

# 1 **Readiness for behavioral change of discretionary salt intake among women in Tehran, Iran**

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11

## 12 **Abstract**

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### 14 **Background**

15 It is vitally important to take into consideration women's role in dietary pattern choice and family  
16 food management. Since women's readiness for dietary behavioral change can be one of the most  
17 effective fundamental measures for preventing chronic diseases in developing countries, the  
18 present study is aimed to determine the readiness for behavioral change in voluntary salt intake as  
19 well as its determinants among women living in Tehran.

### 20 **Materials and methods**

21 The present cross-sectional study was conducted on 561 women referring to the women care units  
22 across city of Tehran. In this regard, demographic information of the participants was collected.  
23 The self-administered questionnaire included assessment of nutrition-related knowledge on salt  
24 intake and its association with diseases, discretionary salt intake, stages of change, and self-  
25 efficacy of women. In addition, the logistic regression test was used to determine the predictors of  
26 women's readiness for behavioral change in voluntary salt intake.

### 27 **Results**

28 40% women had someone in the family who had such a limitation (salt intake-limited exposure  
29 group), while 81.6% always or often added salt to their foods. Moreover, one-third of the

30 participants were in the stage of pre-contemplation and 41.2% were in the stage of preparation for  
31 reducing salt intake. Stage of change increased with an increase in the self-efficacy score ( $r=0.42$ ,  
32  $p<0.001$ ). Self-efficacy and salt intake-limited exposure were the two most important determinants  
33 of the women's readiness for behavioral change in voluntary salt intake, respectively: (OR=1.1  
34 95% CI: 1.06-1.14  $p<0.001$ ; OR=1.58, 95% CI: 1.03-2.42  $p<0.038$ )

## 35 **Conclusions**

36 Results of the present study showed that increased self-efficacy is associated with higher levels  
37 of behavioral change among women. Since self-efficacy is very important for initiating and  
38 maintaining the behavioral change, women's empowerment for reducing salt intake necessitates  
39 putting the emphasis on increased self-efficacy as well as community-based nutritional  
40 interventions.

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## 55 **Introduction**

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57 Behavior change is a process which occurs in individuals with different levels of motivation and  
58 readiness for change [1- 3]. Changing health-related behaviors can significantly affect some of the  
59 most important causes of death and diseases. Behavior plays a pivotal role in health. Evidence  
60 suggests that different behavioral patterns are deeply rooted in sociocultural conditions and depend  
61 on cultural background. Currently, behavior change interventions have a high potential for  
62 changing the current pattern of diseases. It is difficult to change the genetic pre disposition to  
63 diseases and social conditions, at least in the short term [4].

64 Studies which assess individuals' readiness to change health behaviors reveal that over one-third  
65 of people are at the pre-contemplation stage and few (8-14%) at the preparation stage [5-7].  
66 Moreover, increase in age, level of education, and self-efficacy; and the existence of chronic  
67 diseases such as hypertension which requires the limitation of salt intake, have been associated  
68 with placing individuals at higher levels of change [5, 7-8].

69 Hypertension is among the main risk factors for cardiovascular diseases, especially myocardial  
70 infarction, stroke, and congestive heart failure [9]. Based on the report by the Institute for Health  
71 Metrics and Evaluation of Iran, hypertension is the second risk factor among the 10 main risk  
72 factors of increased DALYs in 2010. According to this report, hypertension is among the most  
73 important causes of cardiovascular diseases [10]. Statistics show that cardiovascular diseases have  
74 the highest rate of mortality in Iran, similar to other countries. However, it is in the third rank of  
75 disease burden [11]. The main reason for increased prevalence of hypertension could be the daily  
76 growth in the elderly population, and increase in risk factors, such as unhealthy eating habits  
77 (increased salt intake, saturated fats, etc.), decreased physical activity, overweight, and stress. One  
78 of the most important factors in unhealthy eating habits is the salt intake [12].

