

Original Article

Studying the Environmental health status and consumption of Baking soda in military and urban Lavash bakeries of Tehran in 2012

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Abstract

Background and purpose: Consumption of baking soda, as a primary material for preparation of bread dough, has been banned due to its health complications in Iran. So bread production in our country faced difficulties and one part of them is related to health issues which are bread production. Also, in some cases, baking soda is used in the bread production. This study was done to study the environmental health status and consumption of baking soda in the military and urban Lavash bakeries of Tehran in 2012.

Materials and methods: This is a descriptive comparative study done on Lavash bread production of 14 military bakeries and 14 corresponding urban bakeries near them. PH in the samples was tested based on Institute of Standards and Industrial Research of Iran No. 2628. To check the status of environmental health and personal hygiene of bakeries, the check list of Cereal Research Center was used.

Results: In terms of environmental health status, 28.6% military bakeries and 7.1% urban bakeries were at good level. In terms of personal hygiene, all bakeries were in the poor category. Also, 42.9% of military Lavash bakeries and 14.3% of urban Lavash bakeries used baking soda in their bread production.

Conclusion: Environment health and personal hygiene status in military bakeries are better than the urban bakeries; however, hygiene status was not desirable in military bakeries. Also, baking soda consumption in military bakeries was more common than the urban bakeries. According to the results of this study, control of health status and avoiding baking soda consumption in the bakeries are necessary.

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1. Introduction

Bread has particular importance from nutritional, health, and social points of view. It constitutes an essential role in people's nutrition basket, especially for individuals with lower income (1). As bread is the most extensively used food item in Iran and each Iranian consumes an average amount of 300 g bread per day, it is critical to pay attention to the production and consumption conditions of bread, from hygienic, nutritional and economical attitudes. A study on bakeries of Tehran in 2009 revealed that among 7 types of popular breads, Lavash has the highest rate of consumption (39.1%), and similar conditions prevail in the military, as well (2). Using baking soda deteriorates the health quality of bread. Baking soda (sodium bicarbonate) causes rapid swelling of the dough (3) and that is why it is used in bakery. Considering the adverse effects of baking soda in bread preparation, it was forbidden for use in bread by the Ministry of Health in 2001 (4) and mandated to the bakers' guild by the Ministry of Commerce in 2006, obliging bakers to use sour dough (3). Replacing the natural fermentation process with baking soda leaves the phytic acid in bread unchanged. It is a relatively stable chemical compound which absorbs bivalent ions in the form of phytate and compromises mineral absorption in body (6). At the same time, malabsorption of micronutrients is a major global issue, with approximately 3 billion people in developing countries at risk of zinc and iron deficiency (7). Modifying bread baking process and eliminating baking soda may serve to reduce the amount of phytic acid and improve micronutrient absorption (6).

In addition, unhygienic conditions of bakeries may provide the background for chemical and microbial contaminations (2). Numerous study findings indicate that the health conditions of Iranian bakeries (personal hygiene of workers, environment health of bakeries, hygiene of raw materials and the production process) are less than acceptable (8). Moreover, since the products of bakeries cannot be modified after completion and presentation to the clients, the need for hygienic conditions in bread production is highlighted.

Therefore, considering the adverse effects of using baking soda in bread preparation and the importance of health standards in bakeries, we undertook the present study to compare the quality of bread products in Lavash bakeries (civilian and military) of Tehran in terms of using baking soda and hygiene conditions in 2012.

2. Materials and Methods

This is a descriptive, comparative study conducted in Tehran in 2012. The study population consisted of Lavash bakeries of a military force headquarters and its barracks in Tehran province (14 bakeries) and an equal number of neighboring civilian bakeries selected through survey. Out of the 28 bakeries, we sampled 3 bread loaves from the middle products of each bakery, yielding a total of 84 Lavash loaves for baking soda and pH measurements. The pH of each specimen was measured in triplicate separately, and the average value was recorded as the pH of bread produced in that bakery. pH measurements were performed in accordance with the standards of Iran's Standard and Industrial Research Institute, protocol number 2628 (9). For this purpose, the specimens were first dried in laboratory environment, and then ground to a homogenized powder using an electric grinder. Subsequently, 10g of the ground powder was weighted in a 250cc flask. 90cc distilled water was added to it and then shaken alternately for 10-15 minutes with the flask closed. A Mettler Toledo pH meter was then used to measure the pH (9). Specimens with pH values above 6.2 were considered as containing baking soda (3).

