**Sodium Amount in Hospital Meals in Rio de Janeiro**

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### Abstract

**Background:** In the treatment of hospitalized hypertensive patients, the use of drugs should be combined with drug therapy. As for food, sodium contributes to increased blood pressure and is widely used in the preparation of processed products and the meals served to the patients. These meals should follow the guidelines for hypertension, since hospital stay is designed to promote and restore health.

**Objectives:** To analyze the amount of sodium offered to hospitalized patients, including hypertensive patients, in the meals of a hospital and propose adjusted menus if necessary.

**Methods:** By observing the menus offered over seven days, the amount of sodium was assessed considering the food servings by cooking measurements and comparing with the food composition table. Subsequently, two menus have been proposed in which the amount of sodium did not exceed the recommendation of 2000 mg/day.

**Results:** Considering the daily sodium amount of 2000 mg recommended for hypertensive patients, 3475±174 mg was found in the meals, which is 73.0% higher than the recommended amount. The adjusted menus were appropriate compared to that adopted by the hospital, with a reduction of 66.0% (1682 mg) and another one with reduction of 47.0% (1994 mg).

**Conclusions:** It was observed that the hospital studied offered excess amounts of sodium in the patients’ meals, including those with hypertension. Simple interventions such as the removal of processed foods and control of added salt allowed a significant reduction in the amount of sodium considering the menu offered by the hospital.

**Keywords:** Sodium chloride, dietary; Hypertension; Food service, hospital; Sodium, dietary

### Introduction

Systemic hypertension (SH) is a multifactorial clinical condition associated with functional and structural changes in target organs. For this reason, it is one of the main factors that cause death among the group of chronic non-communicable diseases (CNCDs). It is characterized when an individual presents constant levels of systolic blood pressure (SBP) ≥140 mmHg or diastolic blood pressure (DBP) ≥90 mmHg¹².

SH may be related to factors such as heredity, gender, age and ethnicity, but it can also be associated with smoking, physical inactivity, obesity, stress, dyslipidemia and improper diet⁴.

In 2006, the estimate of hypertensive individuals in Brazil was approximately 17 million individuals. In 2011, it reached more than 30 million⁴, thus becoming one of the main health problems in Brazil, increasing medical and social costs⁵. It is worth noting that cardiovascular disease (CVD) is presented as the leading cause of death in Brazil, in individuals from 40 years of age⁶.

Non-drug treatment is of fundamental importance for the control of hypertension and should be combined with...
drug therapy, enabling to maintaining controlled blood pressure levels with reduced doses of drugs⁷.

To help drug treatment, changes in lifestyle is necessary and consists of physical activity, reduced body weight, reduced alcohol intake and dietary changes such as adoption of a low calorie diet aimed at weight loss and reduction in salt or sodium chloride intake⁸.

Sodium is a mineral that is essential to the human body. It is responsible, for example, for controlling extracellular fluid volume and plasma. About 10% of ingested sodium is present in the natural content of the foods, and the rest in the addition of salt to food⁹.

The amount of sodium or cooking salt considered to be the maximum amount for the daily intake of a healthy individual is 5 g, corresponding to 2 g sodium, but statistics show that the average Brazilian consumption doubles that recommendation¹⁰. Sodium recommendation for hypertensive patients is normosodic, i.e., the same as indicated for healthy individuals⁵.

Although it is essential to human health, when excessive, sodium is harmful to health. Some studies have shown a direct relationship between high salt intake and SH¹¹. Added to the preparation of meals taken to the table and added to processed products, sodium chloride is extensively used in diets, as it has the function of improving the color, texture and especially the flavor¹² of foods.

Access to proper diet, using safe and healthy foods is a fundamental human right, resulting in the individual’s quality of life, both in the family environment and especially in the hospital¹³. The latter has the purpose of ensuring the necessary supply of nutrients with a view to maintaining a proper nutritional status or restoring it in the patients during the hospital stay¹⁴. The objective of this study was to determine the amount of sodium offered in previously standardized menus, recommended for patients admitted to a private hospital in the state of Rio de Janeiro, able to receive a normal diet, proposing adjustments if necessary.

