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Sodium amounts in industrialized foods in institutional restaurants

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Abstract

For the benefit of individuals' health, consumption of sodium should be restrained, so it is important that customers of foodservice units (FNU) know what is really on their plates so that they can make appropriate choices. *Objective*: This research aimed to point out the impact of industrialized products as to the amounts of sodium offered to users of these units in the state of São Paulo, considering the suggestion of the World Health Organization of a daily consumption of less than 5g of sodium chloride, or 2g of sodium. *Method*: Information concerning industrialized products utilized in a period of thirty days has been collected from the stock control documents from each unit. The calculated quantity of sodium was the result of the multiplication of the information in the labels of the industrialized food by the amount used to prepare dishes served for lunch. Given that information and the number of served meals, the average amount of sodium offered daily by those products per client was calculated. This average was compared to the WHO's suggestion. *Results*: The content of sodium in industrialized food used in the dishes served by the FNUs is, on average, greater than the previously estimated amount for a lunch meal, reaching up to 2.5 times the prestablished suggestion. *Conclusion*: Consumption of this mineral should be reduced by raising the awareness of the population, foodservice managers and the Brazilian government.

Keywords: Collective Feeding. Industrialized Food. Lunch. Salt. Sodium. Recommended Dietary Allowances.

Introduction

Healthy eating is important because it helps protect against noncommunicable chronic diseases (NCD) such as diabetes, hypertension, stroke, heart diseases and some types of cancer, which potentially lead to death. These diseases are among the main causes of disability and death in Brazil and other countries.[1]

NCDs caused by increased blood pressure,[2] ostheosporosis,[3] stomach cancer,[4] metabolic syndrome,[5] etc. are problems that might have origin in inappropriate diets, especially when there is excessive salt intake, a very important ingredient in the world cuisine. Salt is composed primarily of two chemical elements, 40% sodium and 60% chloride.[6] Sodium is the element that, when eaten in excess, may be harmful to the individual's health. However, when adequate amounts of salt are ingested, this mineral will continue to perform important functions of the human body, which are: blood pressure control, regulation of plasma volume, transmission of nerve impulses, and muscle contraction.[7] Therefore, reducing sodium intake is important to decrease hypertension rates and, consequently, diminish morbidity and mortality caused by chronic diseases.

The World Health Organization (WHO) recommends a daily intake lower than 5g of sodium chloride, i.e., 2g of sodium;[8] however, studies indicate that in general consumption is much higher. The 2008/2009 Household Budget Survey 2008/2009 shows that part of the Brazilian population consumes 3.6g of sodium per day.[9] In Portugal, studies indicate a consumption that ranges between 9 to 12 grams of salt per day,[10] as well as in the United States.[11] In the United Kingdom, average daily consumption is 8.1g.[12]

Thus, in order to find possible alternatives to diminish the intake of this nutrient, it is necessary to know its sources, which can be the most diverse, including: salt addition and/or sodium added to industrial foods, monosodium glutamate, sodium bicarbonate, sweeteners, additives, etc., as well as sodium naturally contained in foods.[13]

It is widely known that the amount of this nutrient in processed foods is very high. Sichieri et al. found in their research that industrial foods have up to 20 times more salt than natural foods, resulting in a considerable addition of sodium to the meal.[14] Concerned about these facts, the Ministry of Health developed the Plan for Sodium Reduction in Processed Foods, which is part of the Plan for Reduction of Salt Consumption by the Brazilian Population, based on international experiences and implemented in April, 2011. The plan estimates a decline in consumption to 5g of salt *per capita*/day – 2000 mg of sodium – by 2020 and should be achieved by voluntary reduction of sodium contents in processed foods by manufacturers.[15]

However, in addition to actions oriented to the production of processed foods, other measures can be set out for the benefit of people's health. So, considering the increased consumption of foods out of the home in Brazilian urban areas,[9] including foodservice units that serve hospitals, industries, companies, schools, among others, which in Brazil are called Food and Nutrition Units (FNU),[16] it is crucial to devise actions for these establishments such as, for example, reduction of the amount of processed ingredients in dishes and selection of foods containing lower sodium contents. Another measure could be that the FNUs inform to consumers the ingredients contained in the dishes, with emphasis on those having higher sodium content, as recommended by WHO.