We used the standardized checklist of the Cereal Research Center to assess the personal and environmental hygiene in bakeries. The checklist contains 68 questions and has a Cronbach's alpha of 0.89. The scores were then classified as Good (53-66), Average (40-52) and Poor (<40). Data from the checklists and baking soda tests were analyzed on SPSS software version 16 using descriptive (frequency and mean) and analytic (independent t-test, chi-square test, Fisher test) statistics.

3. Results

The findings indicate that 28.6% of military bakeries fall in the Good category, and 64.3% in the Average category. As for civilian bakeries, 7.1% fall in the Good category, 28.6% in the Average category, and the rest (64.3%) fall in the Poor category (Table 1).

Table 1. Distribution of frequency of environmental health conditions in military and civilian bakeries

Level Group	Good		Average		Poor	
	Frequency	Percent	Frequency	Percent	Frequency	Percent
Military	4	28.6	9	64.3	1	7.1
Civilian	1	7.1	4	28.6	9	64.3

Also, the personal hygiene of all military and civilian bakeries fell in the poor category. The distribution of frequency of bakeries for overall hygiene (environmental hygiene, personal hygiene, health of raw materials and instruments) indicated that most military bakeries (57.1%) were in the average category and most civilian bakeries (71.4%) were in the poor category, with Fischer's test indicating no significant difference between the two groups. In addition, none of the bakeries attained the good or excellent level (Table 2).

Table 2. Comparing the absolute and relative frequency of overall hygiene status in military and civilian bakeries

Level Group	Average			Poor			Fisher test significance level
	Count	Percent	Mean and standard deviation	Count	Percent	Mean and standard deviation	
Military	8	57.1	87.75 ± 6.1	6	42.9	68.75 ± 7.4	P=0.25
Civilian	4	28.6	81.75 ± 2.3	10	71.4	61.4 ± 8.71	
Total	12		85.75 ± 5.8	16		68.15 ± 8.8	

Our findings indicate that the mean pH value from bread specimens of military bakeries was higher than the civilian bakeries, with the difference being statistically significant ($p=0.012$) (Table 3).

Table 3. Mean pH of bread specimens from military and civilian bakeries

Group	pH	Mean	Standard Deviation	Independent t-test
Military		6.17	0.28	T=2.69 Df=26 P=0.012
Civilian		5.91	0.20	

In this study, we considered specimens with pH values below 6.2 as baking soda-free, and those with $pH > 6.2$ as containing baking soda (Table 3, 4).

Table 4. Comparing the absolute and relative frequency of baking soda use in military and civilian bakeries based on pH values

Level Group	Count	pH<6.2		pH>6.2		Fisher test significance level
		Frequency	Percent	Frequency	Percent	
Military	14	8	57.1	6	42.9	0.209
Civilian	14	12	85.7	2	14.3	

4. Discussion

Investigating the environmental hygiene of bakeries revealed that 28.6% of military and 7.1% of civilian bakeries were in good conditions. A study by Partovi also indicated that 37% of civilian bakeries observed the conditions of environmental hygiene relatively (10). Sharifi Arab et al demonstrated that 23% of bakeries in Shahroud were in poor conditions, 67% were in average, and 10% were in good conditions, making them better compared to our civilian bakeries but poorer than our military bakeries (2).

A study by Malakoutian et al, reported that merely 16% of civilian bakeries in Rafsanjan had an acceptable health situation, which is not consistent with our findings (11). Heidarmah et al, studied the parameters of environmental hygiene in bakeries of Isfahan, to report that 37% of them obeyed the standards relatively, that is, 63% of bakeries were in poor conditions, which is in line with the situation of civilian bakeries in our study (12).

