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Original Article

Education Section

Educational Intervention Based on Protection Motivation Theory to Improve Vitamin E and C Consumption among Iranian Factory Workers

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ABSTRACT

Introduction: Various studies have suggested the protective role of antioxidant vitamins such as vitamin C and E against toxic injury and disease resulting from toxic metals. Thus, studying the antioxidant vitamins consumption behaviour, particularly in high-risk groups such as factory workers with high exposure to toxic metals is emphasised.

Aim: This study examined the effects of educational interventions based on the Protection Motivation Theory (PMT) among cement factory workers after intervention and six months of follow-up.

Materials and Methods: Cement factory workers were randomly assigned into three groups: indirect (n=70), face-to-face (n=70) and control (n=70). The content of face-to-face interventions included multimodal lectures with powerpoint presentations, discussion, questions and answers, individual counselling sessions, and educational pamphlets and booklets. The indirect group received recently designed educational content through pamphlets and booklets. Workers completed PMT questionnaire and Food Frequency Questionnaire (FFQ) at baseline, post-intervention, and at the six-month follow-up.

Results: Results showed significant positive changes on all PMT constructs, knowledge, and vitamins E and C consumption in both intervention groups at immediate post-intervention and at six month follow-up. Knowledge and intention remained higher in face-to-face groups than in indirect group and higher maintenance was also observed in relation to vitamins and C consumption in the face-to-face group.

Conclusion: Findings of this study indicated the PMT intervention, particularly face-to-face intervention, is sound and can be performed for other protective dietary behaviours, such as other antioxidants consumption.

Keywords: Nutrition education, Vitamins intake, Workers

INTRODUCTION

Exposure to toxic metals has caused widespread problems over the past decades [1]. Studies reported that metal exposure may cause dysfunction in the cardiovascular system, liver, kidneys, skin, gastrointestinal system, nervous system, and reproductive system [1,2]. Antioxidants such as vitamins E and C can prevent majority of the toxic metals damage, provide protection against deleterious free radical attacks and a convenient method of reducing metals poisoning [1,3].

Micronutrient deficiency, particularly of vitamins, is one of the main problems of global health [4]. Studies indicate that educational interventions in the workplace focused on behavioural approaches can make sustainable changes in some risk factors [5]. In this regard, behavioural theories can be considered as methods to improve dietary behaviour and overall public health [6].

The PMT is a social-cognitive model that explains health related behaviour change by two cognitive processes: coping appraisal and threat appraisal [7]. Threat appraisal is comprised of perceived vulnerability, meaning the perceived personal risk that the health threat will occur. Perceived severity identifies the dangerousness of the health threat if it was to happen [8]. Coping appraisals are influenced by response efficacy: an individual expecting that carrying out recommendations can remove the threats, and self-efficacy: an individual's competency to carry out the action, successfully [9]. Coping and threat appraisal combine to create intention to adopt a protective behaviour [10]. Study results also found that knowledge can influence the coping and threat appraisal, and can play considerable role on behavioural changes [11,12]. In Iran, previous studies have reported that individuals have not, as yet, adopted the minimum recommendations for the consumption of vitamins [13]. Thus, studying the antioxidant vitamin consumption behaviour particularly in high-risk groups such as factory workers with high exposure to toxic metals is necessary. Some of the metals emitted by cement industries are known to be toxic and harmful for human health, even at low concentrations [14].

Previous studies have examined PMT constructs on different dietary behaviours in a variety of samples [7,15]. However, there is no research on vitamins E and C consumption behaviour among a high-risk group like cement factory workers. This study aimed to investigate the effect of educational interventions (face-to-face and indirect) on vitamins E and C consumption behaviour based on PMT after intervention and six months of follow-up.

MATERIALS AND METHODS

This study was a randomized controlled trial conducted in Kurdistan Province of Iran during June 2017-January 2018. Participants were randomly assigned using a random number table from a possible 300 [16]. Cement factory workers were then divided into three groups: indirect (n=70), face-to-face (n=70) in day shift and control (n=70) in night shift. These methods were utilised to reduce the effect of the educational group on the control that could contaminate an experiment and produce tainted results.