79 Based on the most recent study (2014) on adults in Tehran, Iran, daily salt intake was 9 g for men  
80 and 6.96 g for women, with 53.6% being discretionary salt intake or salt intake in cooking or at  
81 the table [13]. At present, the per-capita salt intake in Iran is 10-12 g per day, higher than the  
82 amount recommended by the World Health Organization (WHO), i.e. less than 5 g per day. In  
83 other words, Iranians consume salt in their diet 5.2 times more than others [14]. A study reported  
84 mean salt intake to be 10.3 g per day in urban and rural areas of Ilam Province, Iran [15]. Moreover,  
85 it is 11.47 g per day for adults in Isfahan, Iran [16]. In terms of salt intake, Iran is similar to  
86 Denmark (7.1 g per day in women), China (12 g per day), Spain (9.8 g per day), and Japan (7.8 g  
87 per day) [17-20]. Contrary to most developed countries in which the majority of salt intake (75%)  
88 results from processed food [21-22], 50 to 60% of daily salt intake in Iran is the salt added in  
89 cooking or at the table [13,23]. In developing countries, most salt intake is the salt added in cooking  
90 or at the table. To reduce salt intake, behavioral interventions are much more effective and cost-  
91 effective than population-level interventions [24-25].

92 At present in Iran, reduction of salt intake is among the major priorities of planners, policy makers,  
93 and experts of the health services system [23]. On the other hand, small decreases in salt intake  
94 are associated with a significant reduction in blood pressure among those with hypertension or  
95 normal blood pressure [26-28]. That is why the WHO has recommended the reduction of daily  
96 intake of salt to 5 g for adults [29]. Studies show that, in most developing countries including Iran  
97 and China, approximately 75-80% of the total salt intake is the salt added in cooking and at the  
98 table [2]. Therefore, the major solution must focus on discretionary salt intake, with a change in  
99 dietary habits and promotion of nutrition literacy and attitude for selecting low-salt foods must be  
100 placed on the agenda so that the level recommended by WHO, i.e. less than 5 g per day, can be  
101 achieved [3, 30].

102 Evidence suggests that individuals benefits from reducing salt intake [26, 28]. Reducing salt intake  
103 is an easy, beneficial, independent, and low-cost method for reducing the burden of diseases,  
104 decreasing related costs, and maintaining health, and is the most effective preventive approach in  
105 most countries [31-34]. Therefore, national intervention programs, e.g. educational programs with  
106 the cooperation of the Ministry of Health, households, and related organizations, seem necessary  
107 for reducing discretionary salt intake. Considering these problems, it is vital to offer effective  
108 interventions. Of course, the use of interventional approaches for reducing discretionary salt intake  
109 requires the consideration of individuals' readiness for change. No such study has yet been  
110 conducted in Iran on the reduction of salt intake. Few studies have been conducted in Iran on  
111 discretionary salt intake, and no information is available on Iranian women's readiness for  
112 changing this behavior. Thus, it seems necessary to conduct studies in order to examine women's  
113 readiness for changing the behavior of discretionary salt intake.

114 In the Iranian society, women have the most important role in nutrition planning and preparation  
115 of food for the family. They have the vital role of dietary patterns choice and shaping the taste of  
116 the family [35]. Mothers affect the dietary experience of family members, especially young  
117 children, and teach them the preference for the taste of salt [36]. They are responsible for cooking  
118 and controlling the amount of salt added to the food. Also, they have the important role of  
119 managing the food the family consumes. Thus, they were selected as representatives of the whole  
120 family.

121 The present study aimed to determine the readiness for changing the behavior of discretionary salt  
122 intake and its determinants in women residing in Tehran capital city in Iran.

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## 124 **Materials and methods**

125 Theoretical Basis of Research: The trans-theoretical model of stages of change shows the time-  
126 and motivation-related aspects of change. This model presupposes that everyone passes the stages  
127 of pre-contemplation, contemplation, preparation, action, and maintenance.

128 Pre-contemplation: In this stage, individuals do not think about changing their behavior in the  
129 foreseeable future which is usually defined as the following six months. In this stage, individuals  
130 have no intention to change their behavior, but are aware of the problem or behavior.

131 Contemplation: Individuals think about a change in the foreseeable future but not immediately,  
132 defined as 1-6 months. In this stage, they are aware of and think about and reexamine their  
133 behavior, but have not yet made a decision.

134 Preparation: Individuals plan for changing their behavior in the near future which is often defined  
135 as the next month. In this stage, they decide to change their behavior.

136 Action: Individuals have significantly changed their lifestyle in the past 6 months. Since action is  
137 visible, a change in behavior is often considered synonymous with action.

138 Maintenance: Individuals maintain change for some time, usually six months or more. In this stage,  
139 the behavior is stable and permanent and individuals try to prevent regression [1-3].

