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Salt Content in Traditional and Nontraditional Breads in Yazd City, Iran, 2015-2016

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ABSTRACT

Background: Cardiovascular diseases (CVDs) are the leading cause of premature death in the 21st century. Dietary factors, such as high salt intake, are related to increased risk of CVDs. One of the main sources of dietary salt is bread. On the other hand, salt content is a quality indicator of bread. Therefore, this study was conducted to evaluate the salt content in a variety of consumed breads in Yazd city, Iran. **Methods***:* This study was a cross sectional research conducted in Yazd. The list of the bakeries obtained from their industry office. Ten percent of about 600 bakeries in Yazd (62 bakeries; 2 samples in each bakery) were selected using simple random sampling based on sample frame of ID number of each bakery. Finally, 9 types of bread included in this study. Sodium content was measured using flame photometer method. Salt content in breads was reported in each 100 g bread. **Results***:* It was found that Nan-Taftoon Tanuri is the most popular bread among traditional breads in Yazd (45.2%). It had significantly more salt than Nan-Fantezi and Nan-Sangak ($P < 0.02$). Also, Nan-Sangak had the least salt among traditional breads. However, the mean salt of traditional breads was more than the standard level (1g salt/100g bread ($P < 0.0001$). **Conclusion***:* The current study showed that the mean salt content of traditional breads was significantly more than the standard level. Furthermore, Nan-TaftoonTanuri had significantly more salt than others, such as Nan-Fantezi and Nan-Sangak.

Keywords: *Breads; Flame photometer; Nan; Salt; Sodium chloride; Yazd*

Introduction

Bread is one of the main national diet sources in many countries of the world including Iran (Malakootian *et al.*, 2005, Qazi *et al.*, 2003). Bread supplies over half of the energy intake of different

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world populations as well as the nutrients, such as carbohydrates, proteins, minerals, and vitamins (Bajerska *et al.*, 2015).

The Persian word for bread is "Nan". The Sasanian inscriptions of the 3rd century have mentioned this word. Also, analyzing historical documents show that the word "Nan" has been mentioned in the Pahlavi texts of the 9th century (Karizaki, 2017). **Figure 1** shows some traditional types of bread, such as "Nan" in Iran. In Iran, the mean bread consumption per capita has been estimated approximately 320 g per day (286 g in urban areas and 382 g in rural areas) that it is five times more than that of Europe (Ahamadabadi *et al.*, 2016, Sabeghi, 2004) and 6 times more than global average (Karizaki, 2017). Furthermore, it has been reported that bread can provide nearly 60-65% of daily energy and protein as well as 2-3 g of minerals among Iranian population (Chamandoost *et al.*, 2015).

One of the main sources of dietary salt and sodium is bread (Saavedra-Garcia *et al.*, 2016). The high sodium intake is associated with increased risk of health problems such as hypertension and cardiovascular diseases (CVDs), increased sodium levels and urinary calcium excretion, osteoporosis and gastric cancer (Geissler and Powers, 2017).

CVDs are the leading cause of premature death in the 21st century. Dietary factors, such as high salt intake is one of the main risk factors for hypertension and also CVDs (Sadeghi *et al.*, 2017). For this purpose, one of the key public health targets is controlling salt consumption policy (Brinsden *et al.*, 2013, Nwanguma and Okorie, 2013). On the other hand, salt content is a quality indicator of bread. Accordingly, the unauthorized levels of salt in bread may have adverse effects on consumers health and the quality of bread (Zibaeenezhad *et al.*, 2010). However, the various studies from Iran reported that the amount of salt in breads was higher than the standard in many cities, such as Charmahal & BaKhtiari (Moshtagi Mogadam *et al.*, 2004), Esfahan (Bashtam *et al.*, 1995), Mashhad (Hassanzadeh *et al.*, 2002), Kerman (Malakootian *et al.*, 2005) and Sabzevar (Khamirchi *et al.*, 2010). The mean salt in traditional breads in Tehran was 0.41% for Sankag, 1.39% for Barbary, 1.05% for Tafton and 1.14% for Lavash; while this value for both bulky and semi-bulky was 1.39%. In the cities of Yazd, Mashhad, Tabriz, and Kermanshah, the salt content in traditional breads was 0.57% for Sangak, 1.07% for Barbary, 1.60% for Taftoon, and 1.21% for Lavash. Overall 42.7% of traditional bread in Tehran and 47.2% of traditional bread in other cities were above the standard limit (Hradian *et al.*, 2017). Therefore, this study aimed to assess the salt content in variety of breads which were consumed in Yazd city, Iran in current situation.

Materials and Methods

This study was a current situation analysis as a cross-sectional research conducted in Yazd city, a central and traditional city in Iran.

