The Effective Factors for Fruit and Vegetable Consumption among Adults: *A Need Assessment Study Based on Trans-Theoretical Model*

Seyed Mohammad Mahdi Hazavehei[1], Sara Shahabadi[1,2], Manoochehr Karami[3], Mohammad Reza Saidi[4], Saeed Bashiriyan[1], Masoumeh Mahdi-Akhgar[5] & Seyedeh Zeinab Hashemi[1]

[1] School of Public Health and Research Center for Health Sciences, Hamadan University of Medical Sciences, Hamadan, Iran

[2] School of Public Health, Kermanshah University of Medical Sciences, Kermanshah, Iran

[3] School of Public Health and Social determinants of Health Research Center (SDHRC) Hamadan University of Medical Sciences, Hamadan, Iran

[4] School of Medicine and Cardiovascular Research Center, Kermanshah University of Medical Sciences, Kermanshah, Iran

[5] Social Determinants of Health Research Center, Urmia University of Medical Sciences, Urmia, Iran

Correspondence: Sara Shahabadi, School of Public health and Research Center for Health Sciences, Hamadan University of Medical Sciences, in front of Mardom park, Shahid Fahmideh ST, 4171-65155, Hamadan, Iran. Tel: 98-081-3838-0574. E-mail1: S_Shahabadi15@yahoo.com; S.Shahabadi@umsha.ac.ir

Abstract

Introduction: The World Health Organization recommended consuming at least 5 servings of fruits and vegetables (FV) per day in order to reduce the risk of non-communicable diseases (NCDs). The purpose of this study is to determine the influential factors related to intake of FV among adults in Kermanshah city based on Transtheoritical Model.

Material and Methods: This is a cross-sectional study which is conducted in Kermanshah city. Participants (n=1230) are selected by multi stage sampling; 30-50 year olds people covered by health centers. In order to collect data, we used a TTM-based questionnaire. The results are analyzed using SPSS-16 and Lisrel 8, with P< 0.05 as statistically significant level.

Results: The mean age of the participants is 37.75 and 65% of them are women .The mean score of knowledge is 2.4; that is, 80% of men and 78% of women in this study are in poor knowledge about FV consumption. In case of fruit and vegetable consumption behavior, 50% and 61% of participants are in pre-contemplation/contemplation stage, respectively. The average number of fruit servings is 1.42 and the average number of vegetable servings is 0.99 per day. Also, ANOVA test results showed a significant correlation between constructs of TTM and stages of change so that individuals' progress through stages of change from pre-contemplation to maintenance added on the scores of self-efficiency, processes of change, and decisional balance.

Conclusion: This study indicated that, TTM constructs such as self-efficacy, processes of change, and decisional balance are good predictors for FV consumption.

Keywords: adult, fruit, Kermanshah, required assessment, study, TTM, vegetable

1. Introduction

Previous studies indicated that consumption of Fruit and Vegetable (FV) was effective in reducing non-communicable diseases, such as cardiovascular diseases, diabetes, hypertension and cancer (Bazzano, 2006; Boeing et al., 2012; Dauchet & Dallongeville, 2008; DiBello et al., 2008; Dosil-Díaz, Ruano-Ravina, Gestal-Otero, & Barros-Dios, 2008; Moore et al., 2005). Also, it can prevent adult obesity (Alinia, Hels, & Tetens, 2009; Ledoux, Hingle, & Baranowski, 2011).The World Health Organization (WHO) recommended eating at least 400 grams or 5 servings of FV (2 servings of fruits and 3 servings of vegetables) per day to reduce the risk of non-communicable diseases (NCDs) (Who & Consultation, 2003). However, according to existing

literature, Iranian each fruits and vegetables level much less than this (Esteghamati et al., 2009). An effective strategy to increase FV consumption level is educational intervention based on appropriate theories of behavior change since these theories provide useful information about the variables that affect the behavior(Contento, 2008; Goodson, 2010; Schuster, 2011). These theories are good guides for changing behavior by proposing constructs that can predict behavior and methods to change the behavior such as FV consumption (Baranowski, 2011; Hussein, 2011). One of the most common model of behavior change is the Trans-Theoretical Model (TTM) developed by Prochaska and Diclemente in 1980's (Prochaska & DiClemente, 1986). TTM has four main constructs including: *stages of change*, *processes of change*, *decisional balance*, and *self-efficacy*. **Stages of change** is the main construct which include: (1) *pre contemplation*; when an individual does not feel the need for change (2) *contemplation;* when an individual is thinking about behavior change (3) *preparation*; when an individual decides to change or not (4) *action*; when an individual takes the steps to change (5) *maintenance*; when an individual tries to keep on behavior change, and (6) *relapse*; when an individual returns to the previous model of behavior. The TTM **processes of change** are divided to 2 categories: *cognitive process* and *behavioral process* that describe the activities used to continue through the stages of change (Glanz, Rimer, & Viswanath, 2008). Other constructs of TTM are **decisional balance**, and **self-efficacy.** Decisional balance refers to an individual's relative weighing of pros and cons (Prochaska, 1994) while self-efficacy is a indicates individuals' belief in their ability to do certain things and take control over challenging demands (Bandura, 2006). Previous studies proved that interventions based on TTM are effective in increasing FV consumption (Alexander et al., 2010; Di Noia & Prochaska, 2010; Diep, Chen, Davies, Baranowski, & Baranowski, 2014; Horwath, Nigg, Motl, Wong, & Dishman, 2010; Salehi, Mohammad, & Montazeri, 2011). The purpose of this study is to determine the influential factors related to FV intake among adults in Kermanshah (a province in Iran) based on TTM. The current research is based on the results of another study carried out in Kermanshah to examine the average FV consumption level for cardiovascular patients per day which proved to be very low among this age group (fruits=0.28 unit per day and vegetables=0.12 unit per day).