140 The model of stages of change have been employed in numerous diet-related studies in order to  
141 determine the stages of change in diet behavior, including the reduction of fat intake and increasing  
142 fiber, fruit, vegetable, and dairy intake, and its efficiency has been confirmed. Therefore, diet-  
143 related behavioral interventions are more effective if they are based on theories of health-related  
144 behavior change [30, 37-45].

## 145 **Study Design:**

146 The present cross-sectional (descriptive-analytic) study was conducted on 561 women visiting  
147 women's care units in Tehran, Iran, selected through convenience sampling.

148 Inclusion criteria: Women who:

- 149 1. were willing to participate in the study;
- 150 2. were minimum 18 years of age;
- 151 3. were literate;
- 152 4. prepared food for the family;

153 Exclusion criteria:

- 154 1. Pregnant or breastfeed
- 155 2. have a low-sodium diet prescribed by doctors of dietitians;

## 156 **Data Collection Tool:**

157 In this study, a researcher-made questionnaire was used that included 4 sections in the fields of  
158 nutritional knowledge, discretionary salt intake, women's readiness to change behavior and self-  
159 efficacy. The questions in this questionnaire were based on the aims of the study, review of the  
160 studies, specific cultural and social conditions of Iranian women.

161 Demographic questionnaire included age, occupation, and level of education. In terms of  
162 occupation, women were divided into two groups: employed and home-makers. In terms of the  
163 level of education, considering the diversity in this factor, women were divided into three groups  
164 of below high school diploma (elementary and high school education), high school diploma, and

165 university education in order to check the relationship between this factor and the qualitative  
166 variables of the study.

167 Self-administered questionnaire consisted of several section. In the first section measuring  
168 women's nutritional knowledge was regarding the relationship between high salt intake and  
169 diseases. Each correct response received the score of 1 [46]. The other question was related to the  
170 presence of someone in the family who had limitations on salt intake. The answer "yes" showed  
171 the salt intake- limited exposure group in the family.

172 The second section focused on the discretionary salt intake. Over 60% of salt intake in Tehran is  
173 the salt added in cooking or at the table [13]. Also, it is difficult to precisely measure salt intake  
174 [6, 47]. Therefore, in order to prevent the recall bias and since self-reported avoidance of salt intake  
175 has a high correlation with the actual behavior [48], the habit of adding salt in cooking and at the  
176 table was questioned. Respondents could select one of the options of "always", "often",  
177 "sometimes", "rarely", or "never" (respectively scored 1 to 4) for each item on salt intake in  
178 cooking or at the table. To classify the responses, the answers given to these questions were  
179 congregated as "salt users" or "non-salt users". Non-salt users were those who never, rarely, or  
180 sometimes added salt in cooking or at the table. Salt users where those who had selected the  
181 answers "always" or "often" [49, 50].

182 The third section determined the readiness for changing salt intake which was designed at the scale  
183 of stages of change based on the trans-theoretical model using the questionnaire used by Newson  
184 e al [6]. With this scale, the intention and decision of individuals regarding discretionary salt  
185 intake were determined by selecting one of the five stages of pre-contemplation, contemplation,  
186 preparation, action, and maintenance. To determine the predictors of readiness for changing the  
187 behavior of discretionary salt intake, stages of change were divided into three categories of pre-

188 contemplation (not ready for change), ready for change (including contemplation and preparation),  
189 and action (change has occurred; including action and maintenance).

190 The fourth section was on women's self-efficacy for reducing salt intake, including 6 questions  
191 scored on a five-point Likert scale from "Not at all sure" to "Completely sure" (scored 1 to 5,  
192 respectively). Minimum and maximum possible scores were 6 and 30, respectively. Questions in  
193 this section were designed based on the Persian adaptation of the General Self-Efficacy Scale  
194 (GSES) [51] and Self-Efficacy in Nutritional Behavior Scale (SENBS) [52].

195 In the pilot study conducted to determine the ease of understanding the self-efficacy questionnaire,  
196 a sample of 15 women completes the questionnaire and expressed their opinions regarding their  
197 understanding of items. In the final version, changes were applied which included the adaptation  
198 of phrases to participants and creating an appropriate framework for them.

199 To determine the reliability of the instrument and internal consistency of the self-efficacy items,  
200 30 women completed the questionnaire and Cronbach's alpha of 0.914 showed the internal  
201 consistency of this scale.

