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AMOUNT OF BAKING SODA AND SALT IN THE BREAD BAKED IN CITY OF ZABOL

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ABSTRACT

Large amounts of proteins, calories and minerals are supplied from bread. In the meanwhile, baking soda prevents their absorption and much salt causes various diseases. The aim of this case study was to determine the amount of baking soda and the salt in bakeries of Zabol. For this purpose, 95 bakeries were chose from Zabol through census method and pH and salt and baking soda used in them were determined. In addition, information such as employment history and education level of dough-preparer was also collected and their relationship was evaluated using baking soda through statistical tests. The results showed that 67.36% of the samples had pH greater than 6. The highest pH was observed in Taftoon bread as 73.97%. 30.52% of samples had salt more than the standard level. The present study also showed a significant relationship between the type of bread and the use of baking soda in it (P- Value: 0.039). No significant relationship was observed between the type of bread and the use of salt. Accordingly, the most bread types baked in the city of Zabol are in about standard level in terms of the salt amount and the baking soda.

INTRODUCTION

Bread as the most important product of wheat is the staple food of many countries of the world and supplies a major part of daily energy, protein, minerals and vitamins required by body [1-3]. Based on the results of the consumption pattern of households, average per capita bread consumption in Iranian households is 320 grams a day [286 grams in urban areas and 382 grams in rural areas] [4, 5] which is five times greater than per capita consumption in Europe which is 60 g per day [2, 6] In addition, bread is a necessity in Iranians' food basket and is considered as a valuable and sacred foodstuff. Low cost and wide acceptability of it has caused this foodstuff to play an important role in satiating the hungry and a producing a major part of the energy demands of the country's households [5]. Bread is one of the sources of micronutrients such as iron to body [1,7] and has been able to meet 10% of the iron needed for the body [1,8] In the case of using leaven or yeast, it can cause degradation of phytate available in dough and therefore can play an important role in increasing the bioavailability to some minerals including iron, zinc and calcium [9] In order to produce a stuffed bread, the dough should have a uniform porosity and be strong and flexible when touching [10] the bread crust should be in golden brown colour, crispy and chewable [7] The bread produced by a dough which is not bulky and porous by yeast or sourdough is kept at a very low level in terms of taste, digestibility and thereby is not suitable for consumption [7, 11]. In our country for various reasons including saving time and providing quick dough, workers' impatience and low skill, unfortunately bakeries sometimes use harmful chemical additives such as baking soda and salt that expose consumers' health at risk [3,7,12] The mentioned substances are illegally used to puff or leaven bread in the bakery because this chemical substance is decomposed on heating and carbon dioxide gas is produced and a part of sodium bicarbonate is converted to sodium carbonate during this process which is resistant to heat [12,13] Baking soda not only affects the bread colour and makes it yellow or darken, but also gives unfavourable and alkaline taste and flavour to bread due to sodium carbonate and also causes anaemia, increases uptake of heavy metals including lead, cadmium, mercury, enhances absorption of iron, zinc, calcium, osteoporosis, cardiovascular diseases especially in children and women, causing or

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aggravating convulsions in children, intellectual weakness, fatigue, hands-trembling, vitamins inactivation, preventing the fermentation process, impaired digestive enzyme activities and thus indigestion that causes stomach cramps and bloating leading to stomach and intestines diseases and reduces the flavour and taste of the bread and un-leavening the bread and increasing bread wastes [3,7, 14, 15] And in addition, consuming baking soda reduces the growth and yeast activity and thereby reduces phytate enzyme activity in bread with increasing ambient pH [16]. Besides, consumption of salt can cause blood pressure due to increasing the sodium in the bread [9]. Reports have shown that one reason for high bread wastes in Iran is the use of baking soda in bread-baking process so that there is a bread waste as 15%-20% of in our country; while the bread waste is 1%-2% in developed countries [9, 16]. Although, the Ministry of Health has banned the use of baking soda in bread from 2002/03/11 [18], scattered observations indicate the continuity of using baking soda in bread. Accordingly, this study aims at investigating the use of baking soda and salt and the factors affecting baking soda in the bakeries of Zabol in 2014 and recommending some strategies for reducing the use of baking soda and salt in bread for transmitting health care infections to the patients and the common areas where contamination occurs.