2. Materials and Methods

This is a cross-sectional study that is conducted in Kermanshah. Participants (n=1230) are selected by multi stage sampling between January and May 2015. The inclusion criteria are 30-50 year olds people covered by health centers in Kermanshah and with no type of non-communicable diseases. Exclusion criteria are pregnant women and those who were unwilling to participate in this research. This study is approved by the Human Subject Review Board of Hamadan and Kermanshah Universities of Medical Sciences. After explaining the purpose of study, verbal consent was taken from participants. In order to collect data, we used a TTM-based questionnaire. To examine validity and reliability of the questionnaire, a panel of experts (Health education and promotion specialists, nutritionist and cardiologist), alpha Cronbach, and Structural Equation Modeling (SEM) methods are employed. It was found that the questionnaire has good reliability and validity. It consists of 4 parts: 7 questions to measure demographic charachtristics and 4 questions to measure FV consumption. Participants were supposed to answer some question asked about the average number of days per week that they consume fruits and vegetables and the amount of fruits and vegetables that they consume in each day. The behavior scores are calculated by multiplying the numbers of above questions and divided by the minimum desired amount of fruits (2 servings) and vegetables (3 servings) per day. The obtained number indicates average intake of fruits and vegetables per day, for each person. Ten questions are devised to measure participants' knowledge. Minimum and maximum scores of the participants' knowledge were 0 and 10, respectively. The internal consistency assessed in a pilot test was $\alpha=0.83$. In order to assess processes of change, participant were asked to respond to 38 phrases based on a 5-point Likert scale, from 0 (never) to 4 (always), and $\alpha=0.95$. Decisional balance assessed pros and cons of FV consumption by 8 questions and using a 5 point Likert scale, from 0 (totally disagree) to 4 (totally agree), and $\alpha=0.78$. Self-efficacy is assessed by 6 items based on a 5 point Likert scale, from 0 (I'm quite disappointed) to 4 (I'm pretty sure), and $\alpha=0.92$. Also, participant's anthropometric indicators such as Body Mass Index (BMI) and Waist circumference to Hip Ratio (WHR) are measured. Considering BMI$\geq$25 for all participants, those women and men with WHR>0.8 and WHR>0.9, respectively, were regarded as participants with inappropriate or risky index (Hadaegh et al., 2009). Descriptive statistics, including mean and standard deviation and frequencies, were presented in tables. In order to analyze other variables, t-test, ANOVA, chi square (Exact Fisher), Pearson and spearman coefficient test are employed. The results are analyzed using SPSS 16, Lisrel 8(for assessing reliability), considering P<0.05 as statistically significant level.

3. Results

The mean age (SD) of the participants is 37.75(6) and 65% of them are women (n=803). With regard to gender, there is statistically significant difference between men and women in all of demographic characteristics, except age. The characteristics of participants are shown in Table 1. The mean score (SD) of knowledge of participants was 2.4 (2.39); that is, 80% of men (344subjects) and 78% of women (627 subjects) had poor knowledge about FV consumption. There were no significant difference between men and women in terms of knowledge score. Considering anthropometric indices, 61.2% of participants had BMI≥25and 52% had inappropriate WHR. Inappropriate WHR of women was higher than men and thus there was a significant difference between the two groups.