### Methods

This is an exploratory study with direct observation of food servings for one week in March 2015, offered to patients admitted to a private hospital located in the city of Rio de Janeiro.

The foods were assessed with cooking measurements to quantify the sodium content in the meals that make up the normal diet served to patients.

A diet considered normal consists of five meals: breakfast, lunch, afternoon snack, dinner and supper, offered to all patients able to this consistency, including the hypertensive patients.

We opted for determining the amount of sodium present in each meal considering the preparations, added salt and processed products, once the patients’ intake was not considered.

The Table for Food Consumption Assessment using Cooking Measurements, the Food Composition Table, the Table of Equivalents, Cooking Measurements and Chemical Composition of Foods and Unified menu preparation sheets to analyze the presence of intrinsic sodium in foods on the amount served. From the foods not included in the tables, the nutritional facts provided on the products labels have been used. The salt sachets offered to the patients along with their meals were included in the total daily sodium amount assessed.

Daily sodium values at every meal were compared with the daily recommendation contained in the VI Brazilian Guidelines on Hypertension, and expressed as means±standard deviations and percentages.

### Results

The amount of sodium found in the meals offered over one week is presented on Table 1. There is a slight variation in the total amount of sodium over seven days as well as in the amounts in each served in each meal. There is a little difference in the total sodium in breakfast (which was constant on all days, because the same food is served) and in the afternoon snack. The supper was the meal with the highest sodium difference during one week of observation.
Table 1
Sodium Amount (mg) found in each meal offered for seven days in the hospital studied

| Week days | Breakfast Na (mg) | Lunch Na (mg) | Afternoon Na (mg) | Dinner Na (mg) | Supper Na (mg) | Total Na (mg) |
|-----------|------------------|---------------|-------------------|----------------|----------------|---------------|
| Day 1     | 1054             | 968           | 180               | 1360           | 244            | 3806          |
| Day 2     | 1054             | 935           | 180               | 1125           | 66             | 3360          |
| Day 3     | 1054             | 984           | 180               | 934            | 244            | 3396          |
| Day 4     | 1054             | 1352          | 118               | 891            | 66             | 3481          |
| Day 5     | 1054             | 1027          | 180               | 1090           | 2              | 3353          |
| Day 6     | 1054             | 1399          | 180               | 812            | 244            | 3389          |
| Day 7     | 1054             | 1102          | 180               | 934            | 66             | 3336          |
| Average   | 1054             | 1027          | 153               | 1018           | 133            | 3475          |

As reported by the cooks, there is no added salt or processed spices in the recipes, except for spices such as garlic, onions and fresh herbs, which were not accounted for containing a tiny amount of sodium.

The sodium amount found in tomato paste was not assessed in this study, since the hospital cooks could not specify the amount used in cooking measurements, since they use tomato paste following their professional experiences.

There has been an excess of sodium in meals of up to 90.0% compared to the recommendation of 2000 mg. The highest amount of daily sodium was offered in large meals (lunch and dinner) and in the breakfast (Table 2).

An average daily amount of 3475±171 mg was found, corresponding to an average of 73.0±9.0% excess over the amount recommended in the VI Brazilian Guidelines on Hypertension\(^5\), for hypertensive patients (2000 mg sodium/day).

Chart 1 reproduces one of the menus offered in the hospital. It was chosen because it is the one with the highest amount of total sodium and exceeding the recommendation in the guidelines. Note that breakfast features many ultraprocessed products, such as cookies, toasts, cream cheese and deli meats, contributing to an increase in the total amount of sodium served.

