

A Study of Salt (Sodium Chloride) Content in Different Bread Consumed in Shiraz City in Spring/Summer 2009

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Background: Randomized controlled studies over the last 4 decades demonstrated that controlling blood pressure could reduce the risks of cardiovascular disease. The relationship between diet ingredient (particularly the salt) and blood pressure has been well established and since bread is the main element in population diet, especially in our country, the determination of sodium content of bread is of high priority and warrants further investigation.

Method: A total of 204 bakeries were selected for this study and the amount of salt in different bread was measured once during spring and summer, using the method of Iran's Organization for Standards and Industrial Investigation. The study was performed on 6 different kinds of bread baked in different districts of Shiraz city.

Results: This study demonstrated that 17.9% of bread's salt level in Shiraz exceeds the standard level and the remaining 82.1% is within the standard range. Mean percentage of bread's salt was reported as 1.31 gram%.

Conclusion: Compared to the previous reports, the results of present study fortunately showed a reduction of salt in bread during the last two decades. However, 17.9% of bread's salt is yet more than the standard level.

Keywords: Hypertension, Diet, Bread, Salt

Introduction

Cardiovascular disease, the leading cause of death and disability, is associated with inadequate blood pressure control.^{1,2} The relationship between blood pressure and risk of cardiovascular events is positive, continuous, consistent and independent of other risk factors.² Randomized controlled studies over the last 4 decades support the effectiveness of controlling blood pressure in reducing the risks of cardiovascular disease.³ Failure to reach the desired level of blood pressure contributes to the burden of hypertension complications.⁴ Results of the cardiovascular health study suggest that failure to reach the innocuous blood pressure (systolic BP \leq 140 mm Hg) accounts for 34% of strokes and 22% of myocardial infarctions in the elderly.⁵

The relationship between diet and blood pressure has been well established. Also, lower blood

pressure has been correlated to higher intakes of potassium, calcium, magnesium, protein and fiber.⁶ Reducing salt consumption in all kinds of food would help control blood pressure in hypertensive patients and decreases risk of cardiovascular disease and mortality in the population.⁷

In a study, it was noted that if sodium intake was reduced by a median of 78 mmol per 24 hours (based on urinary sodium excretion) blood pressure was on the average reduced 5.0/2.7 mm Hg in hypertensive patients and 2.0/1.0 mm Hg in normotensive subjects, considering a direct relationship between sodium intake and the blood pressure.^{8,9}

Excessive sodium consumption also may cause resistant hypertension.¹⁰ A study conducted on 2400 individuals revealed that increasing salt consumption (100 mmol per 24 hours) elevated the risk of cardiovascular disease by 45% and mortality by 26%.¹¹

Therefore restricted sodium intake is considered to be useful for all people, as a preventive measure in normotensive and, more certainly, as partial therapy in hypertensive patients.¹²

Implementation of dietary changes can pro-

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duce significant beneficial results on blood pressure levels within two weeks and can persist over time if the changes are maintained. It should be noted that dietary changes are important not only for treatment of hypertension but also for prevention.^{13,14}

The European Society of Hypertension (ESH) and the European Society of Cardiology (ESC) recommended reducing daily sodium intake from 100 to 65 mmol per day corresponding to 3.8 grams per day of sodium chloride, which may be currently hard to achieve. An achievable recommendation is less than 5 grams sodium chloride per day that is 85 mmol per day of sodium.^{11,15}

The recommended solutions for reducing sodium intake are frequent consumption of natural food, lowering sodium content of processed foodstuff and fast foods, adding no excessive salt to meals during cooking or at the table and using half sodium chloride and half potassium chloride preparation or pure potassium chloride substitute.¹²

Since bread is the main element of diet, especially in our country, therefore sodium content of bread is of high importance and demands further investigation. Greater attention paid to this topic will hopefully lead to favorable outcome of related diseases in the coming years.

Patients and Methods

This is a descriptive study on bread's salt from 204 bakeries in different districts of Shiraz. The amount of bread's salt was measured once in each season of spring and summer. Overall, 408 bread

samples were collected from bakeries for measuring their salt content.