202 To determine the face and content validity of the questionnaire, a panel of experts (10 experts and  
203 professors) was used and their opinions regarding the clarity and appropriateness of questions for  
204 the objectives were applied.

205 In the data collection procedure, first explanations were given by the researcher regarding study  
206 objectives, confidentiality of data, and that no names or address had to be written on the  
207 questionnaires. Then, eligible women entered the study if they were willing to participate.

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## 209 **Data Analysis**

210 Data were analyzed in SPSS 16. Descriptive data are presented in absolute and relative frequency.  
211 The Kolmogorov-Smirnov test was used to determine the normality of quantitative data. The  
212 relationship between personal-social variables, knowledge, and self-efficacy with dependent  
213 variables (discretionary salt intake and stages of change in salt intake behavior) was assessed using  
214 Spearman's correlation and chi-squared test. Logistic regression was employed to determine the  
215 predictors of readiness for changing the behavior of discretionary salt intake. In all tests, the  
216 significant level was  $<0.05$ . This study was approved by the Committee of Ethics in Research,  
217 Shahed University (IR.Shahed.REC.1394.280).

## 218 **Results**

219 Mean age of women was  $36.21 \pm 10.1$  years, ranging from 18 to 60 years. Most women (36.2%)  
220 belonged to the age group of 30 to 39 years. Older women had lower levels of education ( $r=0.287$ ,  
221  $p<1.001$ ). The level of education of 46.5% of women was university, and 38.8% (218 women) had  
222 high school diploma. Also, 66.6% of women were homemakers. Employed women had levels of  
223 education 3-fold higher than that of homemakers ( $p<1.001$ ). Relative frequency of discretionary  
224 salt intake in cooking and at the table based on women's characteristics are presented in Table 1.  
225 40% women had someone in the family who had such a limitation (salt intake-limited exposure  
226 group). Compared to younger women, more women aging 40 years or older belonged to the salt  
227 intake-limited exposure group ( $p=0.045$ ). The knowledge of women regarding the relationship  
228 between salt intake and diseases was undesirable in 44.7% of cases (i.e. they had answered less

229 than half of the questions correctly), and only 28% of women had a desirable knowledge of this  
230 matter. Mean score of self-efficacy for reducing discretionary salt intake was  $19.58 \pm 6.4$ .

231 **Discretionary salt intake in cooking:** In cooking, over half of the women (52.6%),  
232 163 women (29.1%), and 39 women (6.9%) always, often, and never added salt to food,  
233 respectively. Adding salt to food while cooking had a significant correlation with the salt intake-  
234 limited exposure (Fisher's exact test,  $p=0.046$ ). The ratio of women who exposure salt intake  
235 limitation and added salt to food (77.6%) was less than the ratio of women who did not exposure  
236 such a limitation and added salt to food (84.3%). Mean score of self-efficacy was higher in women  
237 who did not add salt in cooking than those who did ( $22.4 \pm 6.3$  vs.  $18.9 \pm 6.2$ , respectively,  $p < 0.001$ ).

238 **Discretionary salt intake at the table:** Here, 298 women (53.1%), 24.1%, and 8.9%  
239 (50 women) never, sometimes, and always added salt to food at the table, respectively. Level of  
240 education and age were correlated with adding salt to food at the table. Adding salt to food at the  
241 table was less in women with university education (21.5%) than those with an education level  
242 below diploma (34.1%) ( $p=0.029$ ). Moreover, women aging 40 years or above added salt to food  
243 at the table less than women aging 30-39 and below 30 years (respectively 19.3 vs. 20.7 and 29.5%,  
244  $p=0.047$ ). Mean score of self-efficacy was higher in women who did not consume salt at the table  
245 than those who did ( $p < 0.001$ ) (Table 1). A positive and significant correlation was observed  
246 between salt intake in cooking and at the table ( $r=0.194$ ,  $p < 0.001$ ); 69.2% of women who never  
247 added salt to food in cooking did not consume salt at the table.

248 **Total discretionary salt intake (in cooking & at the table):** Table 2 shows  
249 the total discretionary salt intake based on demographic and other characteristics of women. In

250 general, 66% of women were salt users. Age and mean self-efficacy score were significantly  
251 correlated to the total salt intake ( $p=0.048$  and  $p<0.001$ , respectively).