The better conditions of military bakeries compared to their civilian counterparts may be due to the greater surface area of military bakeries and availability of an appropriate resting room without room limitations. On the other hand, civilian bakeries tend to have smaller than standard surface areas, and a small, dark poorly ventilated resting room. In addition, another advantage of military bakeries compared to civilian bakeries was the presence of a separate store for preserving flour and salt, whereas in most civilian bakeries, bags of flour were stacked inappropriately near the oven or other places. In certain cases, lack of space even prevented the use of a palette, resulting in bags of flour placed on the ground and water absorption by the flour.

Distribution of frequency of personal hygiene in bakeries revealed that all military and civilian bakeries had poor personal hygiene, with military bakeries having a better condition. The results indicate that on the one hand, the workers did not have adequate awareness and belief about the health standards, and on the other hand there was no regular and continuous supervision of their behavior. Examples of this kind include lack of a valid health certificate, lack of soap and washing liquids, unacceptable personal hygiene of the workers, and lack of appropriate working garments in some bakeries.

A study by Gholami about the hygiene conditions of bread production in urban areas of Ilam reported that only 57.7% of bakers observed their personal hygiene, which is better compared to the bakeries addressed in our study (8). These findings highlight the need for further attempts aimed at education, supervision, and monitoring personal hygiene in this group of workers. Finally, the distribution of frequency of the bakeries in terms of the overall hygiene status (hygiene of the environment, workers, raw materials, equipment) revealed that most military bakeries (57.1%) were in average conditions, and most civilian bakeries (71.4%) in poor conditions, with Fischer's test indicating a significant difference between the two groups. In addition, none of the bakeries could accomplish a good or excellent level.

Currently, Lavash is the most widely used bread in Iran. Despite the adverse effects of using baking soda instead of sour dough in preparing bread (e.g. digestive symptoms, calcium, and phosphorus and iron malabsorption) confirmed by many studies, and the fact that the Ministry of Health has forbidden the use of baking soda in baking, it is still used illegally for bread production (3).

Our findings indicate that the mean pH of bread baked in military bakeries is significantly higher compared to the civilian bakeries (Table 3) and that baking soda is used in 42.9% of military bakeries and 14.3% of civilian bakeries. Although many bakery workers stated that they did not use baking soda during sampling, the test results confirm the illegal use of baking soda which is a violation of health regulations unfortunately neglected by the authorities. Kamani (2010), Rahmizadeh (2012), Jahed Khaniki (2006), Ayyub Beigi (2009), Rezayi Mofrad (2011), Asemi (2004), and Sharifi Arab (2009) reported that 60%, 88.9%, 82.6%, 8.4%, 12.5%, 9.82%, and 2%, respectively, of bakeries used baking soda for preparing lavash (2-4,13-16). Partovi reported that 25% of all bakeries (of any type) in Tehran used baking soda in preparing bread, most frequently machine-produced lavash and taftun breads (10). In general, the findings of the present study indicate that military bakeries used baking soda more than civilian bakeries. Other causes for baking soda use include lack of sufficient supervision and sampling bread produced by bakeries to perform quality control tests, and controlling baking soda use in bakeries through performing assessments and controlling complete dough fermentation by environmental health experts. The visits tend to focus on personal and environmental hygiene issues which are accomplished mostly through observation of the situation, while bakers tend to hide their baking soda from their view.

The findings of the present study indicated that the personal and environmental hygiene is better in military bakeries compared to civilian bakeries and is more consistent with health codes and regulations. On the other hand, baking soda is still used in military bakeries more than civilian bakeries.

As baking soda may endanger the consumers' health, its continued use will certainly pose risks to people's health. Therefore, the authorities should exert greater levels of supervision on bakeries, particularly military bakeries. Moreover, it is essential to educate bakers about the adverse effects of baking soda in order to control this problem.

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