Considering the number of bakeries in each area, samples were taken from 6 different kinds of bread. These are known as Lavash (Fig. 1a), Sangak (Fig. 1b), Taftoon (Fig. 1c), Mashini (Fig. 1d), Fantezi (Fig. 1e) and Barbari-Tanoori Sonati (Fig. 1f). Samples were sent to the laboratory for quantitation of their salt content. The method used for measuring breads' salt was that of Iran's Organization for Standards and Industrial Investigations. This included the adding of respective ingredients to a 250 ml flask in the following order, 1 gram of dried and ground bread, 10 ml. of 0.1 normal silver nitrate (1 ml of 0.1 normal silver nitrate solution is equal to 0.00585 gr of sodium chloride). , and 10 ml concentrated citric acid. The flask content was heated until it boiled. The mixture was made clear by adding 5 ml. of saturated potassium permanganate to the boiling solution. Having cooled the flask, 100 ml. of distilled water and 5 drops of ammonium sulfate ferric reagent were added to the container and the titration was carried out by drop wise addition of 0.1 normal ammonium thiocyanate until a brown-reddish color appeared and remained for at least 15 seconds.

Salt percentage= (0.1 normal Silver nitrate - 0.1 normal ammonium thiocyanate) × 0.585

Statistical analysis

T and one-way ANOVA tests were conducted for statistical analysis of the data, using SPSS software version 15. P values less than 0.05 were con-

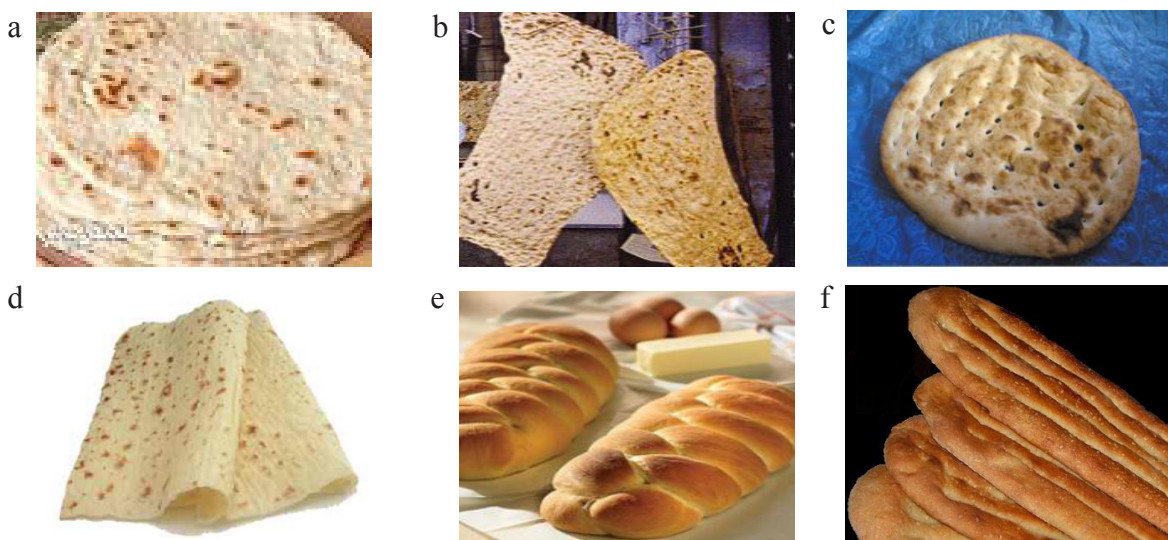


Figure 1. Different kinds of bread. Lavash (Fig. 1a), Sangak (Fig. 1b), Taftoon (Fig. 1c), Mashini (Fig. 1d), Fantezi (Fig. 1e), Barbari-Tanoori Sonati (Fig. 1f).

Table 1. Percentage of salt in different bread

Bread type	Less than 2%	More than 2%	Sample volume	Mean percentile of salt
Lavash	190(78.8%)	51(21.2%)	241	1.4795
Sangak	39(95.12%)	2(4.88%)	41	1.0200
Taftoon	53(75.7%)	17(24.3%)	70	1.4112
Mashini	47(95.9%)	2(4.1%)	49	0.6148
Fantezi	4(100%)	0(0%)	4	0.8825
Barbari-Tanoori Sonnati	2(66.7%)	1(33.3%)	3	2.1967
Total	335(82.1%)	73(17.9%)	408	

sidered significant.

Results

In this cross-sectional study, a total of 408 bread samples were collected during spring and summer (204 samples in each season).

In regard to the abundance of bakeries, collected samples of each bread were different. Largest samples were Lavash and the smallest were Barbari-Tanoori Sonati (Table 1).

In this study the percentage of salt in bread was either higher or lower than 2%. Values more than 2% were considered above the standard limit regarding WHO recommendation for salt content of bread.

The present study showed that 17.9% of breads' salt level in Shiraz was more than the standard level and 82.1% of it was within the standard range (Table 1).