Individuals were eligible for inclusion if they did not present a history of, or current, physical symptoms of serious neurological, cardiovascular, renal, hepatic, endocrine, metabolic or gastrointestinal disease and previous pharmacological treatment, according to the medical reports available at the factory. All workers provided written, informed consent and participation was voluntary. All procedures involving human subjects were approved by the Kurdistan University of Medical Sciences Ethics Board Committee.

Measures: The vitamin E and C intake were measured by using a FFQ. The FFQ contained questions regarding a list of foods

and a standard serving size for each commonly consumed by Iranians [17,18]. Whereas Iranian Food Composition Table (FCT) [17] is not comprehensive and complete, for some food items the United States Department of Agriculture Food Consumption Table (USDA) FCT [19] was used, too. Workers were asked to report their frequency of consumption of a given serving of each food during the previous year on a daily, weekly or monthly basis. Portion sizes of consumed foods were converted to grams by using household measures [17]. Daily vitamins E and C consumption for participants were computed by Nutritionist IV software which was designed for evaluation of Iranian foods. Results were expressed as milligrams of vitamins E and C per day (mg/day).

PMT constructs were adopted based on previous food consumption behaviour studies [7,15]. To obtain content validity, health behaviour experts, psychology, nutrition, and instrument design evaluated the researchers Farsi language questionnaire. To ensure the clarity of the questionnaire, a pilot examination was performed with 30 workers. The questionnaire was then modified based on the feedback received. Demographic characteristics, knowledge and PMT constructs were assessed by self-reported questionnaire [ANNEXURE].

Self-efficacy was assessed by eight items. The two week test/retest reliability of the self-efficacy scale was r=0.77 and the α was 0.90.

Response efficacy was measured with eight items. The two week test/retest reliability was r=0.78 and the α was 0.83.

Perceived severity was measured with twelve items. The two week test/retest reliability of the perceived severity scale was r=0.89 and the alpha coefficient α was 0.83.

Perceived vulnerability was measured with seven items. The two week test/retest reliability of the perceived vulnerability scale was r=0.71 and the (α) was 0.78.

Intention to consume vitamins E and C was measured with one item asking participants about their intention during the next months. The two week test/retest reliability of the intention scale was r=0.69 and the α was 0.88.

Response-efficacy, self-efficacy, perceived severity, perceived vulnerability and intention were assessed using a 5-point Likert scale (from 1=strongly disagree to 5=strongly agree).

Participants' knowledge was assessed by thirteen items, which measured workers' capabilities to understand information about risk factors and antioxidant vitamins (α=0.83). Possible responses were correct answers=1 and incorrect or did not know answers=0.

Intervention: The face-to-face intervention was composed of eight sessions (two sessions per week). Each session took 30-45 minutes and consisted lectures with powerpoint presentations, discussion, questions and answers, and the distribution of educational pamphlets and booklets. Education sessions (held by a PhD student of health education and a nutrition expert) focused primarily on increasing knowledge. Sessions also concentrated on changing related beliefs of response efficacy, self-efficacy, perceived vulnerability and severity. In addition to group counselling sessions, participants received individual sessions based on baseline assessments (15-20 minutes each). These sessions helped workers to review their personal purposes and intentions as well as recognise strategies to overcome obstacles. The timeline, intervention components, and methods of education are shown in [Table/Fig-1]. The indirect group received recently designed educational content through pamphlets and booklets. The control group received no educational or counselling sessions but did receive the educational pamphlets and booklets after the final follow-up questionnaires were administered. Workers completed PMT and FFQ questionnaires at baseline, post-intervention, and at the six-month follow-up.

Time	Theoretical constructs	Methods used
Week 1 and 2	Knowledge	Group session components: -Lecture about the benefits of vitamins for health, effects of vitamins E and C on reducing metals toxicity; introduce vitamins-rich foods, effects of toxic metals. -Powerpoint presentation and distribution of educational booklets on the benefits of vitamins E and C.
Week 3 and 4	Perceived threat (perceived severity and vulnerability)	Group session components: -Lecture about the effects of vitamins deficiency, highlighting the seriousness of the threat condition like heavy costs of disease treatment, increasing individual's perception of the threat of vitamins deficiency focused on danger control. -Distribution of educational pamphlets on the harmful effects of toxic metals.
Week 5 and 6	self-efficacy	Group session components: -Lectures about the participants' ability to overcome obstacles to consume healthy diets, highlighting the importance role of vitamins E and C. - Group discussion and questions and answers about how to consume vitamins in diet. Individual session components: Individual-tailored counseling about workers' knowledge of healthy diet.
Week 7 and 8	Response-efficacy	Group session components: -Lectures about the more emphasis on the role of vitamins in decreasing the risk of diseases and metals toxicity, necessity of testing vitamins. -Question and answer about the materials presented in the past sessions. Individual session components: Individual-tailored counseling about workers' vitamins consumption.