Reducing sodium consumption by the population by implementing profitable public health strategies is, therefore, crucial to maintain health and prevent NCDs. In the light of what was mentioned earlier, this study aims to describe the amount of sodium in processed foods served by FNUs in the state of São Paulo in order that the collaborative role of these foodservice units in reducing sodium consumption may take place by implementing effective actions.

Method

It is a cross-sectional observational study with convenience sampling conducted in FNUs located in the cities of São Paulo, São Bernardo do Campo and Osasco. Six institutional foodservice units were invited to participate in the survey, which were chosen because of the easy access to those responsible for the companies that contracted the foodservice, and four of them accepted the proposal.

Information on the industrialized products and respective amounts used were collected from the stock control documents of each unit. Data was collected by the researcher from April to July, 2014. Thus, the amount of sodium was determined for each processed food used in the unit based on the nutritional facts label and the amount of each product as informed by the FNU.

After calculating the sodium amount contained in the processed foods used in one day, the total amount was divided by the number of meals produced in the day to obtain the average *per capita* amount for each item of the menu. The sum of these data provided the average *per capita* amount of sodium contained in the meal by industrialized products. This procedure was performed during 30 consecutive days at each FNU.

The parameters for comparison were WHO's recommended salt intake, which is lower than 5g per day and the daily distribution of the total energy value (TEV), which considers that lunch corresponds to 35% of TEV (the Workers Nutrition Program estimates a variation from 720 to 960 mg of sodium at lunch).[16] So, considering WHO's proposed value, the estimated daily limit

for total salt intake is 2000mg (sodium amount contained in 5g of salt). If a lunch meal represents 35% of TEV, then the maximum desirable consumption of sodium in the lunch meal is 700mg.

In the data presentation, the ingredients that most contributed to Na contents were listed, in decreasing order of supply, until 75% of the total monthly amount of sodium, as provided by each FNU, was represented, so that the foods source of sodium most utilized by each FNU were determined.

This study was carried out according to Resolution CNS/MS no. 466/2012, and the institutions from which data were collected, after being informed on the objectives of the survey, signed the Free Informed Consent Term.

Results and Discussion

The calculated sodium content in the processed foods used in the dishes served by the FNUs investigated indicated that, on average, was higher than the amount that WHO recommends for a lunch meal, i.e., less than 5g of salt per day, and regarding the distribution of total daily energy value, a lunch meal should correspond to about 35% of TEV.[8] The mean values found were as follows: Unit "1" served 1583.69 mg of sodium at one lunch meal; Unit "2", 970.68 mg; Unit "3", 1075.05 mg; and Unit "4", 1769.21 mg. According to ANVISA:[17]

> [...] the goals of each establishment should be based on the foods data sheets used for analysis of salt and sodium contents in the main meals and should consider a progressive reduction of these minerals up to a total average content of 920mg for the total portions of the dishes provided. (author's translation)

The study conducted by Borjes, Tasca & Zamprogna[18] found a total amount of 910 mg of sodium from industrialized products, lower than the values found in the present work.

It should be noted that Na is not provided by this source only; therefore, it is vitally important to assess the need to use ingredients containing high contents of this mineral when preparing the menus as well as the cost/benefit ratio of using these items.

There are FNUs that work with programs designed to protect the consumers' health and, for this reason, they develop campaigns that go from providing information on a particular food or nutrients to the implementation of new choices in the menu in order to encourage or discourage its consumption. Of the FNUs included in this study, unit "2" has this kind of action and is the one that presented the lowest Na offering during the period studied. In this unit, there is a program designed to promote healthy dietary habits among workers, which also contains a project

aimed to diminish sodium intake by the employees. It is often put into practice by eliminating salt shakers from the tables, by distributing informational pamphlets for consumers' awareness, as well as lectures delivered by nutritionists. Based on the results of the present study, they decided to eliminate sausages and diet gelatin, for example, from the menus.