*Sampling***:** Inclusion criteria were all of bakeries in area of Yazd city. The list of thesis bakeries obtained from the bakeries industry office. Ten percent of about 600 bakeries (62 bakeries; and in each bakery 2 bread samples) was selected using simple random sampling method. Sampling was performed among sample frame of ID number of each bakeries based on random digit number. Bread samples were collected by blinding manner and during 1 week. Finally, 9 types of bread were included and transferred to the laboratory of food and drug ministry.

Sodium content measurement: Sodium content was measured using flame photometer method by the device model: Corning 435. Each sample was measured twice. A photoelectric flame photometer is a device used in inorganic chemical analysis to determine the concentration of certain metal ions, such as sodium, potassium, lithium, and calcium.

Theoretically, it is a controlled flame test with the intensity of the flame color measured by photoelectric circuitry. The intensity of the color depends on the energy absorbed by the atoms that was sufficient to vaporize them (Terrier, 1953). Salt content in bread was calculated according to this formula: Salt (g)×1000/2.5 = sodium (mg) and estimation reported in each 100 g bread.

Data analysis: An independent sample *t*-test was used for comparing salt content in various bread types. Moreover, one sample *t*-test was applied for comparing salt content of different bread types with the standard level of 1 g/100 g bread. Post hoc analysis of LSD was used for comparing of salt content among various bread types.

Results

In this study, 62 random samples of different bread types were analyzed in Yazd city. **Table 1** represents the frequency and distribution of different bread types among examined random samples in Yazd. Nan-Taftoon (Tanuri) was the most popular bread type among traditional breads in Yazd city (45.2%). Nan-Taftoon machini (20.6%) and Nan-khoshk (14.3%) had the second and third rank. Nan-barbari mashini (4.8%), Nan-fantezi (4.8%), Nan-sangak (3.2%), and Nan-lavash (3.2%) had lower frequency, respectively. The mean and standard deviation of salt content in common types of traditional bread in Yazd are presented in **Table 2**.

It was found that Nan-TaftoonTanuri had significantly more salt content than Nan- Fantezi and Nan-Sangak. (mean difference about 1g salt/ 100 g bread, $P < 0.02$) (**Table 3**).

Furthermore, it was observed that Nan-Sangak had significantly lower salt content than Nan-Taftoon Tanuri and Nan-Taftoon Machini and Nan-Khoshk. (mean difference about 0.8-1 g salt/ 100 g bread, $P < 0.05$) (**Table 4**).

The findings showed that the mean salt content of traditional breads was more than the standard level (1 g salt /100 g bread) (mean difference = 0.74 , 95% CI (0.58-0.89) ($P < 0.0001$) (**Table 5**).