Table 2 indicates gender based information about stages of change and the habit of separating fruits and vegetables. In case of fruit consumption, majority of participants are in contemplation stage (40%), followed by maintenance (30%) and preparation (15%). Among women, 41% are in the contemplation stage, 32% are in the maintenance stage, and 12.5% are in preparation stage. Of all male participants, 38% are in the contemplation stage, 28% are in the maintenance stage, and 19% are in preparation stage indicating statistically significant difference between men and women in distribution of these stage (χ^2=0.023, P>0.05). With regard to vegetable consumption, the majority of participants are in the contemplation stage (50%), followed by preparation (21%) and maintenance (15%). Of all women, 51% are in the contemplation stage, 19% are in the preparation stage and 16% are in maintenance stage. Among male participants, 48.5% are in the contemplation stage, 25% are in preparation stage, and 12.5% are in maintenance stage, and there is no significant difference between men and women in distribution of stages of change (χ^2=0.061, P>0.05). Based on WHO recommendations, in order to prevent non-communicable diseases, everyone should consume at least 2 servings of fruits and 3 servings of vegetables each day. Table 3 shows the average servings of FV consumption of adults per day divided by the stages of change and gender. The lowest and highest rate of FV consumption seems to be in pre-contemplation stage and maintenance stage, respectively. Based on χ^2 test, there is no statistically significant difference between men and women; however, based on ANOVA test results, there is significant difference between the stages of change of men and women. According to Table 4, research findings indicate significant difference between men and women in some constructs of process of changes, such as dramatic relief, environment re-evaluation, helping relationship, and self-liberation. The scores of TTM variables for all stages of change are shown in Table 5. Based on ANOVA test, there is a significant difference between the stages of change of men and women with respect to all variables.

Table 6 indicates correlation between FV consumption, BMI, and WHR. The results suggest that, there is an inverse relationship between FV consumption and body mass index. There is also a direct correlation between FV consumption and WHR.

Table 1. Demographic characteristics, level of knowledge about FV consumption and anthropometric indices of participants

Variable	Overall(n=1230)	Male(n=427)	Female(n=803)	P value
Age(Mean ±SD)	37.75($\pm$ 6)	37.9($\pm$ 6.2)	37.6($\pm$ 5.8)	0.508[a]
Educational Status	N (%)	N (%)	N (%)	<0.001[b]
Graduate	76(6)	40(9)	36(4)	
Bachelor	349(29)	134(31)	215(27)	
Middle	335(27)	141(33)	194(24)	
Illiterate and Elementary	470(38)	112(27)	358(45)	
Occupational Status				<0.001[b]
Employed	623(50)	416(97)	207(26)	
Unemployed and Retired	12(1)	11(3)	0(0)	
Housewife	595(49)	0(0)	596(74)	
Annual household incomes				0.047[b]
Under 170$	209(17)	54(13)	155(19)	
170-330$	860(70)	315(74)	545(68)	
330-660$	140(11)	52(12)	88(11)	
Up660$	21(8)	6(1)	15(2)	
Marital Status				<0.001[b]

Married	1089(88.5)	371(87)	718(90)	
Single	141(11.5)	56(13)	85(10)	
Number of children				<0.001[b]
0	184(15)	94(22)	90(11)	
1	355(29)	139(32.5)	216(27)	
2	411(33)	129(30.5)	282(35)	
Above 3	280(23)	65(15)	215(27)	
Knowledge status				0.453[a]
Poor	971(79)	344(80)	627(78)	
Relatively favorable	179(14.5)	51(12)	128(16)	
Good	80(6.5)	32(8)	48(6)	
BMI>=25	758(61.6)	266(62.2)	492(61.2)	0.594[a]
Inappropriate WHR	642(52)	162(38)	480(60)	<0.001[a]

a: P value is obtained using independent samples T-Test

b: P values are obtained using Chi-Square test

Table 2. Comparison of the stages of change in Fruit and Vegetable consumption behavior based on sex

Stages of change		Men (n=427)	Women (n=803)	Total (n=1230)
		N (%)	N (%)	N (%)
Pre contemplation	Fruit	40(9)	83(10)	123(10)
	vegetable	48(11)	89(11)	137(11)
Contemplation	Fruit	162(38)	326(41)	488(40)
	vegetables	207(48.5)	407(51)	614(50)
Preparation	Fruit	80(19)	100(12.5)	180(15)
	vegetables	107(25)	149(19)	256(21)
Action	Fruit	26(6)	36(4.5)	62(5)
	vegetables	12(3)	28(3)	40(3)
Maintenance	Fruit	119(28)	258(32)	377(30)
	vegetables	53(12.5)	130(16)	183(15)
Chi-square(Fruit)	0.023			
Chi-square (Vegetable)	0.061			

Table 3. The average servings of fruit and vegetable consumption per day in adults based on the stages of change and sex