[Table/Fig-1]: Components of interventions by time, targeted constructs, and methods.

STATISTICAL ANALYSIS

Data analyses were done using SPSS version 24.0. Values were given in means and standard deviations. Changes in outcome variables from baseline through post intervention and follow-up were measured by a two-way repeated measure ANOVA to show differences between groups. Mauchly's test determined that Greenhouse-geisser assumptions were met for those variables. Furthermore, one-way ANOVA was used to indicate differences between groups at each time. Bonferroni's post-hoc honest significant difference tests were employed.

RESULTS

Demographic characteristics are shown in [Table/Fig-2]. There were no significant differences between groups for demographic characteristics.

Post-hoc analyses showed that there were no significant differences between the control and two intervention groups at baseline. Results showed the changes in outcome variables across time for each of the three groups [Table/Fig-3]. There were significant interaction effects between times and groups for PMT constructs, knowledge and vitamins E and C consumption ($p<0.001$). This showed the groups differed across time. Furthermore, pairwise comparisons of means revealed that there were significantly different changes between post-intervention, follow-up, and baseline in face-to-face and indirect groups for all variables ($p<0.001$).

Significant changes on PMT constructs, knowledge, and vitamins E and C consumption were observed in both intervention groups at three points of time assessment (p=0.02-0.001). Results showed that levels of knowledge remained higher in the face-to-face group than in the indirect group (2.67 vs. 1.73, respectively). In relation to intention, the face-to-face group also showed higher maintenance than the indirect group (3.87 vs. 3.20, respectively). Moreover, findings indicated that vitamin C remained higher in the face-to-face group than in the indirect group (21.65 vs. 17.60, respectively); higher vitamin E was also found in the face-to-face group than in the indirect group (3.47 vs. 2.44, respectively).

Demographic characteristics	Face-to-face	Indirect	Control	p-value
Age (year), Mean (SD)	34.60 (4.50)	33.80 (4.98)	34.69 (4.78)	0.48
Education, Number (%)				
Under diploma	4 (5.71)	8 (11.43)	3 (4.29)	0.67
Diploma	29 (41.43)	27 (38.57)	30 (42.86)	
Bachelor science	25 (35.71)	23 (32.86)	25 (35.71)	
Master science	12 (17.14)	12 (17.14)	12 (17.14)	
Marital status, Number (%)				
Married	52 (74.29)	47 (67.14)	53 (75.71)	0.48
Single	18 (25.71)	23 (32.86)	17 (24.29)	
Work experience (year), Mean (SD)	9.21 (4.52)	8.24 (4.07)	8.09 (4.27)	0.24

[Table/Fig-2]: Demographic characteristics of the workers in groups.
SD: Standard Deviation

