



## Behavioral beliefs of reducing salt intake from the perspective of people at risk of hypertension: An exploratory study

Mohammad Ali Morowatisharifabad<sup>(1)</sup> , Amin Salehi-Abargouei<sup>(2)</sup>,  
Masoud Mirzaei<sup>(3)</sup>, Tahereh Rahimdel<sup>(4)</sup> 

### Original Article

#### Abstract

**BACKGROUND:** The average salt intake in Iran is 12 g per day and it is reported to be about 10 g per day in Yazd City, Iran. This study was conducted to explain the behavioral beliefs toward salt intake reduction in people at risk of hypertension (HTN) based on Theory of Planned Behavior (TPB) guideline.

**METHODS:** This study was a TPB-based exploratory research. The participants were 25 married individuals at risk of developing HTN, with a mean age of  $42.9 \pm 7.2$  years. They were selected by purposive maximum variation sampling continued until data saturation. The data collection method was a semi-structured interview. Study lasted from January 2017 to April 2017.

**RESULTS:** Concerning the advantages and disadvantages of reducing daily salt intake, data analysis yielded 52 primary codes, 19 subcategories, and 5 categories. Advantages in two categories included disease prevention and misconceptions about the benefits, and disadvantages in three categories included physical health disorder, difficulty following a low-salt diet, and false beliefs about the disadvantages of salt intake reduction.

**CONCLUSION:** According to the findings of this study, prevention of high blood pressure and cardiovascular diseases (CVDs) was among the most important advantages of reducing salt intake, and undesirable taste of low-salt foods and family members' disagreement were among the most important disadvantages of reducing salt intake. The misconceptions of our participants included blood lipids reduction and creation of difficulty contracting the muscles. It is recommended to correct misconceptions and strengthen behavioral beliefs to promote salt intake reduction behavior in educational interventions.

**Keywords:** Sodium Chloride, Psychological Theory, Behavior, Hypertension

*Date of submission:* 29 Oct. 2018, *Date of acceptance:* 13 Jan. 2019

#### Introduction

The high intake of salt is associated with hypertension (HTN), stroke, heart diseases, kidney stones, and gastric cancer.<sup>1</sup> Reduced salt intake is associated with reduced blood pressure and thus lower chance for developing cardiovascular diseases (CVDs).<sup>2</sup> The amount of salt intake is more than the World Health Organization (WHO) recommended amounts in the most countries of the world.<sup>3</sup> The average salt intake is 12 g per day in Iran,<sup>4</sup> and it is reported to be  $10.1 \pm 3.0$  g per day in Yazd City, Iran.<sup>5</sup>

One of the theories used to change a person's behavior is the Theory of Planned Behavior (TPB)

that can be used to predict and explain a wide range of behaviors. According to the theory, human behavior is guided by three kinds of considerations: behavioral beliefs, normative beliefs, and control beliefs, that are considered as the dominant determinants of an individual's intention and behavior.<sup>6</sup>

**How to cite this article:** Morowatisharifabad MA, Salehi-Abargouei A, Mirzaei M, Rahimdel T. Behavioral beliefs of reducing salt intake from the perspective of people at risk of hypertension: An exploratory study. ARYA Atheroscler 2019; 15(2): 59-66.

1- Professor, Department of Ageing Health, School of Public Health, Shahid Sadoughi University of Medical Sciences, Yazd, Iran

2- Assistant Professor, Nutrition and Food Security Research Center AND Department of Nutrition, School of Public Health, Shahid Sadoughi University of Medical Sciences, Yazd, Iran

3- Professor, Yazd Cardiovascular Research Center, Shahid Sadoughi University of Medical Sciences, Yazd, Iran

4- PhD Candidate, Department of Health Education and Health Promotion, International Campus, Shahid Sadoughi University of Medical Sciences, Yazd, Iran

Correspondence to: Tahereh Rahimdel, Email: rahimdel2000@yahoo.com

Behavioral beliefs determine attitudes toward behavior.<sup>7</sup> Behavioral beliefs are people's beliefs about the outcomes or benefits of doing the behavior.<sup>8</sup>

Studies have shown that there is a relationship between the belief in dietary intake and the healthy behavior pertaining to it,<sup>9</sup> and beliefs about the status and consequences of the disease contribute to the desire of individuals to do health-promoting behaviors.<sup>10</sup>

Behavioral beliefs about certain behaviors such as exercise,<sup>11</sup> walking,<sup>12</sup> and choosing the method of cesarean delivery<sup>13</sup> have been explained by the TPB.