As can be seen in Fig. 2, this same unit maintained sodium offering close to 700 mg, some days below 700mg and in other days much higher. This fact occurred as a result of the day's menu. For example, lunch meal no. 10 consisted of chicken sausage, which resulted in 993.24 mg of Na per serving, based on the total of 60 kg of this product served to 621 diners. Also in the same day, this foodservice utilized industrialized meat broth, which added 488.49 mg of sodium per serving to the dish, since a total of one kilo of this product was used for the same number of consumers.

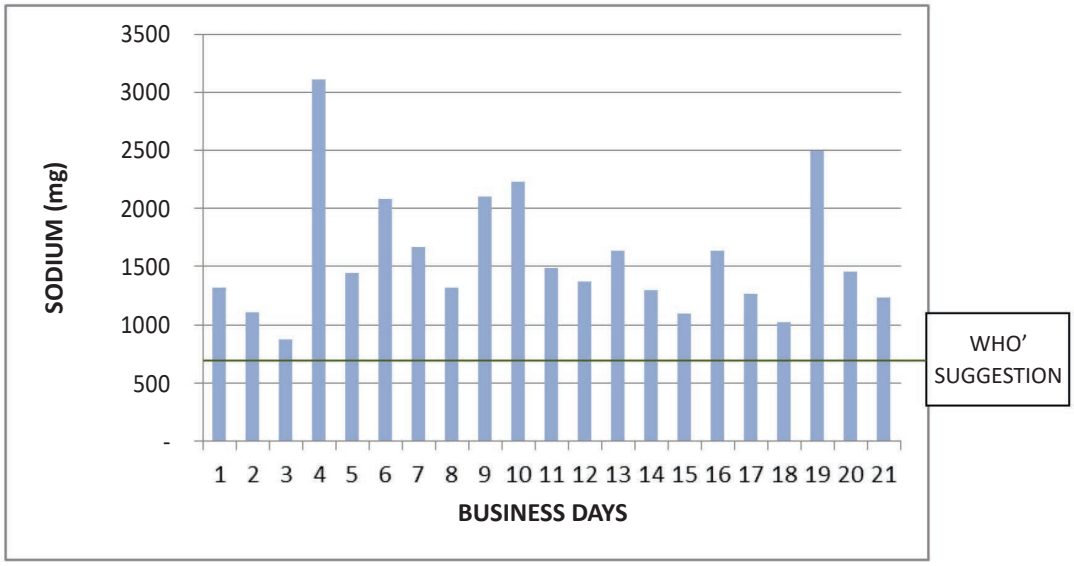

Figure 1. Daily sodium offering (mg) in business days in the period of May 2 to 30, 2014 by foodservice unit "1", compared to WHO's suggestion.

