families, in spite of having good attitude and worries about cancer, perform inadequate practices for cancer prevention (29). Therefore, there is urgent need for awareness and intervention raising programs throughout the country especially in the low-income regions to increase knowledge and behavior for skin cancer prevention and control.

The most important construct which predict protection motivation or the intention to doing skin cancer preventing behaviors is response efficacy. Those who knew behaviors such as using sunscreen, cap, sunglasses, dressed up clothes as efficient and effective, had more powerful intention to apply these behaviors. Studies by Zare-sakhvidi et al. and Rahaei et al. have indicated that this construct is one of the powerful predictors of protection motivation against cancers in adults (11, 13).

Self-efficacy after response efficacy was the most powerful predictor of motivation and intention to perform skin cancer preventing behaviors. In other words, those who have intention to perform these behaviors, more over those believe these behaviors are effective in preventing skin cancer, are confident regarding their ability to perform these behaviors. Studies by Zare-sakhvidi et al. and Rahaei et al. have obtained the similar results. However, self-efficacy was a more powerful predictor than response efficacy in Zare-sakhvidi et al. study (11, 13). Self-efficacy, more over PMT, has been applied in other health behavior models including health belief model (30, 31). This indicates its effective role on improvement of predictive efficacy of healthcare models. Therefore, cancer and other diseases care providers should encourage self-confidence in patients and usual people to do the recommended health care and how to combat diseases (32).

The results indicated that perceived costs predict protection motivation significantly but reversed. The person estimation of protection behaviors costs can be a barrier to apply protection behaviors. Zare-sakhvidi et al. obtained similar results, but this construct was not the predictor of protection motivation (11).

Collecting the questionnaire data through self-reporting is among the study limitations. So caution should be exercised in generalizing the results. However, this problem was removed through giving enough time and stating study goals to the participants. A similar study by Bai et al. on application of PMT in predicting intention to receive cervical cancer screening in rural Chinese women indicated that if verified with longitudinal studies, PMT studies is applicable for intervention program development (14). High participation of rural women in the study due to their interest to prevent skin cancer is among study strengths.

Conclusions

The results indicated that PMT is a good framework to predict behavior specially in intention and motivation of protection against skin cancer. The effective constructs on predicting skin cancer preventive behaviors more over motivation were response efficacy, self-efficacy, perceived severity all as directly and perceived costs indirectly. Also, household income was a relatively strong predictor to adopt sun protection behaviors and skin cancer. It is proposed to this theory and its constructs be used in designing interventional skin cancer preventing behaviors' programs in rural women.

Abbreviations

PMT: protection motivation theory; UV: ultra violet; CVR: content validity ratio; CVI: content validity index; CFI: comparative fit index; GFI: goodness of fit index; AGFI: adjusted goodness of fit index; NFI: normed fit index.

Declarations

Ethics approval and consent to participate

This study has been approved in ethical committee of Arak University of Medical Sciences with ethical code number IRCT2015082423754n1. The written informed consent form was collected from the participants.

Consent for publication

Not applicable.

Availability of data and materials

The datasets analyzed during the current study are available from the corresponding author on reasonable request.

Competing interests

The authors declare that they have no competing interests.

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Authors' contributions

AHK, MK and NR designed the study and interpreted the data. AHK, MK, SA and NR wrote the main manuscript text. AHK, MK, SA and NR conducted the survey and analyzed the data. All authors read and approved the final manuscript.

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Tables

Table 1 Demographic information of the rural women participated in path analysis of skin cancer preventive behaviors using PMT

	Variable	Number (percent)
Marital status	Single	24 (10.4%)
	Married	202(87.8%)
	widow	4(1.7%)
Education level	Illiterate	16(7%)
	Elementary	98(42.6%)
	Secondary	42(18.3%)
	High school	44(19.1%)
	Diploma	23(10%)
	College	7(3%)
Job status	Housekeeper	200(87%)
	Farmer	4(1.7%)
	Rancher	3(1.3%)
	Other	23(10%)
Job of their husbands	Without husband	28(12.2%)
	Farmer	50(21.7%)
	Rancher	4(1.7%)
	Employee	17(7.4%)
	Worker	66(28.7%)
	Other	65(28.3%)
History of sunburnt	Yes	154(67%)
	No	76(33%)

PMT: Protection Motivation theory

Table 2 Skin cancer preventing behaviors in the rural women participated in path analysis of skin cancer preventive behaviors using PMT

	Number (percent)					Mean and SD (range 0-4)
	Never	Sometimes	Half of times	Most of times	always	
Wearing caps	36(15.7%)	71(30.9%)	62(27%)	48(20.9%)	13(7.5%)	1.70±1.13
Use sunscreen	21(9.1%)	52(22.6%)	35(15.2%)	72(31.3%)	50(21.7%)	2.34±1.29
Wear gloves	48(20.9%)	82(35.7%)	54(23.5%)	35(15.2%)	11(4.8%)	1.47±1.12
Wear sunglasses	102(44.3%)	57(24.8%)	36(15.7%)	24(10.4%)	11(4.8%)	1.07±1.20
Wear clothes that cover most of the body.	12(5.2%)	69(30%)	46(20%)	39(17%)	64(27.8%)	2.32±1.30
Working in the early morning and afternoon hours	10(4.3%)	47(20.4%)	9(30%)	68(29.6%)	36(15.7%)	2.32±1.10
Visiting your physician when observing suspicious symptoms	10(4.3%)	35(15.2%)	69(30%)	76(33%)	40(17.4%)	2.44±1.08
Less sun exposure	7(3%)	41(7.8%)	71(30.9)	72(31.3%)	39(17%)	2.41±1.06