Variable	Stage	Face-to-face (N=70)	Indirect (N=70)	Control (N=70)	p-value
Perceived severity	pretest	2.96 (0.51)[a]	2.83 (0.36)[a]	2.93 (0.50)	0.001
	post-test	3.54 (0.37)[b]	3.17 (0.32)[b]	2.96 (0.51)[b]	
	Follow-up	3.72 (0.47)[c]	3.26 (0.40)[c]	2.97 (0.51)	
Perceived vulnerability	pretest	2.46 (0.49)[a]	2.57 (0.36)[a]	2.47 (0.50)	0.001
	post-test	3.50 (0.30)[b]	3.04 (0.28)[b]	2.50 (0.49)[b]	
	Follow-up	3.67 (0.39)[c]	3.17 (0.34)[c]	2.51 (0.51)	
Response efficacy	pretest	3.00 (0.52)[a]	2.99 (0.41)[a]	3.07 (0.45)	0.001
	post-test	3.89 (0.35)[b]	3.53 (0.40)[b]	3.09 (0.45)	
	Follow-up	4.16 (0.44)[c]	3.69 (0.51)[c]	3.08 (0.45)	
Self-efficacy	pretest	2.47 (0.39)[a]	2.46 (0.33)[a]	2.46 (0.39)	0.001
	post-test	3.22 (0.27)[b]	2.99 (0.26)[b]	2.52 (0.40)	
	Follow-up	3.45 (0.32)[c]	3.17 (0.31)[c]	2.54 (0.42)	
Knowledge	pretest	1.34 (0.20)[a]	1.36 (0.20)[a]	1.38 (0.29)	0.001
	post-test	2.65 (0.29)[b]	1.72 (0.19)[b]	1.41 (0.28)	
	Follow-up	2.67 (0.31)[c]	1.73 (0.21)[c]	1.40 (0.29)	
Intention	pretest	1.59 (0.50)[a]	1.61 (0.52)[a]	1.60 (0.49)	0.001
	post-test	3.31 (0.69)[b]	2.53 (0.70)[b]	1.64 (0.48)	
	Follow-up	3.87 (0.80)[c]	3.20 (0.93)[c]	1.64 (0.54)	
Vitamin E	pretest	0.87 (0.38)[a]	0.86 (0.32)[a]	0.87 (0.40)	0.001
	post-test	2.64 (0.80)[b]	1.92 (0.66)[b]	0.88 (0.39)	
	Follow-up	3.47 (0.80)[c]	2.44 (0.79)[c]	0.89 (0.40)	
Vitamin C	pretest	10.07 (5.44)[a]	9.88 (5.29)[a]	9.54 (4.96)	0.001
	post-test	18.56 (8.70)[b]	15.46 (6.80)[b]	9.74 (4.73)[b]	
	Follow-up	21.65 (9.36)[c]	17.60 (8.09)[c]	9.87 (5.04)	

[Table/Fig-3]: Changes in outcomes variables during baseline through follow-up.
Means reported and standard deviations in brackets. a: significantly different changes between baseline and post intervention p<0.001; b: significantly different changes between post intervention and follow-up p<0.02-0.001; c: significantly different changes between baseline and follow-up p<0.001.

DISCUSSION

Findings provided evidence that the implementation of PMT among workers is a promising educational intervention to increase vitamins E and C consumption in this target sample. Zhang Y et al., indicated that using PMT as a motivational intervention significantly increased consumption of vegetables and fruits among United Kingdom undergraduates [20]. Despite significant changes on vitamins E and C consumption in both intervention groups, consuming vitamins remained higher in the face-to-face group than in the indirect group. One explanation for this result may relate to the utilised educational method. Face-to-face individual and group discussion sessions increased workers' perception of the threat of vitamin deficiency and seriousness of the threat condition, while exchanging experimental experiences and knowledge. As previous studies supported, more effective results are produced from face-to-face training on the proper behavioural changes rather than indirect [21,22].

Despite the significant increase in the amount of vitamins E and C, values remained far from the minimum recommendations to consume vitamins E (15 mg/day) and C (90 mg/day) [23]. Therefore, investigation into what other factors might influence vitamins E and C consumption is warranted. Socioeconomic characteristics and cultural norms beliefs may affect food habits. Especially in a sample of workers belonging to deprived areas, which have a lack of availability to information resources, making research very difficult. Moreover, there was no sufficient support from factory officials to educate workers and check for vitamin deficiency probability in them. Most workers did not know the values of their body vitamin levels so did not feel that they might have vitamin deficiency.

This study showed the intervention groups had higher response efficacy and self-efficacy (coping appraisals) at post intervention and follow up. PMT research indicates that increases in copping appraisal facilitated and increased performance of recommended behaviours [10]. Sainsbury K et al., demonstrated that short-term intervention, using PMT to improve gluten-free, increased coping appraisal among adults with celiac disease [24]. As coping appraisal had a higher impact on recommended behaviours than other PMT constructs, as reported in previous studies [25,26], these interventions could be emphasised.