In the studies on the detection of behavioral beliefs about salt intake in patients with diabetes, the relationship of HTN and stroke with high salt intake<sup>14</sup> and the relationship between high salt intake and CVDs<sup>15</sup> were considered as the most important nutritional factors for the risk of CVD due to HTN by participants.<sup>16,17</sup>

In addition, the results of previous studies have shown that people's knowledge about salt is moderate toward low,<sup>5,17-20</sup> and the only correct belief among most people is that high amounts of salt may cause some health problems.<sup>9,21-23</sup>

Most participants also considered that high salt intake for people with chronic illnesses such as HTN and diabetes mellitus (DM) was harmful, and they did not have enough information about these diseases and mistook them.<sup>24</sup> Despite the importance attached to the salient beliefs in the TPB, little attention has been paid to the exploratory phase in the previous researches.<sup>7</sup>

Given the high salt consumption in Iran, the wide variety of food preferences and cultures in the world and their role in dietary habits, and the few theoretical studies on the behavioral beliefs toward salt, this exploratory study was conducted to explain behavioral beliefs toward salt intake reduction in people at risk of HTN based on the guidelines of TPB.<sup>25</sup>

## Materials and Methods

The present study was a TPB-based exploratory research. Participants in the study were 25 individuals<sup>25</sup> at risk of developing HTN aged 20-50 years old. The inclusion criteria were having a risk factor for HTN such as DM according to the participants' report, being overweight or obese, living in Yazd, and willing to participate in the study.

A few participants were selected at first by convenience sampling; then snowball sampling helped us select informative participants and

maximum variation sampling continued until data saturation, when new conceptual information could not be obtained.<sup>26</sup>

The data collection was performed using a semi-structured interview.<sup>25</sup> The duration of each interview was 30-40 minutes. During the interview, the advantages and disadvantages of reducing salt intake (consuming 5 g per day equivalent to one teaspoon of salt) were asked from the participants by these two questions:

- 1) What are the advantages of reducing daily intake of salt according to your opinion?
- 2) What are the disadvantages of reducing daily intake of salt according to your opinion?

Data were collected using exploratory questions as needed to provide further explanation. The study lasted from January 2017 to April 2017. Interviews were held in 25 sessions conducted in places which were convenient for the participants, like workplace and home.

All interviews were transcribed verbatim and read as soon as possible several times to gain a deep understanding and then were broken into the smallest meaning units (primary open codes). Then, the codes were further compared by their similarities to draw new codes after merging.

In the classification step, the merged codes that were more similar were assigned to the same subcategory and similar subcategories were assigned to the same category, and ultimately the themes were formed based on the constructs of the TPB.

Content analysis began after the first interview and continued until the end of the data collection. For the accuracy and robustness of the data collected, in-depth and prolonged engagement was used. The variety of expertise in the research team increased credibility. Member check was also used. This means that the drawn code was given to the participants to take their comments into account about the accuracy of the analysis.

The maintenance of research documents and the researcher's personal interest in the subject matter also led to data confirmability.<sup>27</sup> For transferability, the maximum variation sampling was considered for age, education, and occupation.

The protocol of the study was approved by the Ethics Committee of Shahid Sadoughi University of Medical Sciences, Yazd, Iran (approval code: IR.SSU.SPH.REC.1395.133).

Before the interview, the purposes of the study were explained to the participants and an informed oral consent for participating in the study was obtained from them. In addition, the participants

were assured that their personal information would be kept confidential. Participants could also withdraw from the study whenever they wished.

## Results

In the present study, 25 people at risk of developing HTN, with a mean age of  $42.9 \pm 7.2$  years old, who were all married were enrolled (Table 1).

**Table 1.** Demographic characteristics of participants in the study

Variable		[n (%)]
Age (year)	< 40	8 (32)
	40-50	17 (68)
Gender	Men	11 (44)
	Women	14 (56)
Education	Under diploma	2 (8)
	Diploma	7 (28)
	College education	16 (64)
Occupation	Housewife	1 (4)
	Employee	21 (84)
	Self-employed	3 (12)

With respect to the advantages and disadvantages of reducing daily salt intake, 52 primary codes were drawn, 21 of which were assigned to 19 subcategories and five categories (advantages in two categories and disadvantages in three categories), and finally, two main themes of the advantages and disadvantages of salt intake reduction were formed (Table 2).

Regarding salt intake reduction, two categories, namely, disease prevention and misconceptions about the advantages were drawn.