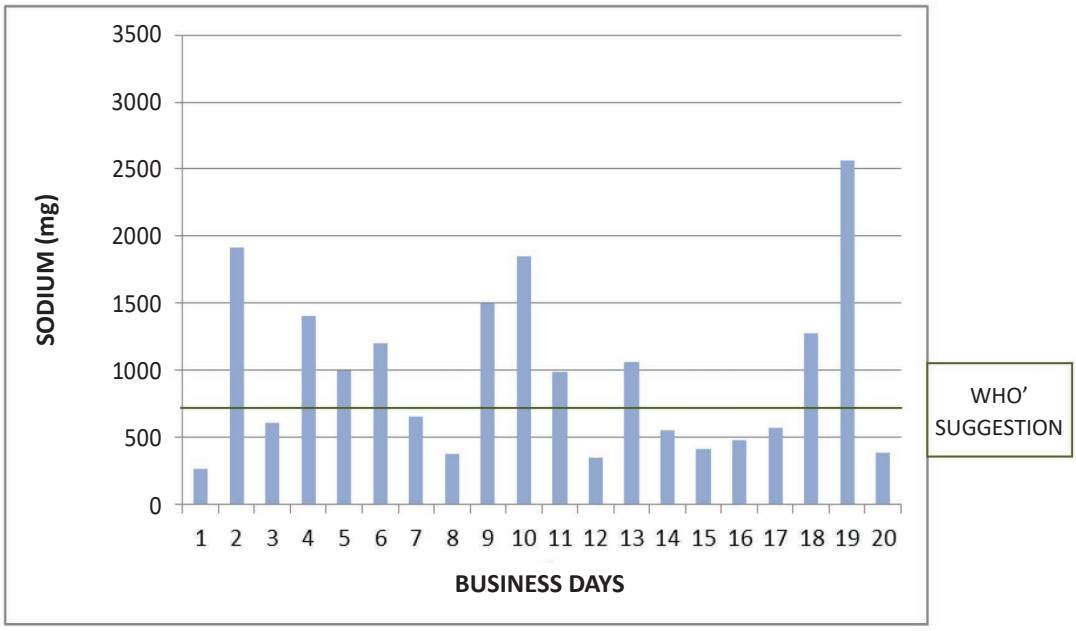

Figure 2. Daily sodium offering (in mg) in business days in the period of April 04 to 30, 2014 by foodservice unit "2", compared to WHO' suggestion.

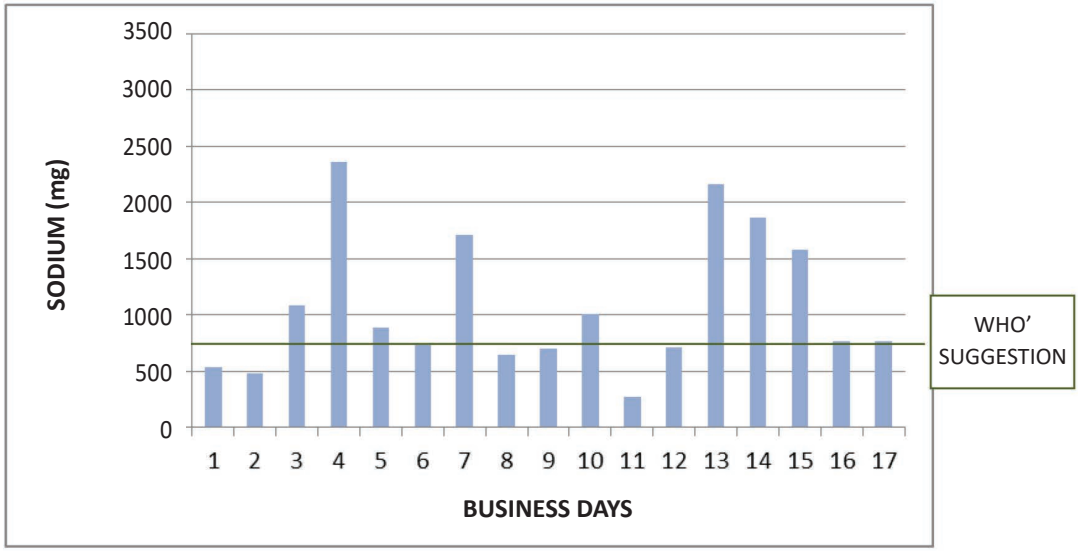

Figure 3. Daily sodium offering (in mg) in business days in the period of June 4 to 30, 2014 by foodservice unit "3", compared to WHO's suggestion.