Given the low scores of perceived severity and vulnerability (threat appraisals) at baseline, most of the workers did not consider themselves susceptible to developing metal exposure threats, and implied they did not believe that threats would significantly affect their lives. Results showed workers from both interventions, particularly the face-to-face group, had higher threat appraisal after interventions and follow-up. The findings of Naghashpour M et al., showed the effectiveness of nutrition education in improving the threat appraisals to calcium intake among adolescent students after three months of follow-up [27]. Other reviews of PMT-related research, found that increases in threat appraisals lead to higher protection behaviours performance [10].

Findings showed that workers from the intervention groups had higher knowledge at post and follow up assessments. Findings indicated that knowledge remained higher in the face-to-face group than in the indirect group at follow-up. Perhaps the higher effectiveness of face-to-face intervention and more emphasis on vitamin consumption in group discussions and question and answer sessions, resulted in higher maintenance of knowledge. Previous evidence suggested that nutrition knowledge is important for health and diet decisions [28]. Therefore, it is important to conduct further interventions to see how changes in knowledge levels can influence the PMT constructs and related behaviours. Although vitamin deficiency had been reported in previous studies among diverse populations [13,29], attention to research among workers who were exposed to toxic metals without sufficient knowledge of the role of antioxidants has been less investigated and needs more attention.

The present study findings revealed a significant increase in intention scores in the intervention groups following the education program and at follow-up. Particularly, intention remained higher in the face-to-face group over the indirect group. According to previous PMT research, intention had a significant role and strong predictor on behavioural changes [15,30]. Therefore, specific attention should be paid to it when designing intervention plans.

LIMITATION

This study relied on self-reported PMT and FFQ questionnaire, which introduces the biased outcome possibility. Furthermore, we did not have access to blood samples to increase the accuracy of assessment for dietary vitamins. Therefore, conducting concurrent evaluation was not possible to measure the amount of vitamins consumed according to FFQ and workers' blood samples.

Despite these limitations, there are some novel points that should be noted. This is the first nutrition–intervention study to examine vitamins E and C consumption behaviour using PMT among cement factory workers at the six-month follow up. There were few or no earlier studies to refer to or rely upon to predict an outcome. The workers examined in this study did not have sufficient access to health occupational services or sources of information relating to antioxidant vitamins benefits and vitamins E and C measurement facilities. Therefore, investigating among a high risk populations in deprived area is important. Furthermore, the vitamins consumption behaviour was measured by objective tool. Also, using two methods of face-to-face and indirect interventions, provided comparisons for the efficacy of the education in two groups, a modeless used in previous research.

CONCLUSION

This study adds to existing research that a nutrition education program, based on the PMT, is practical for workers with high risk to promote antioxidant vitamin consumption. Results showed significant changes on PMT constructs, knowledge and vitamins E and C consumption in both face-to-face and indirect groups at post intervention and six month follow-up. Higher maintenance of vitamins E and C consumption, knowledge and intention was also observed in the face-to-face group over the indirect group, which indicates that face-to-face training is more effective for making behavioural changes. Face-to-face educational programs in deprived area can be difficult or impossible thus, the indirect method can be performed as a useful, cost beneficial and simple way to reduce barriers.

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ANNEXURE

Protection Motivation Theory Questionnaire

Knowledge

1- Dusts of the cement industries include high levels of toxic metals and some toxic compounds.

1-True ○ 2-don't know ○ 3-Untrue ○

2- Some of the metals emitted by cement industries are harmful to human health, even at low concentrations.

1-True ○ 2-don't know ○ 3-Untrue ○

3- Toxic metals exposure may cause dysfunction in the blood and cardiovascular system.

1-True ○ 2-don't know ○ 3-Untrue ○

4- Toxic metals exposure can induce problems for the eliminative pathways (colon, liver, kidneys, and skin).

1-True ○ 2-don't know ○ 3-Untrue ○

5- Toxic metals exposure may cause dysfunction in a respiratory and pulmonary system.

1-True ○ 2-don't know ○ 3-Untrue ○

6- Continuous toxic metals exposure can induce problems for the nervous and immune system.

1-True ○ 2-don't know ○ 3-Untrue ○

7- Toxic metals can increase the risk of different cancers.