Stages of change		Men (n=427)	Women (n=803)	Total (n=1230)	P value
		Mean($\pm$ SD)	Mean($\pm$ SD)	Mean($\pm$ SD)	
Pre contemplation	Fruit	0.78($\pm$ 0.63)	0.59($\pm$ 0.56)	0.65($\pm$ 0.59)	0.619
	Vegetable	0.35($\pm$ 0.45)	0.51($\pm$ 0.45)	0.45($\pm$ 0.45)	0.296
Contemplation	Fruit	1.03($\pm$ 0.63)	0.83($\pm$ 0.58)	0.9($\pm$ 0.6)	0.035
	Vegetable	0.62($\pm$ 0.48)	0.64($\pm$ 0.57)	0.63($\pm$ 0.54)	0.153
Preparation	Fruit	1.03($\pm$ 0.65)	1.4($\pm$ 0.73)	1.03($\pm$ 0.63)	0.919
	Vegetable	0.62($\pm$ 0.45)	0.74($\pm$ 0.47)	0.69($\pm$ 0.46)	0.193
Action	Fruit	2.2($\pm$ 0.86)	2.07($\pm$ 0.64)	2.12($\pm$ 0.74)	0.203
	Vegetable	1.80($\pm$ 1.21)	2.37($\pm$ 1.17)	2.2($\pm$ 1.19)	0.333
Maintenance	Fruit	2.3($\pm$ 0.76)	2.4($\pm$ 0.78)	2.41($\pm$ 0.78)	0.241
	Vegetable	2.56($\pm$ 0.96)	2.45($\pm$ 1.04)	2.48($\pm$ 1.02)	0.884
Total	Fruit	1.45($\pm$ 0.93)	1.4($\pm$ 1.01)	1.42($\pm$ 0.99)	0.386
	Vegetable	0.86($\pm$ 0.89)	1($\pm$ 0.98)	0.99($\pm$ 0.95)	0.022
ANOVA Analysis(Fruit)		<0.001	<0.001	<0.001	
ANOVA Analysis(Vegetable)		<0.001	<0.001	<0.001	

P value is obtained using independent samples T-Test.

Table 4. Comparison of the processes of change in fruit and vegetable consumption behavior based on sex

processes of change			men (n=427) Mean($\pm$ SD)	women (n=803) Mean($\pm$ SD)	Total (n=1230) Mean($\pm$ SD)	P value
Cognitive process	raising consciousness	Fruit	1.83($\pm$ 1.23)	1.87($\pm$ 1.28)	1.86($\pm$ 1.27)	0.344
		vegetable	1.82($\pm$ 1.22)	1.91($\pm$ 1.29)	1.88($\pm$ 1.27)	0.159
	dramatic relief	Fruit	2.18($\pm$ 1.16)	2.48($\pm$ 1.31)	2.37($\pm$ 1.26)	0.004[*]
		vegetable	2.23($\pm$ 1.13)	2.48($\pm$ 1.16)	2.40($\pm$ 1.16)	0.003[*]
	Environment re-evaluation	Fruit	2.35($\pm$ 1.06)	2.49($\pm$ 1.14)	2.44($\pm$ 1.12)	0.007[*]
		vegetable	2.38($\pm$ 1.04)	2.52($\pm$ 1.12)	2.47($\pm$ 1.1)	0.025[*]
	self-evaluation	Fruit	2.85 ($\pm$ 1.07)	2.58($\pm$ 1.12)	2.92($\pm$ 1.08)	0.091
		vegetable	2.82 ($\pm$ 1.06)	2.36($\pm$ 1.18)	2.9($\pm$ 1.08)	0.101
Behavioral process	social liberation	Fruit	1.99 ($\pm$ 1.2)	2.01($\pm$ 1.26)	2 ($\pm$ 1.24)	0.276
		vegetable	2.01($\pm$ 1.18)	2.02($\pm$ 1.25)	2 ($\pm$ 1.22)	0.066
	reinforcement management	Fruit	2.56($\pm$ 1.03)	2.65($\pm$ 1.02)	2.62($\pm$ 1.02)	0.839
		vegetable	2.51($\pm$ 0.99)	2.64($\pm$ 1.01)	2.59($\pm$ 1.01)	0.112
	helping relationships	Fruit	1.73($\pm$ 1)	1.86($\pm$ 1.11)	1.81($\pm$ 1.07)	0.082
		vegetable	1.75($\pm$ 0.98)	1.87($\pm$ 1.11)	1.83($\pm$ 1.07)	0.028[*]
	self-liberation	Fruit	2.50($\pm$ 1.20)	2.96($\pm$ 1.09)	2.55($\pm$ 1.23)	0.001[*]
		vegetable	2.25($\pm$ 1.08)	2.94($\pm$ 1.08)	2.32($\pm$ 1.15)	0.015
	stimulus control	Fruit	1.98($\pm$ 1.33)	2.14($\pm$ 1.23)	2.08($\pm$ 1.27)	0.010
		vegetable	1.99($\pm$ 1.19)	2.20($\pm$ 1.19)	2.13($\pm$ 1.19)	0.007[*]
	counter conditioning	Fruit	1.94($\pm$ 1.21)	1.98($\pm$ 1.17)	1.96($\pm$ 1.18)	0.378
		vegetable	1.72($\pm$ 1.21)	1.91($\pm$ 1.18)	1.84($\pm$ 1.19)	0.012

P value was obtained using independent samples T-Test.