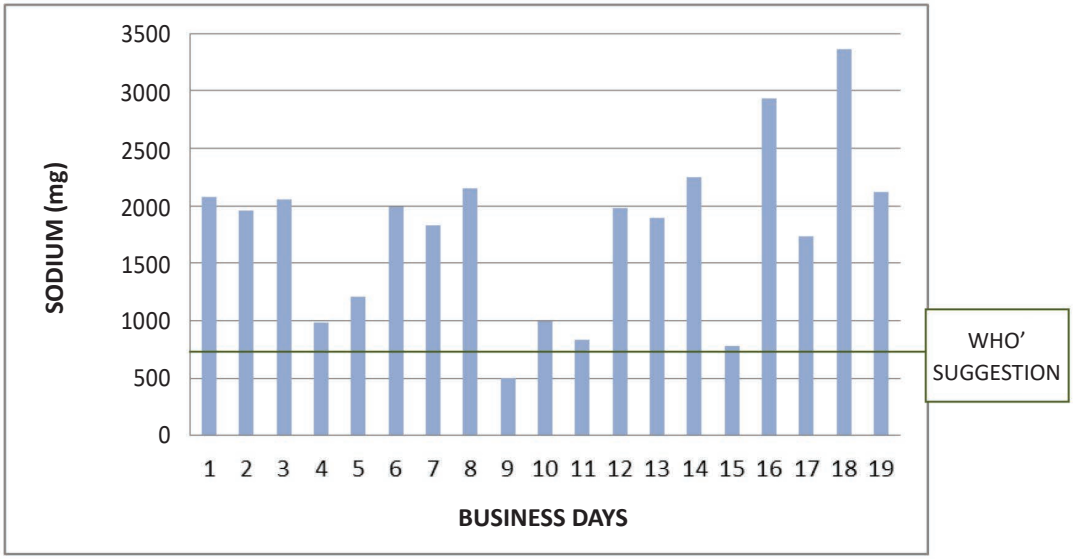

Figure 4. Daily sodium offering (in mg) in business days in the period of June 13 to July 14, 2014 by foodservice unit "4", compared to WHO's suggestion.

This variation occurs in all units, as can be seen in Graph 1, and by similar reasons.

Tables 1 to 4 show the industrialized products that most contributed to sodium offerings. They show the items that, if summed up, reach approximately 75% of the Na content offered in the month studied.

Table 1. Industrialized foods that contributed most to the amount of Na served in the lunch meal of Foodservice Unit "1", located in the city of São Paulo-SP, in the period of May 02 to 30, 2014.

FOOD	Na *per capita/ month* (mg)	Number of days offered	Na *per capita*/day	Na offering compared to WHO' Suggestion (%)
PARMESAN CHEESE	5408	21	258	43
RANCH DRESSING	3879	17	228	38
ITALIAN DRESSING	3115	17	183	31
CHICKEN SAUSAGE	2215	6	369	62
PARMESAN SAUCE	1712	21	82	14
VEGETABLE MARGARINE	1640	20	82	14
FRUIT-FLAVORED GELATIN	1479	19	78	13
MAYONNAISE	1124	4	281	47
DRIED MEAT	932	4	233	39
CHICKEN HOT DOG	834	6	139	23
BLACK OLIVE	801	13	62	10
TOMATO EXTRACT	661	13	51	8
MOZZARELLA CHEESE	592	1	592	99
PRECOOKED POTATO GNOCCHI	591	21	28	5

Table 2. Industrialized foods that contributed most to the amount of Na served in lunch meals by Foodservice Unit "2", located in the city of São Paulo-SP, in the period of April 01 to 30, 2014.

FOOD	Na *per capita* / month (mg)	Number of days offered	Na *per capita* / day (mg)	Na offering compared to WHO' suggestion (%)
VEGETABLE BROTH	2646.35	5	529.27	88
MEAT TENDERIZER	2156.43	2	1.078.22	180
SOY SAUCE	1946.23	13	149.71	25
PARMEZAN CHEESE	1460.51	17	85.91	14
BRAZILIAN-STYLE FRENCH BREAD	1267.29	7	181.04	30
SALTED VEGETABLE MARGARINE	1211.18	5	242.24	40
CHICKEN SAUSAGE	993.24	1	993.24	166
MEAT BROTH	646.13	1	646.13	108
UNSEEDED BLACK OLIVE	603.95	4	150.99	25
"COALHO" CHEESE ("rennet" cheese, typical in northeastern Brazil)	580.58	5	116.12	19
UHT MILK - DESSERT	477.45	12	39.79	7
FRYING POTATO	407.95	6	67.99	11
ZERO PINEAPPLE-FLAVORED GELATIN	340.29	5	68.06	11

Table 3. Industrialized foods that contributed most to the amount of Na served in lunch meals by Foodservice Unit "3", located in Osasco-SP, in the period of June 04 to 30, 2014.