MATERIALS AND METHODS

This is a cross-sectional study conducted in 2012 on 95 bakeries of Zabol. Data collection was performed through census. The number of cases for each type of bakery included 19 Lavash bakeries, 73 Taftoon bakeries and 3 Sangak bakeries. Prior to sampling, a special form was designed to record information including bakery characteristics [operator's name, age, work experience, the type of bread, the education level of bakery owners and daily baking rate). After referring to the bakeries while sampling the bread, the mentioned forms were also completed. To determine the performance of bakeries about the use of baking soda and salt, 3 loaves of middle-baked bread were chose from each bakery and were considered as a mixed sample. The samples were placed inside a nylon bag, and the characteristics of the sample including the place and date of sampling were written on it and sent for carrying out experiments. In the laboratory, samples were tested for the presence of baking soda based on the standard method of Institute of Standard for traditional breads, Standard. No. 2628. Based on the above-mentioned standard, bread pH is a maximum of 6 and thereby the pH greater than 6 in bread was considered as an indicator for the use of baking soda in the produced bread. [19] Measuring the salt was carried out according to Standard Method No. 2577 issued by Institute of Standards and Industrial Research of Iran, and the salt content of less than 2% was considered as authorized level and the higher amount was considered as unauthorized level. pH and salt were measured according to the standard method of Institute of Standard for traditional breads of Iran [20]. To determine pH, the bread sample is first fully dried and pulverized in the laboratory atmosphere and a 10 g pulverized sample is carefully weighed in flask 250 cc and 90cc distilled water is added to it and is capped. Then it was alternately shaken for 10-15 min and then the pH of sample was measured using pre-calibrated pH meter. The experiments were performed with pH meter and a scale with accuracy of 0.010. To measure the salt, one gram of the dried and milled sample was precisely weighed and placed in a flask 250 ml and 10 ml of silver nitrate solution (0.1 N) and 10 ml of concentrated nitric acid were added to it and then the mixture was boiled. When boiling, 5 ml saturated permanganate was added until the solution is colourless and 100 ml of water and 5 drops of Ferric Ammonium Sulphates solution were added to it after cooling. Then it was titred with a potassium thiocyanate solution(0.1 N) up to emergence of brown red colour and stability in this colour for 15 seconds [6] To analyze the results, the SPSS 18.0 software and chi-square test were used. For quantitative variables, mean and Standard Deviation [SD] were used as central tendency and dispersion measures and tables and chart-drawing were used for displaying data about the qualitative variables.

RESULTS

In this study, 95 bakeries were assessed in Zabol. The results showed that the amount of baking soda consumed in bread varies. 64 [76.36%] bakeries have used baking soda and this amount in Taftoon bread was more than other bread types [73.97%]. According to [Table 1], the difference between the frequencies of using baking soda in different bread types was statistically significant [P- Value 0.039]

Table 1: Frequency of different types of Iranian flat bread prepared by the bakeries of Zabol in terms of using baking soda

Type of Bread	With/Without baking soda		Total
	Without baking soda pH<6	With baking soda pH > 6	
Taftoon	[26.02]19	[73.97]54	100 [73]
Lavash	[52.63]10	[47.36]9	[100]19
Sangak	[66.66]2	[33.33]1	[100]3

Dough-preparers at the bakeries under study are divided into three groups of less than 5 years, 6-9 years and more than 10 years of work experience. Those with more than 10 years of work experience had the highest percentage in the groups with the frequency of 44 cases(46.31%) [Table 2]

Table 2: Distribution of work experience in different groups of dough-preparers

Work Experience [year]	Frequency [Percentage]
<5	[20] 19
6-9	[33.68] 32
>10	[46.31] 44
Total	[100] 95

The relationship between the use of baking soda and the work history of dough-preparers was assessed according to which (34.09%) of dough-preparers of this group with more than 10 years of work experience have not used baking soda and (65.90%) of members of this group have not used baking soda [Table 3]. Therefore we can say that there was no relationship between the dough preparers' work experience at bakeries and the use of baking soda (P-Value> 0.05).

Table 3: Frequency distribution of [use of baking soda] according to dough-preparers' work experience

Consumption of Baking Soda	Work Experience		p
	Yes	No	
	Number[percentage)	Number[percentage)	
<5	[31.57]6	[68.42] 13	P-Value > 0.05
6-9	[31.25] 10	[68.75] 22	
>10	[34.09] 15	[65.90] 29	
Total	[32.63] 31	[67.36] 64	

[Table 4] shows the frequency of dough-preparer workers in bakeries under study in city of Zabol according to educational level. The education level of bakeries staff can be categorized to 4 different groups: ["illiterate/elementary school", "guidance school", "diploma degrees)

The group with guidance school education level was the most frequent one with 49 cases (51.57%) in comparison with other education levels. It is also observed that those educated at guidance school grade use baking soda more than others (73.46%). And workers with high school education [57.69%) had used baking soda less than others. And no significant relationship was observed between the education level of workers involved in preparing dough in bakeries and the use of baking soda(P-value> 0.05).