Table 5. Comparison of the constructs of TTM in Fruit and vegetable consumption based on stages of change

TTM Constructs		Cognitive[*] processes Mean($\pm$ SD)	Behavioral[*] processes Mean($\pm$ SD)	Decisional[*] balance scale(Pros) Mean($\pm$ SD)	Decisional balance[*] scale(Cons) Mean($\pm$ SD)	Self-efficacy scale[*] Mean($\pm$ SD)
stages of change						
Pre contemplation	Fruit	8.56($\pm$ 4.01)	7.54($\pm$ 3.79)	10.07($\pm$ 2.43)	7.19($\pm$ 3.71)	7.19($\pm$ 2.96)
	vegetable	8.98($\pm$ 3.87)	7.70($\pm$ 3.60)	10.20($\pm$ 2.58)	7.31($\pm$ 3.84)	7.11($\pm$ 3.06)
Contemplation	Fruit	11.16($\pm$ 3.63)	10.2($\pm$ 3.80)	10.75($\pm$ 1.86)	7.80($\pm$ 3.80)	8.33($\pm$ 3)
	vegetable	11.51($\pm$ 3.66)	10.33($\pm$ 3.84)	10.67($\pm$ 1.98)	7.96($\pm$ 3.83)	8.46($\pm$ 2.74)
Preparation	Fruit	12.32($\pm$ 3.32)	11.08($\pm$ 3.54)	10.73($\pm$ 2.12)	7.83($\pm$ 3.78)	8.81($\pm$ 2.72)
	vegetable	12.25($\pm$ 3.57)	11.28($\pm$ 3.74)	10.79($\pm$ 2.05)	7.82($\pm$ 3.89)	8.86($\pm$ 2.73)
Action	Fruit	11.36($\pm$ 3.980	11.56($\pm$ 3.81)	10.23($\pm$ 1.88)	7.74($\pm$ 4.01)	9.75($\pm$ 2.40)
	vegetable	12.02($\pm$ 3.71)	12.44($\pm$ 3.19)	11.10($\pm$ 1.82)	8.62($\pm$ 3.79)	10.57($\pm$ 1.78)
Maintenance	Fruit	12.9($\pm$ 3.60)	13.1($\pm$ 3.45)	11($\pm$ 2.09)	8.5($\pm$ 3.92)	10.48($\pm$ 2.03)
	vegetable	13.39($\pm$ 3.26)	13.12($\pm$ 3.43)	11.24($\pm$ 1.67)	8.75($\pm$ 3.82)	10.46($\pm$ 2.08)
ANOVA Analysis	Fruit	<0.001	<0.001	0.001	0.003	<0.001
	vegetable	<0.001	<0.001	<0.001	0.012	<0.001

*: The positive and significant correlation with stages of change by spearman's correlation. Correlation is significant at the 0.01 level.

Table 6. Correlation between the average fruit and vegetable consumption per and anthropometric indices

	BMI	WHR
The average fruit consumption per	–0.034[*]	0.004[*]
The average vegetable consumption per	–0.082[*]	0.035[*]

BMI: body mass index; WHR: waist circumference to hip ratio; *: Pearson's Correlation.

4. Discussion

The current study is carried out aimed at determining the influential factors related to FV intake among adults in Kermanshah. It is a case study examining designing educational interventions to increase FV intake level among adults living in Kermanshah, based on TTM. In fact, we are to find the factors influencing FV intake level in adults. Determining status of healthy diet of individuals can reflect their thinking trend and performance, pretty well. We use the information to design intervening programs to improve FV consumption in adults. TTM-based educational intervening programs can effectively increase FV intake level (Greene et al., 2008). According to existing literature, interventions that are based on stages of change can encourage individuals in pre-contemplation, contemplation, and preparation to action/maintenance stages (Johnson et al., 2008). In this study, we assessed knowledge, attitude (based on TTM constructs), and behavior of participants, about fruits and vegetables, separately. Only 6% of participants had good knowledge about FV consumption and the majority of them had no enough information about benefits of FV consumption, how to use FV, and how much FV has to be used per day. Accordingly, the first step in designing an intervening program is providing basic information in order to increase awareness about the consumption of fruit and vegetable. In case of fruits consumption, 50% of participants were in pre-contemplation/contemplation stages and, in case of vegetables consumption, 61% of participants were in pre-contemplation/contemplation stages. Then, the second step in designing an intervening program should be interventions to create and improve self-efficacy and to make them believe in the possibility of consumption of fruit and vegetable. Using self-evaluation process may help facilitating the entry of contemplation in preparation stage. Based on the obtained information, the average number of fruit servings was 1.42(±0.99) and the average number of vegetable servings was 0.99 ($\pm$ 0.95), per day, which is less than what WHO recommends. After going through the five stages of change, consumption level of FV increased significantly. Some studies support these findings (Mao et al., 2012; Rapley & Coulson, 2005). Thus, use of TTM stages can increase FV consumption. There are significant differences between men and women in some constructs of process of change (Table 4). These findings indicate that women are more concerned about healthy food and they tend to grow more favorable attitude toward increasing FV intake. Ta ML, VanEenwyk J study confirms these findings (Ta, VanEenwyk, & Bensley, 2012). According to Table 5, there is a significant correlation between stages and processes of change (cognitive and behavioral processes), decisional balance (pros and cons), and self-efficacy. These findings are in line with the study carried out by Chenjia Mao's (Mao et al., 2012). It shows that TTM is an appropriate model that predicts FV consumption influence which is consistent with the results of other similar studies (Shirazi et al., 2007). This study showed that, self-efficacy improves as the individual goes through the 5 stages of change, from pre-contemplation to maintenance. Self- efficacy was a strong predictor for nutrition-related behavior. Other similar studies confirm these findings (Dumith, Gigante, & Domingues, 2007; Hall, Chai, & Albrecht, 2016; Lee, 2004; Tung, Gillett, & Pattillo, 2005; Wakui, Shimomitsu, Odagiri, & Inoue, 2002). According to Table 6, there is a negative correlation between FV consumption and BMI. So, inadequate intake of fruit and vegetable can lead to weight gain and obesity, but there is no negative correlation between FV consumption and WHR. It shows that, other factors can also be effective in abdominal obesity. The results obtained in this study with regard to WHR index is in line with Lígia Cardoso dos Reis's study (Reis, Correia, & Mizutani, 2014) while this is contrary to reports of WHO (Who & Consultation, 2003).