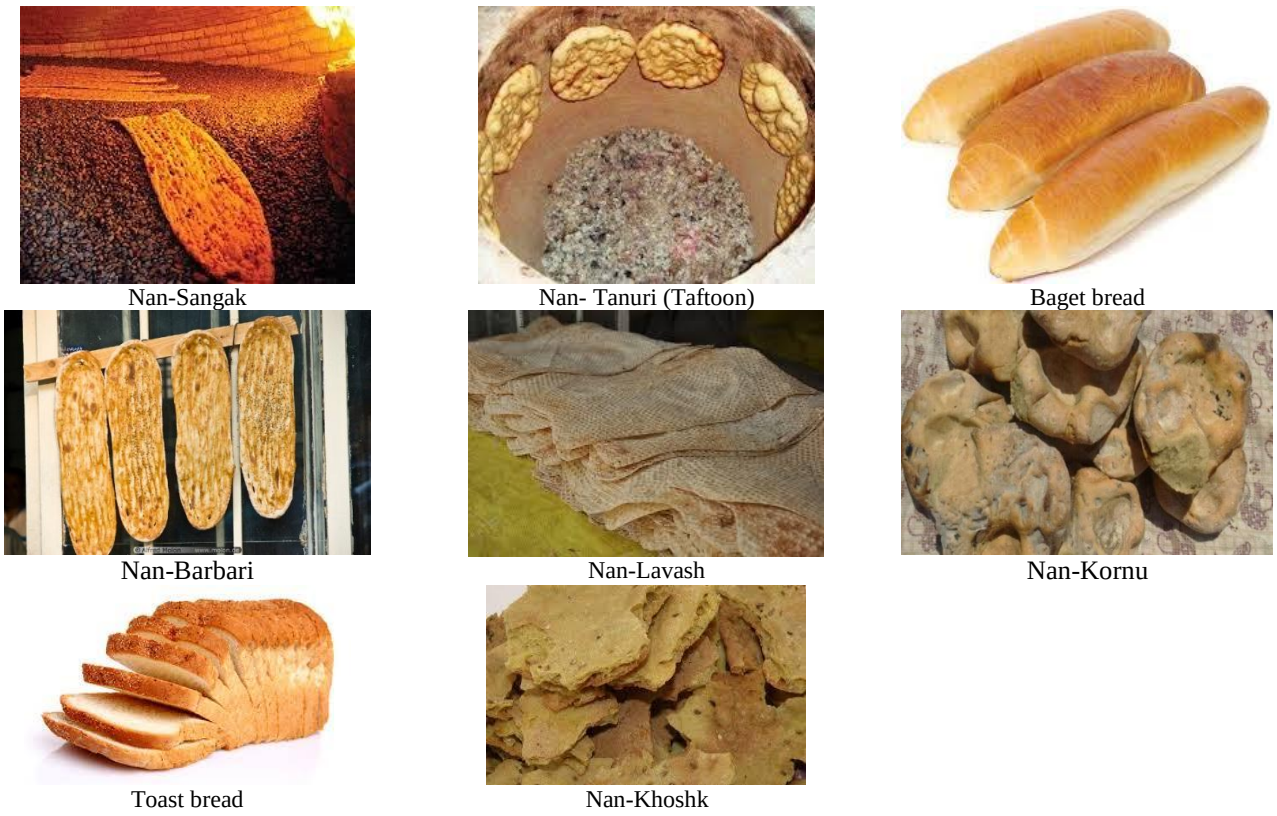

Figure 1. Traditional and none traditional bread types in Iran

Table 1. Frequency and distribution of different breads among evaluated random samples in Yazd city.

Persian name of breads	Frequency	Percent
Nan-Tanuri (Taftoon)	28	45.2
Nan- Barbari	1	1.6
Nan-Barbarimashini	3	4.8
Nan-Sangak	2	3.2
Nan-Taftoonmachini	13	21.0
Nan-Lavash	2	3.2
Nan-Fantezi	3	4.8
Nan-Kornu	1	1.6
Nan-Khoshk	9	14.5
Total	62	100.0

Table 2. The mean and standard error of salt content in common types of traditional bread in Yazd city

Persian name of breads	Mean (g/100 g bread)	N	SE [a]
Nan-Tanuri (Taftoon)	1.9	28	0.11
Nan-Barbari	2.4	1	-
Nan-Barbari Machini	1.3	3	0.33
Nan-Sangak	0.8	2	0.02
Nan-Taftoon Machini	1.7	13	0.17
Nan-Lavash	1.6	2	0.29
Nan-Fantezi	0.8	3	0.19
Nan-Kornu	1.9	1	-
Nan-Khoshk	1.9	9	0.14
Total	1.7	62	0.07

[a]: Standard Error

Table 3. The mean and standard error of salt content between Nan-Taftoon and other traditional breads in Yazd city

Persian name of breads	Mean Difference	SE[a]	P-value
Nan-Sangak	0.97	0.40	0.02
Nan-Barbari Mashini	0.47	0.30	0.17
Nan-Taftoon Mashini	0.08	0.18	0.10
Nan-Lavash	0.18	0.40	0.61
Nan-Fantezi	0.98	0.33	0.005
Nan-khoshk	-1.20	0.21	0.55

[a]: Standard Error

Table 4. Comparing the mean and standard error of salt content between Nan-Sangak and other traditional breads in Yazd city

Persian name of breads	Mean Difference	SE [a]	P-value
Nan-Taftoon Tanuri	-0.97	0.40	0.02
Nan-Barbari Mashini	-0.47	0.50	0.32
Nan-Taftoon Mashini	-0.89	0.42	0.01
Nan-Lavash	-0.78	0.50	0.16
Nan-Fantezi	0.009	0.50	0.98
Nan-khoshk	-1.1	0.43	0.01

[a] : Standard error

Table 5. Comparing the mean and 95% confidenc interval (CI) of salt content of traditional breads in Yazd city with the standard level (1 g salt/100 g bread)

Persian name of breads	Mean difference (95% CI)	T	P-value
Nan-TaftoonTanuri	0.88 (0.66-1.1)	8.14	0.0001
Nan-Barbari Machini	0.35 (-1.07-1.77)	1.07	0.39
Nan-Sangak	-1.15 (-0.52-0.21)	-5.10	0.12
Nan-Taftoon Machini	0.74 (0.36-1.13)	4.22	0.001
Nan-Lavash	0.63 (3.07-4)	2.18	0.27
Nan-Fantezi	-.16 (-1.001)-(-0.63)	-0.80	0.49
Nan-Koshk	0.92 (0.62-1.2)	6.70	0.0001

[a] : Standard error

Discussion

This study indicated that salt content of traditional breads in Yazd city was approximately 1.75 g/100 g bread that are significantly more than the standard level (1g/100 g bread). Nan-Taftoon Tanuri is the most popular and had the highest salt content among other bread types in Yazd. However, Nan-Sangak and Nan-Fantezi had the least salt content.