**Table 2.** Themes, categories, and subcategories of behavioral beliefs among people at risk of hypertension (HTN)

Themes	Categories	Subcategories
The benefits of reducing daily salt intake	Preventing diseases	Positive effects on the heart
		Positive effects on the brain
		Positive GI effects
		Positive renal effects
		Preventing osteoporosis
		Vision enhancement
		Reducing the severity of asthma
		Prevention of obesity
		Reducing blood lipids
		Reducing blood cholesterol
The disadvantages of reducing daily salt intake	Physical health disorders	Adverse effects on the heart
		Weight loss and thinness
		Unpleasant taste of low-salt food
		Imposing restrictions on the consumption of some foods
		Family members' disagreement
	Difficulty adhering to low-salt diet	Changing the previous dietary habits
		Adverse GI effects
		Adverse biochemical effects
	False beliefs about disadvantages	Adverse GI effects
		Muscle contraction impairment

GI: Gastrointestinal

**Preventing diseases:** The first drawn category included the subcategories of positive effects for the heart, effects for the brain, gastrointestinal (GI) effects, renal effects, osteoporosis prevention, vision enhancement, asthma severity reduction, and obesity prevention.

**Positive effects for the heart:** Participants said that heart disease, heart attacks, and HTN could be prevented by reducing daily salt intake.

One of the participants (a 50-year-old housewife) said: "Reducing salt intake causes us at least not to develop an illness called HTN, which is the source of dozens of other illnesses such as stroke".

**Positive effects for the brain:** Participants said that reducing daily salt intake would prevent stroke.

A participant (a 47-year-old female employee) said: "When we eat less salt, our blood pressure does not go up, as a result we ['] not develop stroke".

**Positive gastrointestinal effects:** Participants reported a decrease in gastric ulcer and also in gastric cancer, lack of sour stomach, better nutrition, and prevention of food rotting as beneficial GI effects of salt intake reduction.

A self-employed, 45-year-old man said: "When we eat less salt, the acidity of the stomach increases, as a result, the consumed food will not rot and will be prepared for absorption in better conditions".

**Positive renal effects:** Prevention of development of kidney disease and swelling of hands and legs were among the positive renal effects reported by our participants.

A participant (a 49-year-old male clerk) said: "When we eat less salt, its benefits are that the legs do not swell and the kidneys do not stop functioning".

**Preventing osteoporosis:** Participants reported lower rates of developing osteoporosis and bone health promotion as some other benefits of daily salt intake reduction.

A 42-year-old female faculty member said: "Reducing salt intake will reduce the risk of osteoporosis".

**Vision enhancement:** Participants mentioned prevention of visual problems and vision enhancement as two benefits of salt intake reduction.

A 50-year-old serviceman said: "Salt reduction causes our vision not to decline".

**Reducing the severity of asthma:** Salt can cause inflammation of the respiratory tract by confining water in the body. Participants in our study also reported the reduction in asthma severity as one of the benefits of salt intake reduction.

A 38-year-old male clerk said: "When we eat less salt, we don't get asthma and we won't have dyspnea".

**Prevention of obesity:** Salt intake reduction prevents overweight by preventing water accumulation in the body.

The participants also reported decreased appetite, reaching an appropriate weight, and prevention of overweight and obesity as the benefits of salt intake reduction.

A 35-year-old female clerk said: "When salt is consumed in low amounts, because excess water does not accumulate in the body, it causes weight loss".

**False beliefs about advantages:** Reducing blood lipids and lowering blood cholesterol were two of the false beliefs about the benefits of salt intake reduction reported by our participants.

**Reducing blood lipids:** A 49-year-old serviceman said: "I have diabetes, I don't eat sugar, if I eat low amounts of salt, it is good for lowering blood lipids".

**Reducing blood cholesterol:** A 38-year-old female clerk said: "When we eat less salt, my blood cholesterol lowers".

Regarding the disadvantages of salt intake reduction, three categories, namely, physical health disorder, difficulty following a low-salt diet, and false beliefs about the disadvantages of salt intake reduction were drawn.

**Physical health disorders:** This category includes the adverse effects on the heart, thinness, and weight loss subcategories.

**Adverse effects on the heart:** Participants expressed a drop in blood pressure in people who had hypotension, as one of the disadvantages of salt intake reduction.

A 38-year-old female clerk said: "When less amounts of salt are consumed, the blood pressure in a person with hypotension decreases further".