Table 4: Frequency distribution of (use of baking soda) based on the level of education among dough-preparer workers in bakeries of Zabol

Consumption of Baking Soda	Yes Percentage	No Number [Percentage]
Level of Education:		
Illiterate	0	0
Elementary School	[35]7	[65]13
Guidance School]	[73.46]36
Diploma	[42.30]11	[57.69] 15
Total	[32.63]31	[67.36] 64

The amount of salt used in different bread types varies. 29 (30.52%) bakeries have used salt in their produced bread. This rate was more than other types in Sangak bread [one case (33.33%)]. According to [Table 5], the difference between the frequencies of using salt in different bread types was not statistically significant (P-Value> 0.05).

Table 5: Frequency distribution of salt consumption in different bakeries of Zabol

Type of Bread	Number	Those higher than the standard level. Number [Percentage]
Taftoon	73	(32.87) 24
Lavash	19	(21.05) 4
Sangak	3	(33.33)1

Although the bread had been considered and studied from various aspects as a staple food and an important foodstuff in the food basket of Iranian households in the scientific communities [8], paying attention to the supply and consumption of bread is very important in terms of health and nutrition as well as the national economy [21]. Baking soda has been detected in 64 out of 95 bakeries of Zabol [Table 1] In the case of Taftoon bread, bakery staff [73.97]. were using baking soda to make Taftoon bread. The best practice about lack of using baking soda was associated with Sangak bakery staff. However, according to the Ministry of Health reports, baking soda is used more in baking Lavash bread [22], in a

study conducted by Heidar Mah (2007) on sanitation and bread quality of bakeries in Isfahan, 9.8% of the Taftoon bread produced in machine bakeries and 4.76% of Taftoon bread baked in oven bakeries had used baking soda [23]. In a study by Pasdar Khoshknab et al in 1999 on the status of baking soda in bread baked in Kermanshah town, it was reported that 8% of bakeries under study had used baking soda and this is less than that of obtained in Zabol [24]. In another study, Asemi et al reported in 2004 about the non-consumibility of Lavash and Barbari breads in Kashan in terms of the use of baking soda according to standard method of Institute of Standard for traditional breads, Standard. No. 2628. based on the measurement of bread pH as 9.82% and 14.39% respectively [25]. The results of Malakoutian's study about the quality of baked bread and health status of bakeries in Kerman city show that the salt amount of 32.8% of bakeries that bake machine Taftoon bread and 9.4% of the oven Taftoon bakeries were above the standard level [26] which is inconsistent with the results of this study. Baking soda is mostly used when the dough-preparer worker is delayed at work and uses yeast instead of baking soda for early fermentation and preparation of bread. This leads to early fermentation and preparation of dough for baking bread [27]. The results obtained by Malakootian et al research about the quality of baked bread and the hygienic conditions shows that "Half of the bakeries added soda as a leavening agent to breads. The amount of salt used per production of each loaf of local bread: Sangak, indirect heat, machinery Taftoon and oven Taftoon bakeries was 48.72%, 33.33%, 31.13% and 8.97%, respectively, which was more than the approved standards" and 24.2% of Kerman's bakeries enjoyed suitable hygienic conditions [28]. Although the usual salt amount is useful for the body, but the daily salt requirement is in a range which is provided more than the needed level under normal circumstances of human diet. Accordingly, excessive salt in bread is not justifiable from this perspective [6]. Adding salt makes more dough stickiness and dough sticks to the walls of the oven. To reduce fluidity, dough resistance is increased and due to the poor quality of flour and lack of awareness of owners and workers of the bakery about the dangers of salt, more salt may be added to the dough according to habit. In the meanwhile, training and upgrading these subjects' knowledge can overcome this bad habit and planning is highly recommended in this regard [6, 26]. Much salt has reduced the yeasts activities of dough and consuming it for a long time can increase blood pressure. This is also harmful for people who suffer from kidney diseases and heart failure [29- 33]. Although various studies show that the amount of baking soda in bread has decreased compared to the past decade.

CONCLUSION

The results of this study and other studies indicate that the use of baking soda and salt in bread still illegally continues despite the disadvantages of using baking soda and banning its use in bread by Ministry of Health and the irreparable damages of salt to the body system especially in patients with kidney disease and those with high blood pressure. Accordingly, health authorities and other organs in charge with this issue can act for producing high quality bread and full elimination of baking soda and other illegal additives from the bread with granting supervision ID with the presence of technical officer, and continuously monitoring and controlling bakeries, the continued implementation of applied research to enhance the quality of bread, and intensifying the implementation of legal regulations. Fortunately, in the amendment to Article 13 of the law on foodstuffs, beverage, and cosmetics, training the operators and workers in food preparation and distribution centers such as bakeries have been considered. And has required the bakeries to attend the public health education classes before the start of the work. it seems it is possible to increase the knowledge level of the bakery staff if topics such as losses from the use of baking soda in bread-baking and the benefits of fermentation to be raised in addition to the topics included in the curriculum of public health for bakery staff.

CONFLICT OF INTEREST

There is no conflict of interest.

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