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268 **Table 1. Relative frequency of discretionary salt intake in cooking and at the table based on**  
 269 **women's characteristics.**

	Salt intake in cooking		Salt intake at the table	
	Yes n=458	No n=103	Yes n=128	No n=433
<b>Age (years)*</b>				
<30	86.1	13.9	29.5	70.5
30-39	81.1	18.2	20.7	79.3
≥40	77.6	22.4	19.3	80.7
<b>level of education**</b>				
Below high school diploma	74.4	25.6	34.1	65.9
High school diploma	81.2	18.8	20.2	79.8
University	84.3	15.7	21.5	78.5
<b>Occupation</b>				
Homemaker	82.6	17.4	23	77
Employed	79.7	20.3	22.5	77.5
<b>Salt intake- limited exposure ***</b>				
yes	77.6	22.4	24.7	75.3
no	84.3	15.7	21.6	78.4
<b>Knowledge level</b>				
Desirable	84.2	15.8	22.3	77.7
Undesirable	78.5	21.5	23.5	76.5
<b>Self-efficacy score****</b>				
<b>Mean± SD</b>	18.94± 6.3	22.45± 6.3	15.05± 5.7	20.92± 5.9

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271 \*Age and salt added at the table (chi-squared test, p=0.047)

272 \*\* Level of education and salt added at the table (chi-squared test and p=0.029)

273 \*\*\* Salt intake- limited exposure group and salt added in cooking (Fisher's exact test, p=0.046)

274 \*\*\*\* Self-efficacy score and salt intake in cooking and at the table (Mann-Whitney U test, p<0.001 for each case)

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280 **Table 2. Discretionary salt intake based on the personal-demographic characteristics of**  
 281 **women visiting women’s care units in Tehran.**

Characteristics of women		Salt users N=370		Non-salt users N=191		Total N=561	
		N	%	N	%	N	%
Age (years)*	below 30	122	73.5	44	26.5	166	29.59
	30-39	129	63.5	74	36.5	203	36.18
	≥ 40	119	62	73	38.0	192	34.22
Level of education	Below high school diploma	56	68.3	26	31.7	82	14.62
	High school diploma	143	65.6	75	34.4	218	38.86
	University	171	65.5	90	34.5	261	46.52
Occupation	Homemaker	251	67.1	123	32.9	374	66.67
	Employed	119	63.6	68	36.4	187	33.3
Salt intake limitation in the family	No	223	66.0	115	34.0	338	60.2
	Yes	147	65.9	76	34.1	223	39.8
Knowledge level	Undesirable	165	65.7	86	34.3	251	44.7
	Desirable	205	66.1	105	33.9	310	55.3
Scores of self-efficacy**	Mean ±SD	17.78±6		23.08±5.6			

282 \*Chi-squared tests, p=0.048

283 \*\*t test, p<0.001

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## 287 **Stages of behavior change of discretionary salt intake:**

288 In terms of the behavior changing of discretionary salt intake stages, about one-third of women  
289 (31.9%) were in pre-contemplation, following by 22.3% in contemplation, 18.9% in preparation,  
290 8.2% in action, and 18.7% in maintenance.

291 Table 3 presents the relationship between stages of changing the behavior of discretionary salt  
292 intake in terms of pre-contemplation, readiness (contemplation and preparation), and action (action  
293 and maintenance) with women's characteristics. Women belonging to the age group of over 40  
294 years were in the stage of preparation more than the two other age groups (respectively 45.3 vs.  
295 40.4% in the age group of 30-39 years and 37.3% in the age group of <30 years) ( $p < 0.02$ ).

296 No significant relationship was observed between the level of education, occupation, knowledge  
297 regarding the relationship between salt and diseases, and salt intake- limited exposure in the family  
298 on the one hand, and stages of change on the other. However, a significant relationship existed  
299 between stages of change and adding salt in cooking ( $p < 0.001$ ) and at the table ( $p < 0.001$ ). Women  
300 who did not add salt in cooking or at the table were at higher stages of change (respectively 56.2  
301 and 99% in maintenance). The stage of change moved forward with increasing the score of self-  
302 efficacy ( $r = 0.42$ ,  $p < 0.001$ ). A positive correlation was observed between self-efficacy score and  
303 categorized levels of change ( $r = 0.42$  and  $p < 0.001$ ).