**Weight loss and thinness:** A participant (a 50-year-old physician) said: "Using low salt in food causes skinny people to lose their appetite due to its inappropriate taste, and they cannot eat an adequate amount of food so that their weight is lost".

**Difficulty adhering to low-salt diet:** Participants considered the unpleasant taste of low-salt foods, restrictions on the consumption of certain foods, the opposition of family members, and the change in previous dietary habits as part of the difficulty of adhering to the low-salt diet.

**Unpleasant taste of low-salt food:** Food insipidness and the lack of deliciousness as well as unpleasant taste of low-salt food were also reported as the disadvantages of salt intake reduction by our participants.

A 27-year-old female clerk said: "The reduction in salt intake does not seem to me to be a disadvantage, but it may slightly affect the taste of the food which will be resolved by [adding] lemon juice and orange juice".

**Imposing restrictions on the consumption of some foods:** A participant (a 27-year-old female employee) said: "If we consume less salt, we will not be able to eat some of the foods we like".

**Family members' disagreement:** The unwillingness of children and other family members was reported as one of the other disadvantages of low salt intake by the participants.

A 49-year-old male clerk said: "When the food is low-salt, the children don't eat or drink, they don't eat at the table, or the food will be excess and will be thrown away".

**Changing the previous dietary habits:** Some participants reported the separate cooking of food and the change in the method of food preparation as some of the disadvantages of salt intake reduction.

A 50-year-old housewife said: "If I decide to eat low-salt foods, I'll have to eat separately on myself because my kids and husband won't eat".

**False beliefs about disadvantages:** Participants said that salt intake reduction would lead to adverse effects on the digestive system and might cause adverse biochemical effects and muscle contraction impairment.

**Adverse gastrointestinal effects:** Participants said that salt intake reduction could cause gastric acid secretion as well as digestive problems.

A participant (a 31-year-old male accountant) said: "When we eat low [amounts of] salt, gastric acid secretion will decrease and our food won't be well digested".

**Adverse biochemical effects:** Participants reported disturbed levels of body fluids, iodine deficiency, as well as low blood pH levels as the adverse effects of salt intake reduction.

A participant (a 34-year-old male clerk) said: "*When we eat low [amounts of] salt, we'll develop iodine deficiency*".

**Muscle contraction impairment:** Some participants said that reducing salt intake could lead to problems regarding muscle contraction and movement as well as muscle cramps.

One of our participants (a 38-year-old male clerk) said: "*Everything is useful in a specific amount, if we consume too low amounts of salt, our muscles cannot contract and we will develop muscle cramps*".

## Discussion

The findings of this study represent a classification of the advantages and disadvantages (behavioral beliefs) of reducing salt intake based on TPB in five main categories, namely, disease prevention, false beliefs about advantages, physical health disorder, difficulty in adhering to a low-salt diet, and wrong beliefs about disadvantages.

Prevention of disease included positive effects for the heart, positive effects for the brain, positive GI effects, positive renal effects, osteoporosis prevention, vision enhancement, asthma severity reduction, and obesity prevention.

The positive effects for the heart included prevention of CVDs, myocardial infarction (MI), and HTN, which is consistent with previous researches. In a study on patients with diabetes in Australia, 88% of patients believed that there was a relationship between high salt intake and HTN.<sup>14</sup>

The findings of a review study also found that 80% of healthy participants were aware of the relationship between high salt intake and HTN and 60% of them were aware of relationship between high salt intake and CVD and/or MI.<sup>17</sup>

But only 32% of people with HTN believed that the main nutritional factor for the risk of CVD was salt intake, which mainly affects the health by increased blood pressure,<sup>16</sup> and participants in the study of Sanchez et al. believed that heart disease and HTN were associated with the incidence of these diseases in one of the family members and were not associated with high salt intake.<sup>24</sup>

The positive effects for the brain were another subcategory drawn in our study, which is in line with the results of the study of Gray et al. in which 78% of people with diabetes believed that high salt intake was associated with stroke.<sup>14</sup>

Salt intake is one of the determinants of urinary calcium excretion and calcium is a major component of kidney stones.<sup>28</sup> One of the other benefits of salt intake reduction that the participants believed in this study was the prevention of kidney disease, which is not consistent with the results of the study of Sanchez et al., where the participants believed that kidney disease was inherited and was not associated with salt intake.<sup>24</sup>

Increased salt in the body also increases urinary calcium excretion, as well as calcium loss from the bone, leading to osteoporosis.<sup>28</sup> Prevention of osteoporosis was another advantage of reducing salt intake as expressed by the participants in the study, which is also consistent with the results of the study in which it was believed by about 30% of the participants.<sup>17</sup>

High salt intake is a risk factor for human cataract.<sup>29</sup> Vision enhancement was reported as one of the other benefits of salt intake reduction. Intake of high amounts of salt is an indirect cause of obesity. Salt absorbs water and motivates non-alcoholic beverages consumption, which will increase the body mass index (BMI).<sup>28</sup> Prevention of obesity was one of the other benefits of salt intake reduction that our participants talked of.