1-True ○ 2-don't know ○ 3-Untrue ○

8- Vitamin E and C can provide a convenient method of reducing metals poisoning.

1-True ○ 2-don't know ○ 3-Untrue ○

9- Vitamins E and C protect the cells from the effects of toxic metals damages.

1-True ○ 2-don't know ○ 3-Untrue ○

10- Vitamins E and C can prevent the majority of different disease or delay the development of the previous diseases.

1-True ○ 2-don't know ○ 3-Untrue ○

11- Vitamins E and C can decrease the risk of cancers.

1-True ○ 2-don't know ○ 3-Untrue ○

12- People who took regular vitamins E and C in dietary seemed to have a lesser incidence of diseases and cancers.

1-True ○ 2-don't know ○ 3-Untrue ○

13- Many foods are the source of vitamins E and C especially vegetables, oils, nuts, and fruits

1-True ○ 2-don't know ○ 3-Untrue ○

Response efficacy

1- I can reduce the risk of cancer, by eating vitamins E and C-rich foods.

1-strongly disagree ○ 2-disagree ○ 3-don't know ○ 4-agree ○ 5-strongly agree ○

2- I can reduce the risk of blood and cardiovascular diseases, by eating vitamins E and C-rich foods.

1-strongly disagree ○ 2-disagree ○ 3-don't know ○ 4-agree ○ 5-strongly agree ○

3- I can reduce the risk of respiratory and pulmonary disease, by eating vitamins E and C-rich foods.

1-strongly disagree ○ 2-disagree ○ 3-don't know ○ 4-agree ○ 5-strongly agree ○

4- I can reduce the risk of nervous and immune disease, by eating vitamins E and C-rich foods.

1-strongly disagree ○ 2-disagree ○ 3-don't know ○ 4-agree ○ 5-strongly agree ○

5- I can reduce the risk of eliminative pathways disease (colon, liver, kidneys, and skin), by eating vitamins E and C-rich foods.

1-strongly disagree ○ 2-disagree ○ 3-don't know ○ 4-agree ○ 5-strongly agree ○

6- Vitamins E and C-rich foods consumption protect my body from the effects of toxic metals damages.

1-strongly disagree ○ 2-disagree ○ 3-don't know ○ 4-agree ○ 5-strongly agree ○

7- I can reduce the negative effects of metals poisoning, by eating vitamins E and C-rich foods.

1-strongly disagree ○ 2-disagree ○ 3-don't know ○ 4-agree ○ 5-strongly agree ○

8- Vitamins E and C-rich foods consumption have a positive effect on my health.

1-strongly disagree ○ 2-disagree ○ 3-don't know ○ 4-agree ○ 5-strongly agree ○

Perceived vulnerability

1- I think toxic metals exposure may increase the risk of my kidney and liver disease.

1-strongly disagree ○ 2-disagree ○ 3-don't know ○ 4-agree ○ 5-strongly agree ○

2- Because I do not consume vitamins E and C-rich foods regularly, my cardiovascular system has already begun deteriorating.

1-strongly disagree ○ 2-disagree ○ 3-don't know ○ 4-agree ○ 5-strongly agree ○

3- I think toxic metals exposure may increase the risk of my pathways disease (colon, liver, kidneys, and skin).

1-strongly disagree ○ 2-disagree ○ 3-don't know ○ 4-agree ○ 5-strongly agree ○

4- I think toxic metals exposure may increase the risk of my respiratory and pulmonary disease.

1-strongly disagree ○2-disagree ○ 3-don't know ○ 4-agree ○ 5-strongly agree ○

5- If I do not consume vitamins E and C-rich foods regularly, the risk of cancers from toxic metals exposure increase in me.

1-strongly disagree ○ 2-disagree ○ 3-don't know ○ 4-agree ○ 5-strongly agree ○

6- Thinking about cancer is terrifying me.

1-strongly disagree ○ 2-disagree ○ 3-don't know ○ 4-agree ○ 5-strongly agree ○

7- Because in our family there is no history of cancer, I do not think I'll get cancer in the future.

1-strongly disagree ○ 2-disagree ○ 3-don't know ○ 4-agree ○ 5-strongly agree ○

Perceived severity

1- Heavy costs of the treatment of probable cancer made me and my family feel anxious.