Table 2
Sodium amount (%) offered on a daily basis at the hospital regarding the VI Brazilian Guidelines on Hypertension\(^5\)

| Days | Daily sodium recommendation (mg) | Found in the hospital Na (mg) | Excess % |
|------|---------------------------------|-----------------------------|---------|
| 1    | VI Brazilian Guidelines on Hypertension\(^5\) | 3806                     | 90      |
| 2    | 2000                            | 3360                       | 68      |
| 3    |                                 | 3396                       | 69      |
| 4    |                                 | 3481                       | 74      |
| 5    |                                 | 3353                       | 67      |
| 6    |                                 | 3589                       | 79      |
| 7    |                                 | 3336                       | 66      |
| Average |                                 | 3475                       | 73      |
# Chart 1

Menu offered by the hospital with 3806mg sodium (Day 1)

| Meal                | Foods                                      | Cooking measurement | Na (mg) | Total of Na (mg) |
|---------------------|--------------------------------------------|---------------------|---------|------------------|
| **Breakfast**       |                                            |                     |         |                  |
|                     | Coffee                                     | 200mL               | 2       |                  |
|                     | Milk                                       | 200mL               | 128     |                  |
|                     | Orange juice                               | 200mL               | 0       |                  |
|                     | Bread roll                                 | 1 un                | 324     |                  |
|                     | Toast                                      | 1 un (15g)          | 80      |                  |
|                     | Savory cookies                             | 2 un 8.5g each (17g) | 76      |                  |
|                     | Sweet cookies                              | 1 un                | 58      |                  |
|                     | Processed cheese                           | 1 un 18g            | 123     |                  |
|                     | Margarine                                  | 10 g                | 8       |                  |
|                     | Margarine                                  | 1 un G (40g)        | 12      |                  |
|                     | Guava jam                                  | 15 g                | 0       |                  |
|                     | White cheese                               | 1 un G (40g)        | 12      |                  |
|                     | Deli meat                                  | 2 un                | 235     |                  |
|                     | Papaya                                     | 1 medium slice      | 6       |                  |
|                     | Sugar                                      | 4 sachets of 5g each| 2       |                  |
|                     | Chickpea salsa                             | 2 tbsp 50g          | 2       |                  |
|                     | Baked kibbeh                               | 1 medium slice (100g)| 40      |                  |
|                     | Carrot sticks                              | 2 tbsp 50g          | 4       |                  |
|                     | Okra                                       | 2 tbsp 80g          | 1       |                  |
|                     | Rice                                       | 2 tbsp 50g          | 1       |                  |
|                     | Beans                                      | 1 M ladle 140g      | 3       |                  |
|                     | Salt                                       | 2 sachets (2g)      | 800     |                  |
|                     | Olive oil                                  | 1 sachet 4mL        | 0       |                  |
|                     | Dessert: gelatin                           | 1 glass 50mL        | 117     |                  |
| **Lunch**           |                                            |                     |         |                  |
|                     | Milk with avocado, papaya and banana       | 200mL               | 64      |                  |
|                     | Savory cookies                             | 3 un                | 114     |                  |
|                     | Sugar                                      | 3 sachets           | 2       |                  |
|                     | Chicken pie                                | 1 medium slice (110g)| 557     |                  |
|                     | Cauliflower                                | 1 medium sprout (60mg)| 1       |                  |
|                     | Baroa potato mash                          | 2 tbsp (70mg)       | 1       |                  |
|                     | Rice                                       | 2 tbsp (50g)        | 1       |                  |
|                     | Salt                                       | 2 sachets           | 800     |                  |
|                     | Olive oil                                  | 1 sachet            | 0       |                  |
| **Afternoon snack** |                                            |                     |         |                  |
|                     | Low-fat yogurt                             | 2 cups 170g each (340g)| 242     |                  |
|                     | Sugar                                      | 3 un                | 2       |                  |

Tbsp – tablespoon; Un – unit; M ladle – medium ladle
As for lunch and dinner, the excess amount of sodium can be attributed to the two salt sachets that accompany the meals, which results in an increase of 800 mg of sodium for lunch and dinner. The afternoon snack and supper present a smaller amount compared to the rest of the day, although they also feature processed products.