FOOD	Na *per capita* / month (mg)	Number of days offered	Na *per capita* / day (mg)	Na offering compared to WHO' suggestion (%)
DRIED MEAT	9019	3	3006	501
SHOYU	1802	18	100	17
ITALIAN SAUSAGE	1759	1	1759	293
BREAD	1540	16	96	16
CHICKEN SAUSAGE	1357	1	1357	226
HOT DOG	1323	1	1323	220
MEAT TENDERIZER	1249	17	73	12
MOZZARELLA CHEESE	1068	17	63	10
BEEF KIBBEH	886	1	886	148

Table 4. Industrialized foods that contributed most to the amount of Na served in lunch meals by Foodservice Unit "4", located in São Bernardo do Campo-SP, in the period of June 13 to July 14, 2014.

FOOD	Na *per capita* / month (mg)	Number of days offered	Na *per capita*/day (mg)	Na offering compared to WHO' suggestion (%)
GOURMET SEASONING – MEATS	7078	9	786	131
GOURMET SEASONING – POULTRY	4611	8	576	96
ITALIAN SAUSAGE	1467	1	1467	244
MEAT TENDERIZER	1373	2	686	114
CHICKEN SAUSAGE	1371	2	685	114
TOMATO SAUCE	1243	11	113	19
SKEWER-GRILLED CHICKEN TIGH FILLET – (60 g per unit)	1082	1	1082	180
"PASTEL" (Fried pie)	1046	2	523	87
HAMBURGUER	927	3	309	52
STRAWBERRY-FLAVORED GELATIN	872	10	87	15
HOT DOG	847	1	847	141
KIBBEH	778	1	778	130
COMPLETE "FEIJOADA" KIT	742	2	371	62
SOY SAUCE	676	6	113	19
DARK SAUCE POWDER	578	4	144	24

Industrial sauces, dressings, seasonings and meats appear in almost all tables in this study as some of the major sodium ingredients in industrialized products. Webster, Dunford & Neal[19] identified these same elements in their study carried out in Australia.

The food items listed in Tables 1 to 4 are also the same as those found by Ni Mhurchu et al.[20] In their work, the authors analyzed 44,000 foods purchased by 21,000 households in the UK and found that among the major foods with high sodium contents were table salt (23%), processed meat (18%), bread and bakery products (13%), dairy products (12%), sauces and pâtés (11%). They also found that more than one third of sodium (37%) came from five categories of foods: bacon, bread, milk, cheese and sauces.

In the FNUs examined in this study, the use of processed seasonings, meat tenderizers, gelatin, margarine, frying potato and precooked gnocchi were the major foods high in sodium due to the use of industrialized foods, as can be seen in Tables 1 to 4.

Knowing these products is important because, as Ni Mhurchu et al.[20] concluded:

> The targeting of sodium reduction in a small number of food categories and focusing on products sold in the highest volumes could lead to large decreases in sodium available for consumption and therefore to gains in public health.

The International Collaborative Study on Macronutrients, Micronutrients and Blood Pressure (INTERMAP) – an international study carried out from 1996 to 1999[21] – revealed that the source of sodium consumption varies according to the country studied, showing again the importance of knowing the origin of consumption to fight it. This project identified, for example, that in the People's Republic of China, most of sodium consumption comes from the addition of salt to homemade foods (76%). In Japan, the largest source of consumption is soy sauce (63%), and in the UK (95%) and the USA (71% – underestimated by methodological reasons) processed foods are the greatest sodium contributors.[22]

It is possible that nutritious, safe, pleasant and accessible foods be available in the plate of every Brazilian. But this is a measure that requires joint efforts and the knowledge of diverse professionals, such as nutritionists, specialists from the area of food sciences, the food industry itself and other sectors, with or without government actions. A positive example of this joint effort is the remarkable program that has been developed in the UK since 1996 to reduce the consumption of salt by the population, which has the support of CASH (Consensus Action on Salt and Health), and has the main goal of convincing the food industry to bring about a reduction in the amount of salt in processed foods, educate public regarding the harmful effects that salt have on human health and divulge the impact of this work on public health.[23]