Table 3 Direct, indirect and total effects of PMT constructs on motivation and skin cancer preventing behaviors

Dependent variable	Independent variable	Direct effects	Indirect effects	Total effects
Motivation	Perceived severity	0.12*	-	0.12*
	Perceived costs	-0.19*	-	-0.19*
	Self-efficacy	0.19*	-	0.19*
	Response efficacy	0.44*	-	0.44*
Skin cancer preventing behaviors	Fear	0.14*	-	0.14*
	Perceived	0.15*	04/0	0.19*
	Perceived costs	-	-0.06	-0.06
	Self-efficacy	-	0.06	0.06
	Response efficacy	-	0.15*	0.15*
	Motivation	0.33*	-	0.33*
	Family income	0.34*	-	0.34*

Table 4 Fitting indices resulted from path analysis of PMT in rural women

RMSEA	RMSR	IFI	NFI	AGFI	GFI	CFI	X2/df	df	X2
0.036	0.029	0.99	0.98	0.91	0.99	0.99	2.29	5	11.49

RMSEA: Root Mean Square Error of Approximation
RMSR: Root Mean Square Residual
IFI: Incremental Fit Index
NFI: Normed Fit Index
AGFI: Adjusted Goodness of Fit Index
GFI: Goodness of Fit Index
CFI: Comparative Fit Index

Figures

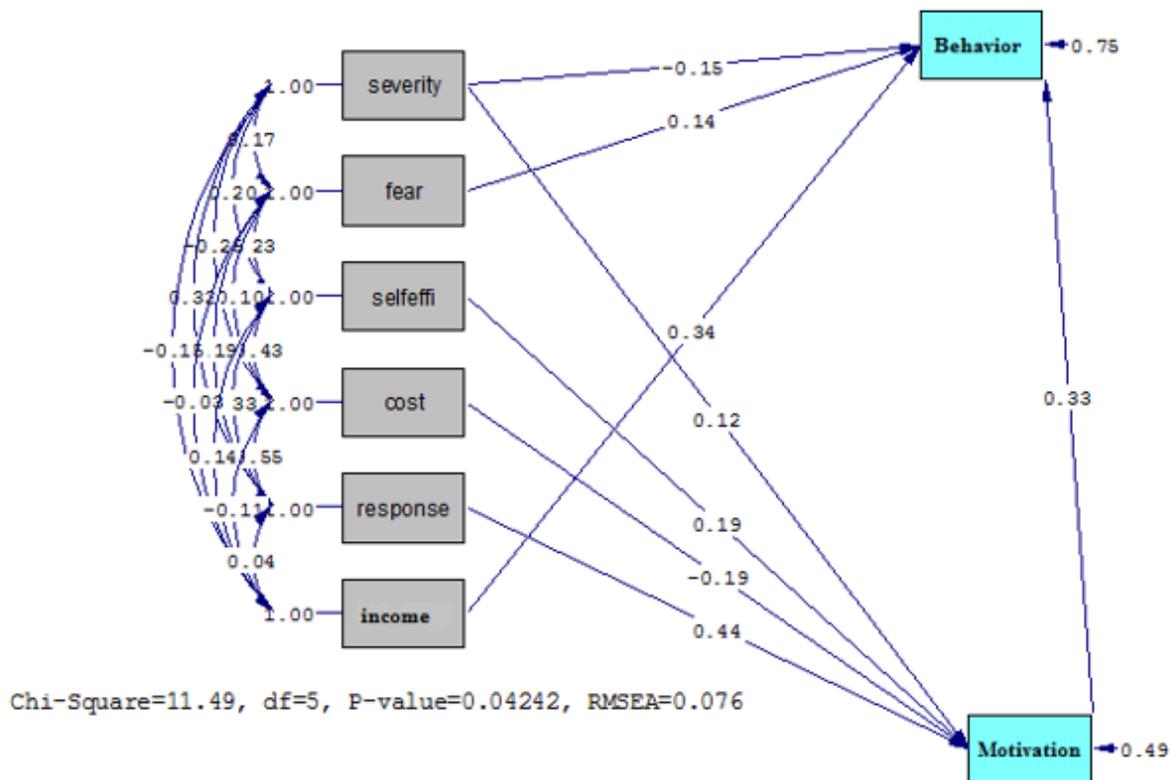


Figure 1

Path analysis model of PMT for skin cancer preventive behaviors Rectangles: model constructs; Big arrows: path coefficient between the constructs; Small arrows: measurement arrows