The main purpose of the hospital is the recovery of the patients’ health, hence the importance of a diet that needs to be understood as part of their treatment. Therefore, changes in the menu and in the form of preparation of meals should be considered, with a view to reducing the sodium offered to the inpatients. Considering the need to adjust the menu, it was possible to propose changes to reduce sodium in the hospital in addition to the use of the aforementioned herbal salt.

Below are two menus proposed to reduce the daily sodium offered by the hospital. The first one contains simple measures for reducing the amount of sodium such the reduction and/or elimination of products, especially the ultraprocessed ones and reducing the added salt at lunch and dinner. The second one was prepared with some concepts of hospital food, not covering all the changes that a hospital diet prioritizes, but suggesting minor changes in the preparation, presentation and inclusion of other ingredients and foods not currently used in the hospital, but that can be included on the menus of hospitals.

The two proposed menus would be substitutes in the menu of day 1, where the excess sodium content was the most significant one (Chart 2). In the two menus presented, we observed a significant reduction in the amount of sodium, proving to be possible to follow the daily recommendation of this mineral, even in a hospital.

| Hospital menu | Menus proposed        | Hospital diet                        |
|---------------|-----------------------|--------------------------------------|
|               | Simple changes        | Hospital diet                         |
| Breakfast:    | Breakfast: Coffee,    | Breakfast: Coffee, milk, orange      |
| Coffee,       |       milk, orange     |       juice, functional grains cake,  |
| milk,         |       juice,          |       guava paste, white cheese,      |
| bread,        |       15-grain bread, |       papaya cream with berries jam,  |
| toast,        |       sweet cookies,  |       sugar.                          |
| savory        |       salted butter,  | Lunch: Chickpeas with olive oil,     |
| cookies,      |       guava jam, white|       cheese, papaya cream with       |
| butter        |       cheese, papaya, |       berries jam, sugar.             |
| cheese,       |       sugar.          | Lunch: Chickpeas with olive oil,      |
| deli meat,    |                       |       chicken and okra stew, polenta, |
| papaya,       |                       |       rice, salt (1 sachet),          |
| sugar.        |                       |       watermelon juice with ginger    |
| Total Na: 1054mg |                       |       and flaxseed, sugar. Roasted    |
|               |                       |       banana.                         |
| Lunch: Chickpea salsa, baked kibbeh, | Lunch: Chickpea salsa, baked kibbeh, |
| carrot sticks, okra, rice, beans, salt | carrot sticks, okra, rice, beans, salt |
| (2 sachets), | (1 sachet), olive oil. | (1 sachet), olive oil.               |
| Dessert:     | Dessert: gelatin      | Lunch: Chickpeas with olive oil,      |
| gelatin      |                       |       chicken and okra stew, polenta, |
| Total Na: 968mg |                       |       rice, salt (1 sachet),          |
|               |                       |       watermelon juice with ginger    |
| Afternoon snack: Vitamin fruit, | Afternoon snack: Vitamin fruit,      |
| savory       |       savory cookies,  |       savory cookies, sugar.          |
| cookies,      |       sugar.           | Afternoon snack: Milk with fruit and  |
| sugar.        |                       |       oatmeal, nut cookies, sugar.    |
| Total Na: 180mg |                       | Total Na: 110mg                      |
| Dinner: Chicken pie, cauliflower, | Dinner: Roast beef, cauliflower,     |
| baroa potato mash, rice, salt (2 sachets), olive oil. | baroa potato mash, rice, salt (1 sachet), olive oil. |
| Total Na: 1360mg |                       | Total Na: 469mg                      |
| Supper: Low-fat yogurt, sugar. | Supper: Low-fat yogurt, sugar.       | Supper: Low-fat yogurt with chia seeds, |
| Total Na: 244mg | Total Na: 122mg       |       chamomile tea, white cheese,    |
|               |                       |       sugar.                          |
| Total sodium of the day: 3806 mg | Total sodium of the day: 1682 mg    | Total sodium of the day: 1501 mg     |
|               | Reduction of approximately 56.0% | Reduction of approximately 61.0%     |
|               | Na compared to the hospital menu | Na compared to the hospital menu     |
Discussion

This study reveals only the amount of sodium provided by the previously standardized hospital menus, rather than the patients’ intake. This factor was not considered, since it was not possible to obtain the 24-h urinary sodium to assess the patients’ salt intake.