The success of CASH resulted in the creation of WASH (World Action on Salt & Health) in 2005, which consists of a group supported by 527 members of 95 countries with the primary objective of improving the world population's health by reducing salt consumption, including salt contained in industrialized foods.[24]

In the present work, it was often observed that the same items were offered by different foodservice units, but from different producers, resulting in distinct sodium amounts served to diners. A good example is gelatin: 34.64mg/g, 12.71mg/g, 9.60mg/g and 4.78mg/g are the sodium contents in different brands of the same product used by different FNUs. In this case, if there is interest in reducing consumption of this mineral, it is essential that the professional responsible for the food purchases in the FNUs read the labels of the foods, plan the menu accordingly and define preparation techniques that will eventually serve dishes with lower sodium contents without necessarily increasing the meal cost.

Dötsch et al.' work[25] shows that 75% of sodium intake comes from industrialized products, and, for this reason, world authorities like the WHO have encouraged the food industry to bring about the reduction of salt contents in their products. Several projects suggest that government engagement is the primary key to reduce sodium contents in the foods, either by addressing general issues or more specific ones. The action that involves the education of individuals about this information can be considered as general.

As specific actions, instructions that alter the production of industrial foods should be considered. These measures depend on the approval of laws having global and transparent goals. He, Campbell and Mac Gregor[26] provide a list in their study of governments engaged in this kind of projects. Among the countries cited are the United Kingdom, Canada, Brazil, Chile, Costa Rica, Cuba, Guatemala, Mexico, Suriname, Uruguay, South Africa and New York city.

Patel et al.[27] studied the consumer confidence in government actions to reduce sodium in processed foods and concluded that the majority of consumers (55.9%) believed that government intervention might be a good idea. It is one more element to be considered in order to prevent the exorbitant occurrences such as those shown in Tables 2 to 5, when the sodium content served to the FNUs customers was compared to the WHO's recommended values. Offering of this mineral is even higher than the total suggested, as identified in the following examples:

- Due to the use of commercial meat tenderizer in some dishes, Unit "2" exceeded in more than 50% the recommended amount of 700mg, since the *per capita* sodium consumption in this situation was 1,078 mg.
- In Unit "3", beef kibbeh accounted for 886mg of sodium in one *per capita* serving, resulting in 127% of the value recommended by WHO.

- In Unit "4", the amount of 1082.16mg of this mineral was due to the dish that used industrialized chicken thigh filet, representing an amount 55% higher than 700mg.
- In Unit "1", the use of chicken sausage provided 369.09 mg of Na *per capita*. The amount of sodium contained in this food alone represents 53% of the daily consumption recommended by WHO.

Knowledge and incentive to FNUs managers in preparing meals with less sodium are key to reduce consumption of this nutrient, which would prevent the conditions described above. Corroborating this theory, the study conducted by Ma et al.[28] reports that the majority of the owners and *chefs* of Chinese restaurants in Philadelphia were willing and able to reduce sodium contents in meals if customer demand could be maintained and if they were provided with training in food preparation and purchase.

Not letting customers unhappy is an appropriate issue to address when one thinks of altering sodium content in their food offerings. However, if there is interest, science today is able to study, identify and even create substitutes for salt. Kremer, Mojet & Shimojo [29] studied salt reduction in foods like soup, salad and fried pork, using natural soy sauce instead, and concluded that it is possible to replace NaCi of foods with this sauce without decreasing the taste intensity and, therefore, the consumer acceptance. Dötsch et al.[25] cite in their work that investigation on the physiology of salt taste receptors is an emergent area of study and over time sodium reduction would be even higher.

Conclusion

In the FNUs studied, sodium contents in industrialized foods are high, contributing to higher sodium contents in the foods served to employees who eat in these places.

Considering that the foodservice units assessed in this study exhibited similar results, it is necessary to review the preparation techniques used in the FNU, especially with regard to the ingredients used in the dishes. It is suggested that they prioritize fresh, natural foods in the food offerings, in detriment of industrialized products, and that during procurement the foods with less sodium content in their composition be selected.

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