However only average salt content of Barbari_Tanoori Sonnati bread was higher than the standard level ($P < 0.001$) and in reducing order was found in Lavash, Taftoon, Sangak, Fantezi and Mashini. (Table 1)

Statistical analysis demonstrated that there was no significant statistical difference ($P = 0.411$) between percentage of salt in spring and summer (Table 2).

Discussion

Randomized controlled studies over the last 4 decades demonstrated that controlling blood pressure could reduce the risks of cardiovascular disease.³ Failure to reach the desired level of blood pressure contributes to the burden of hypertension complications.⁴ The relationship between diet (specially the salt content of diet) and blood pressure has been well established.⁶

Bread constitutes a most important source of diet of the population. Master plan studies of the pattern of household food consumption demonstrated that bread and cereals supply more than 55% of the daily energy in the population of Fars province and account for more than 40% of food basket of families.^{17,18}

Studies done from 1967 to 1992 on 1166 bread samples from 26 different countries demonstrated that bread is a major source of salt in societies and such studies also indicated that salt content of the examined samples exceeded the the standard level in many counties and needed to be reduced gradually.¹⁹ The results of similar studies on salt levels of bread in our country carried out during 1994 to 2005 indicated that the amount of salt in bread was higher than the standard level in Shiraz, Mashhad and Isfahan.²⁰⁻²¹

The permissible amount of salt in flours is 2 grams in 100 grams of dry substance.¹⁶ The present study showed that 17.9% of breads' salt level in Shiraz was more than the standard level and 82.1%

Table 2. Percentage of salt in spring and summer seasons

Season	Less than 2%	More than 2%	Sample volume	Mean percent-age of salt
Spring	165(80.9%)	39(19.1%)	204	1.3449±0.66
Summer	170(83.3%)	34(16.7%)	204	1.2894±0.69
Total	335(82.1%)	73(17.9%)	408	

Table 3. Comparison of the amount of salt (gram %) in Shiraz (2009 and 2005) and Mashhad (2002)

Type of Bread	Shiraz 2009*	Shiraz 2005	Mashhad 2002
Barbari-Tanoori Sonnati	2.19	1.25	2.39
Lavash	1.47	2.78	2.6
Taftoon	1.41	2.57	
Sangak	1.02	1.9	1.9
Fantezi	0.88	1.73	
Mashini	0.61	1.07	1.27

* in grams%

of it was within the standard range. Similar study performed in 2005 by Dr.Sharifi on 70 samples of bread in Shiraz, showed that the amount of salt in 58% of the bread examined was higher than the standard level. In that study the mean percentage of salt in bread was 2.18 ± 1.02 with a maximum of 5.30 and a minimum of 0.3.²⁰ In our study mean percentage of bread's salt was 1.31 with a maximum equal to 3.5 and a minimum of zero. A comparison between the results of these two studies showed that the salt level in bread in Shiraz has been reduced significantly in the last few years (Table 3).

This study showed the amount of salt in reducing order was found in Barbari-Tanoori Sonati, Lavash, Taftoon, Sangak, Fantezi and Mashini. Previous studies conducted in Shiraz and Mashhad also showed almost similar results with Mashini bread having the lowest amount of salt.^{20,21}

This study showed that there was no significant statistical differences between the amount of salt in different areas except for area number 2, ($P = 0.66$). A comparative study was not possible, as previous studies in Shiraz did not delineate divisional classifications. This study demonstrated that only average salt content of Barbari_Tanoori Sonnati bread was higher than the standard level ($P < 0.001$). However, the average amount of salt in other types of bread was lower than the standard level ($P < 0.001$).

According to previous study carried out in Shiraz, the amount of salt in Lavash (average 2.78) and Taftoon bread (average of 2.57) were above the standard level.²⁰

The results of this study and their comparison with those of previous report fortunately showed a reduction in salt content of bread in Shiraz during the last two decades. In regard to the adverse effect of excessive salt intake on blood pressure and its accompanying cardiovascular disorders, collective effort and rigid control by all organizations concerned are needed to raise public awareness and adjust the amount of salt in bread to the standard level.

As mentioned previously. European Society of Hypertension (ESH) and European Society of Cardiology (ESC) Guidelines for the management of arterial hypertension in 2007 recommended reducing daily sodium chloride intake to 3.8 grams per day.¹² One of the practical ways to reach this goal is to replace processed food with natural diet and to reduce daily consumption of salt.

Acknowledgement

This work was financially supported by Vice Chancellor for Research of Shiraz University of Medical Science. The authors declare that they have no conflicts of interest.

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