By calculating the sodium content found in the menus, it was observed that the data obtained in this study are not in line with the VI Brazilian Guidelines on Hypertension\(^5\), which determine 2000mg of sodium per day (2 g), or 5 g salt chloride or cooking salt for hypertensive patients.

A strategy to be used for the control of blood pressure (BP) is the voluntary reduction of sodium content and intake of processed foods, especially in the hospital environment\(^19\).

A large number of randomized trials shows the positive influence of sodium from the diet in BP\(^20\). This strong relationship of sodium derived from food with BP is also demonstrated in a meta-analysis of 37 randomized studies\(^21\). In 2011, a meta-analysis was published, showing that a reduction in the daily intake of at least 3.1 g per day of sodium chloride by hypertensive patients can lead to a reduction of 4.5 mmHg in SBP and 2-3 mmHg in DBP\(^22\). Other studies show that the reduction in sodium intake in the diet results in reduced blood pressure, particularly in hypertensive individuals\(^23\).

Low sodium intake can reduce the need for medication in hypertensive patients due to symptomatic hypotension during periods of reduced salt intake. On the other hand, in diets high in sodium, it is possible that even while using antihypertensive medication, patients show a rapid increase in BP\(^24\).

The Low Salt CKD\(^25\) study evaluated the effects of sodium restriction in patients with chronic kidney disease established on BP, risk factors for the progression of CKD and cardiovascular risk factors. The results showed a reduction in blood pressure levels and a significant reduction in proteinuria and albuminuria, also demonstrating the relationship between excessive sodium intake with the toxic effect that takes place directly on the blood vessels\(^25\).

Therefore, reduction of sodium intake is an important factor in the prevention, control and worsening of hypertension, presenting a positive cost-effectiveness\(^26\).

In general, and especially for hypertensive patients, it is recommended to reduce the salt added to foods, avoid the salt shaker on the table and reduce or eliminate the use of ultraprocessed food such as canned foods, deli meats and sausages, preserves, sauces and ready-made seasonings\(^27\).

In 2014, the Brazilian Ministry of Health released the latest Dietary Guidelines for the Brazilian Population\(^28\), which prioritizes the intake of fresh foods over processed foods and mainly ultraprocessed foods, which would result in a significant reduction of sodium intake in the daily diet\(^28\).

Besides this, in order to reduce cases of chronic diseases and related complications, other measures taken by the Government was the implementation of the Strategic Action Plan for Fighting Chronic Non-communicable Diseases (CNCD) in Brazil 2011-2022\(^27\), issued by the Ministry of Health, consisting in the reduction of salt and sugar content in processed foods through an agreement with the food industry\(^29\).

Another strategy for reducing sodium intake would be using herbal salt in the preparation of meals, hence abolishing added salt, with a reduction to 1600mg / day. The herbal salt consists of a mixture of four equal portions of herbs and salt (rosemary, basil, oregano and salt), used to mask the reduction of salt and may be used in any preparation\(^30\), so as to obtain a reduction of approximately 73.0% on the sodium content of meals\(^31\).

One way to succeed in changing the diet would be combining diet therapy to the food service, focusing on the recovery and prevention of diseases and promoting healthy eating. Hospital food gets special attention because of the desire to improve the quality of healthcare combining diet therapy and food restrictions with more interesting and tasty meals\(^31\).

Conclusions

It was observed that the hospital studied offered excess amounts of sodium in the meals of inpatients, including those with hypertension. Simple interventions such as the removal of processed foods and control of added
salt allowed a significant reduction in the amount of sodium considering the menu offered by the hospital.

Potential Conflicts of Interest
This study has no relevant conflicts of interest.

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