304 To determine the factors associated with women's readiness for behavior change, predictor  
305 variables, including age, level of education, occupation, salt intake- limited exposure in the family,  
306 knowledge level regarding the relationship between salt intake and diseases, and self-efficacy  
307 score were entered into logistic regressions. Results showed that self-efficacy and salt intake-  
308 limited exposure are the most important factors determining women's readiness for changing the

309 behavior of discretionary salt intake compared to women in the pre-contemplation stage (OR=1.1  
310 95% CI: 1.06-1.14  $p<0.001$ ; OR=1.58, 95% CI: 1.03-2.42  $p<0.038$ ) respectively.

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326 **Table 3. Frequency distribution of stages of changing the behavior of discretionary salt**  
 327 **intake in women visiting women’s care units in Tehran based on studied variables.**

328 **Stages of change in the behavior of discretionary salt intake**

		Pre-contemplation N=179		Contemplation and Preparation N=231		Action and Maintenance N=151		Total N=561		P Value
		N	%	N	%	N	%	N	%	
Adding salt in cooking	Never	1	2.6	4	10.3	34	87.2	39	6.9	Fisher’s exact test  P<0.001
	Sometimes	2	3.1	13	20.3	49	76.6	64	11.4	
	Often	40	24.5	56	34.4	67	41.1	163	29	
	Always	136	46.1	158	53.6	1	0.3	295	52.5	
Adding salt at the table	Never	73	24.5	92	30.9	133	44.6	298	53.1	Fisher’s exact test P<0.001
	Sometimes	44	32.6	75	55.6	16	11.9	135	24.0	
	Often	36	46.2	40	51.3	2	2.6	78	13.9	
	Always	26	52.0	24	48.0	0	0	50	8.9	
Level of education	Below high school diploma	24	29.3	34	41.5	24	29.3	82	14.6	Chi- squared tests  P=0.874
	High school diploma	66	30.3	93	42.7	59	27.1	218	38.8	
	University	89	34.1	104	39.8	68	26.1	261	46.5	
Occupation	Homemaker	116	31	164	43.9	94	25.1	374	66.7	Fisher’s exact test P=0.169
	Employed	63	33.7	67	35.8	57	30.5	187	33.3	
Age (year)	< 30	69	41.6	62	37.3	35	21.2	166	29.6	Chi- squared tests P=0.02
	30-39	59	29.1	82	40.4	62	30.5	203	36.2	
	≥ 40	51	26.6	87	45.3	54	28.1	192	34.2	
Knowledge of the relationship between salt intake and diseases	Desirable	98	31.6	134	43.2	78	25.5	310	55.3	P=0.468
	Undesirable	81	32.3	97	38.6	73	29.1	251	44.7	
Salt intake limitation in the family	No	118	34.9	127	37.6	93	27.5	338	60.2	P=0.074
	Yes	61	27.4	104	46.6	58	26.0	223	39.8	
Self-efficacy score	Mean ±SD	16.28 ±5.8		19.70 ±5.9		23.33 ±5.6				P<0.001

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## 331 **Discussion**

332 The present study determined readiness for changing the behavior of discretionary salt intake in  
333 adult women residing in Tehran and its determinants, including age, occupation, level of education,  
334 knowledge level regarding the relationship between salt intake and diseases, self-efficacy score,  
335 and salt intake- limited exposure in the family as the most important determinants of women's  
336 readiness for changing the behavior of discretionary salt intake. Results revealed that the majority  
337 of women were at the pre-contemplation stage. A limited number of participants were in the  
338 maintenance stage and had a significantly higher self-efficacy score compared to those in the pre-  
339 contemplation stage.

340 In the present study, women over 40 years of age consumed less salt at the table and had a more  
341 advanced level of readiness compared to the other age groups. Age is a demographic characteristic  
342 which determines discretionary salt intake. Results can be interpreted by assuming that, as age  
343 increases, individuals focus more on their health and healthy eating habits.

344 Level of education is an indicator of the socioeconomic status and helps a healthy diet. In the  
345 present study, the level of education had a significant correlation with the amount of salt added at  
346 the table, and women with university education consumed less salt at the table than women with  
347 an education level below high school diploma. Chen Ji [53] showed that those with a lower level  
348 of education consume more salt. Similarly, Jeong showed that those with low income and  
349 education level consume more salt [54]. It is clear that a low level of education is a serious  
350 limitation for achieving dietary knowledge and selecting healthy dietary behaviors [55]. The role  
351 of women is more important considering the pivotal role in buying the ingredients, preparing food,  
352 regulating the diet, and dietary choices [56].