The salt content of bread was decreased from the most to the least was seen in Nan-Barbari, Nan-TaftoonTanuri, Nan-Koshk, Nan-Kornu, Nan-Taftoon Machini, Nan-Lavash, Nan-Fantezi and Nan-Sangak, respectively. All of bread types had more than the standard level (1 g/100 g breads) except Nan-Sangak and Nan-Fantezi.

Nwanguma and Okorie evaluated salt content of bread as a major source of sodium in Nigerian diet in 2013. They reported the salt content in bread from 0.51 g per 100 g (0.51%) to 1.8 g per 100 g (1.8%). The average salt content was 1.36 g per 100 g of bread (Nwanguma and Okorie, 2013). However, the samples had more salt content than Nigeria (1.75 VS. 1.36g/100 g bread). In Amman, it was observed that the average salt content in bread samples was 1.19 ± 0.21 g salt/100 g of fresh

bread. Moreover, it was found that its range was between 0.42 g/100 g for white Arabic bread and 2.06 ± 0.19 for Shrak bread. The study suggested that the salt content should be reduced gradually to a lower amount (Hradian *et al.*, 2017)).

Brinsden et al. observed that processed foods contain breads are the biggest contributor of salt consumption. The average salt level of bread was reported 1.23 ± 0.19 g/100 g in 2001, 1.05 ± 0.16 in 2006 and 0.98 ± 0.13 in 2011. This finding showed a significant reduction in salt/100g as 20% from 2001 to 2011.This study recommended that salt reduction intervention is feasible and possible (Brinsden *et al.*, 2013).

In another study, Akpolat et al., examined salt content average of bread in turkey in 2009. They found that daily salt intake was about 18 g/person in Turkey. It was estimated that average bread consumption in turkey was about 400g/d/person as the result mean salt consumption by bread was 7.28 g/d (Akpolat *et al.*, 2009). Usually a person with 70 kg weight eat about 320 g bread daily; therefore, according to this study, people in Yazd receive about 5.02 g/daily from bread that is more than total recommended level of 5 g daily salt intake (Hassanzadeh *et al.*, 2002, Zibaeenezhad *et al.*, 2010).

Joossens et al., evaluated the salt content among breads in Belgium and 25 other regions or countries worldwide. Out of 1166 dried bread samples; 534 samples were from Leuven, 562 samples from 11 other European countries, 44 from the United States and Peru, and 26 from Asia. The average mean salt content of fresh bread in European countries was 1.24 $\pm$ 1.7 g/100 g for white types. In Japan and Korea it was about 0.85 g/100g and in Pakistan, Thailand, Nepal, and Laos was about 0.5 g/100g. Bread with a very low salt content was found in certain areas of Peru, Spain, and Italy (Joossens *et al.*, 1994). In this study, the bread salt content was close to European countries.

A study from Iran reported that mean salt in bread in Shiraz was 1.9 $\pm$ 0.21 g/100g (Zibaeenezhad *et al.*, 2010). Also, another Iranian study in Mashhad estimated the mean salt level among 708 bread samples as 1.22 ± 0.09%. About 0.1% measured samples of Mashhad had salt higher than the standard level (Standard level: ≤ 1.8%). Furthermore, this study showed that Taftoon (1.21 ± 0.08%) and Sangak (1.25 ± 0.2%) contained the lowest and highest salt concentration, respectively.

It was found that bread salt content reduction strategies can help primary prevention of hypertension. Furthermore, reducing salt in bread could be a suitable, cost-effective and sustainable strategy to reduce community salt intake, without other complex individual behavior change strategies (McMahon *et al.*, 2016). However, sudden reductions in salt content of bread affect bread flavor and make it less palatable. However, scientists suggested that almost up to 20% reducing salt content could be detected by the consumer, without the consumer acceptance changes especially if it occurs in a gradual manner (Quilez and Salas-Salvado, 2016, Saavedra-Garcia *et al.*, 2016).It can be used by health policy makers to reduce salt less than 20% in gradual manner.

Conclusions

It was found that salt content of breads as a popular national daily diet in Iran was higher than the recommended level of 1gr salt per 100 g breads. Considering the roll of salt in hypertension as the most important risk factor for cardiovascular disease and also according to feasibility of salt reduction strategies, it is essential and urgent to take interventions for reducing salt content in bread by health policy makers.

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Conflicts of interest

There is no conflict of interest.

Author's contribution

This study was suggested and conducted by Namayandeh SM and Lotfi MH. Salt measurement was performed by Jafari V, Dad V, Biabani J and Razi MH. Data entry and analysis, first draft of

article, and submission were performed by Namayandeh SM and edited according to nutritional aspect of this article by Sangsefidi ZS. All authors reviewed the final draft of the article.

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