This study showed that, according to the participant's situation, health education and promotion interventions are necessary to increase FV intake awareness and to prevent NCDs. Undoubtedly, raising conciseness can increase consumption of fruit and vegetables. Added to this, some measures have to be carried out with regard to the stages of change to overcome barriers and to move forward to later stages of change. An important point is that, strategies of behavior change are related to the amount of daily serving of FV (Zabinski et al., 2006). However, the interventions should target particular stages of change. For example, for individuals in the pre-contemplation stage, it is necessary to raise awareness about hazards of low FV intake and the important role of these two nutrients in reducing the risk of NCDs. Also, cognitive and behavioral processes of change, such as dramatic relief, raising conciseness, social liberation and etc, can facilitate individuals entry to the contemplation stage. Individuals in the contemplation stage should be encouraged to enter preparation stage; therefore, some

strategies should be applied, including: self-efficacy development and reinforcement, self-liberation, and self-reevaluation. Interventions for people in the preparation stage must focus on creating supportive environments, such as: counter conditioning, reinforcement management, stimulus control, and helping relations. Individuals in action stage have to keep on with behavior change. Recommendations regarding strengthening change, decreasing perceived barriers, increasing perceived benefits, and controlling stimulus can be effective for stabilization of behavior change. Finally, adults in the maintenance stage can encourage others through social networking to have adequate FV intake. Certainly, increased consumption of fruits and vegetables can reduce consumption of fatty foods and fast food and risk of cardiovascular diseases, in the future. Some studies in the literature confirm these findings (Goldstein, 2009; Morgenstern et al., 2009; Wang, Cubbin, Ahn, & Winkleby, 2008). The present study carried out to assess adult's need to improve FV consumption. In Kermanshah, FV consumption is much lower than other provinces of Iran (Esteghamati et al., 2009). Results obtained from this research show that TTM is an appropriate behavior change model for increasing FV consumption. What is more, the relation between processes of change (cognitive and behavioral processes), self-efficacy, decisional balance, and stages of change, can be a good guide for designing effective interventions to increase fruit and vegetable consumption. One of the limitations of this research is that the required data are collected based on self-report, thus it is possible that the participants underestimate or overestimate their FV consumption level. However, considering the sample size of this study, these errors can be minimized. Another limitation was large number of questions in questionnaire; to overcome this limitation, interviewers should complete the questionnaire in two sessions.

5. Conclusion

The results of this study showed that, participants had poor knowledge of FV consumption. The majority of participants were overweight or obese and most of them were found in contemplation stage. Their FV consumption level was lower than WHO's recommended level. Research findings indicated a correlation between self-efficacy, processes of change and decisional balance with stages of change. Also, there was a correlation between overweighting, obesity, and FV consumption leading to lower FV intake among obese and overweight participants. Two main factors that may affect FV consumption were found to be knowledge and self-efficacy.

This study indicated that, according to the participant's situation, health education and promoting interventions are necessary to increase awareness about FV intake and to prevent of NCDs. Undoubtedly,increase the knowledge of participants can increase consumption of fruit and vegetables. Along with it, activities should be carried out in line with the stages of change to overcome barriers and to move on from one stages of change to the other.

Acknowledgements

Conflict of Interest

The authors declare that there is no conflict of interests regarding the publication of this paper.

References

Alexander, G. L. et al. (2010). A randomized clinical trial evaluating online interventions to improve fruit and vegetableconsumption. *American Journal of Public Health, 100*(2), 319-326. http://dx.doi.org/10.2105/AJPH.2008.154468

Alinia, S., Hels, O., & Tetens, I. (2009). The potential association between fruit intake and body weight-a review. *Obesity Reviews, 10*(6), 639-647. http://dx.doi.org/10.1111/j.1467-789X.2009.00582.x

Bandura, A. (2006). Guide for constructing self-efficacy scales. *Self-efficacy beliefs of adolescents, 5*, 307-337.