The severity of asthma attacks is associated with salt intake.<sup>28</sup> Reduction in the severity of asthma was reported as one of the benefits of salt intake reduction from the perspectives of the participants in our study.

Studies have shown that salt does not affect the level of blood cholesterol and other lipids,<sup>2,30</sup> and the reduction in lipid levels was among the false beliefs of a few number of our participants who considered it to be a benefit of salt intake reduction.

In the study of Zhang et al., one-third of the participants believed that false self-confidence would reduce physical activity if salt was reduced.<sup>31</sup>

In an international study by Newson et al., intensification of hunger by salt intake was reported as one of the false beliefs.<sup>32</sup>

The difficulty of adhering to a low-salt diet due to its adverse effects on the taste of food, the restrictions on the consumption of certain foods, family members' opposition, and the change in previous dietary habits were reported as the disadvantages of salt intake reduction.

The unpleasant taste of low-salt food is consistent with the findings of a study where the participants believed that salt was essential for the food flavor and that salt-free food was not edible.<sup>24</sup>

Training to use salt substitutes such as lemon juice and vegetables to taste food will resolve this problem.

Disagreement among family members and as a result, individual catering was also highlighted in Keshani and Farvid investigations on the use of high-fiber foods in patients with diabetes<sup>33</sup> and in older women's beliefs about restrictions on dietary salt intake.<sup>34</sup> It can be resolved by educating other family members to support and accompany in adhering to a diet with an appropriate amount of salt and how to prepare low-salt foods.

Disorders of physical health including decreased blood pressure in people with hypotension as well as thinness and weight loss were among the other disadvantages of salt intake reduction reported by our participants.

The participants believed that if the individuals who had low appetite and were thin, reduced their salt intake, their desire to eat food would further decrease and therefore, they would become thinner.

The last drawn category of behavioral beliefs included false beliefs about the disadvantages of salt intake reduction, including adverse effects on digestive system, adverse biochemical effects, and muscle contraction impairment, which few participants talked of.

This can be due to the lack of knowledge about the amount of salt recommended among the participants and the false belief that says reducing salt intake means complete elimination of salt from the diet.

Some participants assumed that reducing salt intake was equivalent to a severe salt deficiency, because they knew that one of the main symptoms of significant reduction in sodium intake was muscular cramping.<sup>35</sup>

Although sodium is an essential nutrient necessary to maintain plasma volume, the balance between acid and alkaline, the transmission of nerve signals, and normal cell function, and although the use of iodized salt plays a role in providing the body's salt, iodized salt is not the only source of iodine supply.

The belief of having difficulty digesting the food and GI problems due to salt intake reduction can also be due to the religious recommendations to eat salt before and after meals.

Considering the recommended intake of salt in a day by the WHO (5 g per day),<sup>36</sup> the participants are less likely to have misconceptions about the disadvantages of salt intake.

There are a number of limitations that should be considered before interpretation of our results. Although this study was based on the perception of

people at high risk of developing HTN and it provided valuable information, we did not interview with health care providers. Therefore, their experience was not taken into account to obtain more comprehensive information, which is suggested to be addressed in subsequent researches.

### Conclusion

According to the findings of this study, prevention of high blood pressure and CVD is one of the main advantages of reducing salt intake, and undesirable taste of low-salt foods and family members' disagreement were among the most important disadvantages of reducing salt intake.

The misconceptions of our participants included blood lipids reduction and creation of difficulty contracting the muscles. It is recommended to correct misconceptions and strengthen behavioral beliefs to promote salt intake reduction behavior in educational interventions.

### Acknowledgments

This article was derived from a PhD. thesis whose protocol was registered as 5134 at Shahid Sadoughi University of Medical Sciences. The authors are grateful to participants for their valuable contributions to the research, and also to International Campus of Shahid Sadoughi University of Medical Sciences for their financial support.

### Conflict of Interests

Authors have no conflict of interests.

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