353 In the present study, occupation as another indicator of socioeconomic status showed no significant  
354 correlation with levels of changing the behavior of discretionary salt intake. Chen Ji [53] showed  
355 that the level of salt intake was higher in those with lower levels of occupation.

356 These factors include a range, from individual determinants to environmental, social, and cultural  
357 characteristics. They direct individuals to attach importance to the type and quality of food based  
358 on economic conditions of the family, ensuring health, and meeting the needs.

359 A significant positive correlation was observed between stages of change and self-efficacy scores.  
360 In other words, self-efficacy scores increased as individuals advanced in the stages of change  
361 towards action and maintenance. In the action and maintenance stage, 87% of participants never  
362 added salt in cooking. Moreover, 45% of women in this stage never added salt to food at the table.

363 The study by Newson [6] showed that 22% of the sample often or always added salt to food before  
364 tasting it and 58% never added salt to food at the table. Over one-third (34%) of participants were  
365 in pre-contemplation and 28% in maintenance stages, and only 8% of the sample were at the stage  
366 of readiness for changing the behavior of discretionary salt intake, inconsistent with the results of  
367 this research.

368 Vander Veen [5] used the stages of change model to show that 32% of participants were at the pre-  
369 contemplation, 14% at the dynamic (contemplation, preparation, and action), and over half of them  
370 (54%) at maintenance stages. Discretionary salt intake in cooking or at the table was lower in the  
371 maintenance group than dynamic and pre-contemplation groups.

372 Results of a study by Ni showed that only 38% of patients who were aware of reducing salt intake  
373 actually practice it. Knowing that salt intake must be limited but not acting upon it shows that these  
374 individuals are at preparation, contemplation, or pre-contemplation stages of change [57]. Another

375 important point is that, despite having knowledge regarding the importance and benefits of a  
376 healthy dietary pattern, practices differs [5, 6, 57]. This shows that specific measures compatible  
377 with the social context must be taken by policymakers to change this behavior among women, and  
378 education alone does not suffice in planning. Measures such as correction of the dietary  
379 environment at home may help.

380 A quasi-experimental study in Malaysia used the stages of change model to evaluate the behaviors  
381 of patients with hypertension in relation to doing regular exercises, reducing salt intake, and  
382 increasing the consumption of fruits and vegetables. Results revealed that patients in action and  
383 maintenance groups had significantly reduced salt intake compared to those in pre-contemplation  
384 and preparation groups.

385 In recent study by Jeong, the most important aspect of readiness for changing a behavior was a  
386 high self-efficacy score [54]. Participants considered environmental support and motivation as the  
387 most important factors leading to behavioral change, consistent with the results of Chen [53].

388 Assessing Iranian women's readiness for change is the first step towards the assessment and  
389 promotion of food and nutrition literacy. Readiness for changing behaviors is a novel concept  
390 which receives considerable attention today. However, few studies have been conducted on this  
391 issue among women.

392 According to studies, the assessment of readiness for changing behaviors has the best results when  
393 the context is defined well. In the present study, women's readiness to change the behavior was  
394 assessed using a valid questionnaire which included different dimensions of behavior change at  
395 home.

396

## 397 **Limitations**

398 This questionnaire needs further corrections before being used for extensive society-level studies.

399 A strong validation process and a larger sample size are required.

## 400 **Conclusion**

401 The evaluation of readiness for changing a behavior is a novel concept in society-level dietary  
402 interventions. These instruments and questionnaires can be easily implemented by experts and  
403 health workers. Therefore, it can be used in large society-level studies after corrections and final  
404 approval.

405 Results of the present study showed that the evaluation of the stage of readiness for changing  
406 dietary behaviors can be a useful tool in interventional studies which aim to change dietary  
407 behaviors since it provides the opportunity to identify readiness for change in different social  
408 groups.

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## 414 415 **Author Contributions**

416  
417 **Conceptualization:** KhN PaH PA AM.

418 **Formal analysis:** KhN PaH PA AM.

419 **Methodology:** PA AM KhN PH.

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422 **Writing - review & editing:** KhN PA.

423

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