Baranowski, T. (2011). Understanding the behavioral linkages needed for designing effective interventions to increase fruit and vegetable intake in diverse populations. *Journal of the American Dietetic Association, 111*(10), 1472-1475. http://dx.doi.org/10.1016/j.jada.2011.07.014

Bazzano, L. A. (2006). The high cost of not consuming fruits and vegetables. *Journal of the American Dietetic Association, 106*(9), 1364-1368. http://dx.doi.org/10.1016/j.jada.2006.06.021

Boeing et al. (2012). Critical review: Vegetables and fruit in the prevention of chronic diseases. *European Journal of Nutrition, 51*(6), 637-663. http://dx.doi.org/10.1007/s00394-012-0380-y

Contento, I. R. (2008). Nutrition education: Linking research, theory, and practice. *Asia Pacific Journal of Clinical Nutrition,* (17 Suppl 1), 176-179.

Dauchet, L., & Dallongeville, J. (2008). Fruit and vegetables and cardiovascular disease: Epidemiological evidence from the non-Western world. *British Journal of Nutrition, 99*(02), 219-220. http://dx.doi.org/10.1017/S0007114507815820

Di Noia, J., & Prochaska, J. O. (2010). Dietary stages of change and decisional balance: A meta-analytic review. *American Journal of Health Behavior, 34*(5), 618-632. http://dx.doi.org/10.5993/AJHB.34.5.11

DiBello, J. R. et al. (2008). Comparison of 3 methods for identifying dietary patterns associated with risk of disease. *American Journal of Epidemiology, 168*(12), 1433-1443. http://dx.doi.org/10.1093/aje/kwn274

Diep, C. S., Chen, T.-A., Davies, V. F., Baranowski, J. C., & Baranowski, T. (2014). Influence of behavioral theory on fruit and vegetable intervention effectiveness among children: A meta-analysis. *Journal of Nutrition Education and Behavior, 46*(6), 506-546. http://dx.doi.org/10.1016/j.jneb.2014.05.012

Dosil-Díaz, O., Ruano-Ravina, A., Gestal-Otero, J. J., & Barros-Dios, J. M. (2008). Consumption of fruit and vegetables and risk of lung cancer: A case-control study in Galicia, Spain. *Nutrition, 24*(5), 407-413. http://dx.doi.org/10.1016/j.nut.2008.01.005

Dumith, S. C., Gigante, D. P., & Domingues, M. R. (2007). Stages of change for physical activity in adults from Southern Brazil: A population-based survey. *International Journal of Behavioral Nutrition and Physical Activity, 4*(1), 25. http://dx.doi.org/10.1186/1479-5868-4-25

Esteghamati et al. (2009). Third national Surveillance of Risk Factors of Non-Communicable Diseases (SuRFNCD-2007) in Iran: Methods and results on prevalence of diabetes, hypertension, obesity, central obesity, and dyslipidemia. *BMC Public Health, 9*(1), 167. http://dx.doi.org/10.1186/1471-2458-9-167

Glanz, K., Rimer, B. K., & Viswanath, K. (2008). *Health behavior and health education: Theory, research, and practice* (4th ed.). John Wiley & Sons.

Goldstein, L. B. (2009). Eating you to a stroke? *Annals of Neurology, 66*(2), 129-131. http://dx.doi.org/10.1002/ana.21760

Goodson, P. (2010). *Theory in health promotion research and practice: Thinking outside the box* (1st ed.). Jones & Bartlett Publishers.

Greene, G. et al. (2008). Change in fruit and vegetable intake over 24 months in older adults: Results of the SENIOR project intervention. *The Gerontologist, 48*(3), 378-387. http://dx.doi.org/10.1093/geront/48.3.378

Hadaegh, F. et al. (2009). Appropriate cutoff values of anthropometric variables to predict cardiovascular outcomes: 7.6 years follow-up in an Iranian population. *International Journal of Obesity, 33*(12), 1437-1445. http://dx.doi.org/10.1038/ijo.2009.180

Hall, E., Chai, W., & Albrecht, J. A. (2016). Relationships between nutrition-related knowledge, self-efficacy, and behavior for fifth grade students attending Title I and non-Title I schools. *Appetite, 96*, 245-253. http://dx.doi.org/10.1016/j.appet.2015.09.033

Horwath, C. C., Nigg, C. R., Motl, R. W., Wong, K. T., & Dishman, R. K. (2010). Investigating fruit and vegetable consumption using the transtheoretical model. *American Journal of Health Promotion, 24*(5), 324-333. http://dx.doi.org/10.4278/ajhp.071218138

Hussein, R. A. E. H. (2011). Can knowledge alone predict vegetable and fruit consumption among adolescents? A transtheoretical model perspective. *The Journal of the Egyptian Public Health Association, 86*(5 and 6), 95-103. http://dx.doi.org/10.1097/01.EPX.0000407136.38812.55