1-strongly disagree ○ 2-disagree ○ 3-don't know ○ 4-agree ○ 5-strongly agree ○

2- If I suffer from cancer, I will be in trouble for a long time.

1-strongly disagree ○ 2-disagree ○ 3-don't know ○ 4-agree ○ 5-strongly agree ○

3- Over the years, cancer will lead to death.

1-strongly disagree ○ 2-disagree ○ 3-don't know ○ 4-agree ○ 5-strongly agree ○

4- Heavy costs of the treatment of the probable kidney and liver diseases made me and my family feel anxious.

1-strongly disagree ○ 2-disagree ○ 3-don't know ○ 4-agree ○ 5-strongly agree ○

5- If I suffer from kidney and liver diseases, I will be in trouble for a long time.

1-strongly disagree ○ 2-disagree ○ 3-don't know ○ 4-agree ○ 5-strongly agree ○

6- Over the years, kidney and liver disease will lead to death.

1-strongly disagree ○ 2-disagree ○ 3-don't know ○ 4-agree ○ 5-strongly agree ○

7- Heavy costs of the treatment of the probable cardiovascular disease made me and my family feel anxious.

1-strongly disagree ○ 2-disagree ○ 3-don't know ○ 4-agree ○ 5-strongly agree ○

8- If I suffer from cardiovascular disease, I will be in trouble for a long time.

1-strongly disagree ○ 2-disagree ○ 3-don't know ○ 4-agree ○ 5-strongly agree ○

9- Over the years, cardiovascular disease will lead to death.

1-strongly disagree ○ 2-disagree ○ 3-don't know ○ 4-agree ○ 5-strongly agree ○

10- Heavy costs of the treatment of the probable respiratory and pulmonary disease made me and my family feels anxious.

1-strongly disagree ○ 2-disagree ○ 3-don't know ○ 4-agree ○ 5-strongly agree ○

11- If I suffer from a respiratory and pulmonary disease, I will be in trouble for a long time.

1-strongly disagree ○ 2-disagree ○ 3-don't know ○ 4-agree ○ 5-strongly agree ○

12- Over the years, a respiratory and pulmonary disease will lead to death.

1-strongly disagree ○ 2-disagree ○ 3-don't know ○ 4-agree ○ 5-strongly agree ○

Self-efficacy

1- I believe that I have the ability to successfully provide and use vitamins E and C-rich foods.

1-strongly disagree ○ 2-disagree ○ 3-don't know ○ 4-agree ○ 5-strongly agree ○

2- I believe that by consuming vitamins E and C-rich foods I can prevent cancer, successfully.

1-strongly disagree ○ 2-disagree ○ 3-don't know ○ 4-agree ○ 5-strongly agree ○

3- I believe that by consuming vitamins E and C-rich foods I can prevent the disease from toxic metals, successfully.

1-strongly disagree ○ 2-disagree ○ 3-don't know ○ 4-agree ○ 5-strongly agree ○

4- Because of the unpleasant taste of some vitamins E and C-rich foods, I cannot eat them.

1-strongly disagree ○ 2-disagree ○ 3-don't know ○ 4-agree ○ 5-strongly agree ○

5- Purchasing vitamins E and C-rich foods is difficult for me.

1-strongly disagree ○ 2-disagree ○ 3-don't know ○ 4-agree ○ 5-strongly agree ○

6- Even if I have a lot of work, I will have enough time to buy vitamins E and C-rich foods.

1-strongly disagree ○ 2-disagree ○ 3-don't know ○ 4-agree ○ 5-strongly agree ○

7- If I do not have a lot of money, I'll spend some money on my purchase of vitamins E and C-rich foods.

1-strongly disagree ○ 2-disagree ○ 3-don't know ○ 4-agree ○ 5-strongly agree ○

8- As a family member, I care more about my own health and my family than anything else.

1-strongly disagree ○ 2-disagree ○ 3-don't know ○ 4-agree ○ 5-strongly agree ○

Intention

1- I'm going to consume vitamins E and C-rich foods regularly in my diet plan.

1-strongly disagree ○ 2-disagree ○ 3-don't know ○ 4-agree ○ 5-strongly agree ○