Johnson, S. S. et al. (2008). Transtheoretical model-based multiple behavior intervention for weight management: effectiveness on a population basis. *Preventive Medicine, 46*(3), 238-246. http://dx.doi.org/10.1016/j.ypmed.2007.09.010

Ledoux, T., Hingle, M., & Baranowski, T. (2011). Relationship of fruit and vegetable intake with adiposity: A systematic review. *Obesity Reviews, 12*(5), e143-e150. http://dx.doi.org/10.1111/j.1467-789X.2010.00786.x

Lee, Y. M. (2004). Process of change, decisional balance and self efficacy corresponding to stages of change in exercise behaviors in middle aged women. *Taehan Kanho Hakhoe Chi, 34*(2), 362-371.

Mao, C. et al. (2012). Assessment of fruit and vegetable intake behavior among adolescents in Hangzhou, China. *The Indian Journal of Pediatrics, 79*(9), 1218-1223. http://dx.doi.org/10.1007/s12098-011-0538-2

Moore, L. L. et al. (2005). Intake of fruits, vegetables, and dairy products in early childhood and subsequent blood pressure change. *Epidemiology, 16*(1), 4-11. http://dx.doi.org/10.1097/01.ede.0000147106.32027.3e

Morgenstern, L. B. et al. (2009). Fast food and neighborhood stroke risk. *Annals of Neurology, 66*(2), 165-170. http://dx.doi.org/10.1002/ana.21726

Prochaska, J. O. (1994). Strong and weak principles for progressing from precontemplation to action on the basis of twelve problem behaviors. *Health Psychology, 13*(1), 47. http://dx.doi.org/10.1037/0278-6133.13.1.47

Prochaska, J. O., & DiClemente, C. C. (1986). *Toward a comprehensive model of change* (1st ed.). Springer. http://dx.doi.org/10.1007/978-1-4613-2191-0_1

Rapley, J., & Coulson, N. S. (2005). Stages of change and consumption of fruit and vegetables among adolescent females: Associations with decisional balance and self-efficacy. *British Food Journal, 107*(9), 663-669. http://dx.doi.org/10.1108/00070700510615044

Reis, L. C. D., Correia, I. C., & Mizutani, E. S. (2014). Stages of changes for fruit and vegetable intake and their relation to the nutritional status of undergraduate students. *Einstein (São Paulo), 1*(2), 48-54. http://dx.doi.org/10.1590/S1679-45082014AO2926

Salehi, L., Mohammad, K., & Montazeri, A. (2011). Fruit and vegetables intake among elderly Iranians: A theory-based interventional study using the five-a-day program. *Nutr J, 10*, 123. http://dx.doi.org/10.1186/1475-2891-10-123

Schuster, E. (2011). Nutrition Education: Linking Research, Theory, and Practice. *Journal of Nutrition Education and Behavior, 43*(4), e306-e307. http://dx.doi.org/10.1016/j.jneb.2011.04.007

Shirazi, K. K. et al. (2007). A home-based, transtheoretical change model designed strength training intervention to increase exercise to prevent osteoporosis in Iranian women aged 40-65 years: A randomized controlled trial. *Health Education Research, 22*(3), 305-317. http://dx.doi.org/10.1093/her/cyl067

Ta, M. L., VanEenwyk, J., & Bensley, L. (2012). Limited percentages of adults in Washington State meet the Dietary Guidelines for Americans recommended intakes of fruits and vegetables. *Journal of the Academy of Nutrition and Dietetics, 112*(5), 699-704. http://dx.doi.org/10.1016/j.jand.2011.12.005

Tung, W. C., Gillett, P. A., & Pattillo, R. E. (2005). Applying the transtheoretical model to physical activity in family caregivers in Taiwan. *Public Health Nursing, 22*(4), 299-310. http://dx.doi.org/10.1111/j.0737-1209.2005.220405.x

Wakui, S., Shimomitsu, T., Odagiri, Y., & Inoue, S. (2002). Relation of the stages of change for exercise behaviors, self-efficacy, decisional-balance, and diet-related psycho-behavioral factors in young Japanese women. *Journal of Sports Medicine and Physical Fitness, 42*(2), 224-232.

Wang, M. C., Cubbin, C., Ahn, D., & Winkleby, M. A. (2008). Changes in neighbourhood food store environment, food behaviour and body mass index, 1981-1990. *Public Health Nutrition, 11*(09), 963-970. http://dx.doi.org/10.1017/S136898000700105X

Who, J., & Consultation, F. E. (2003). Diet, nutrition and the prevention of chronic diseases. *World Health Organ Tech Rep Ser,* 916.

Zabinski, M. F. et al. (2006). Psychosocial correlates of fruit, vegetable, and dietary fat intake among adolescent boys and girls. *Journal of the American Dietetic Association, 106*(6), 814-821. http://dx.doi.org/10.1016/j.jada.2006.03.014

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