Analysis of sodium intake from bread in an institutionalized elderly population

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Introduction

- The Bread role in the total sodium intake (and consequently of salt) has been considered significantly relevant in some populations[1]. Portugal's bread annual *per capita* consumption was about 70 kg in 2009[2].
- Portugal is one of the European countries with the highest rates of stroke mortality, in part because of a probable relationship with the high salt intake[3].
- Current guidelines on salt intake (5g/day) are almost always exceeded, with a higher risk to senior hypertensive individuals who have even straighter recommendations (3,8 g/day), and usually show a much higher salt intake[4,5].
- It is possible to make a 25% salt reduction on the bread without causing a bad acceptability or diminishing its consumption[6].
- On August 12th 2010, the law no.75/2009 took effect to establish an upper limit to bread's salt addition (1,4g /100g of bread)[7].

Objectives

•The present investigation main purpose is to **assess the impact of bread consumption on the daily total sodium intake of a senior institutionalized population** and also, to evaluate, in this institution, the **potential effect and enforcement of the law nº 75/2009** witch took effect on August 12th 2010.
•A secondary objective is to assess the usefulness of creating a protocol with the local bread industry, that would improve salt intake rates of the individuals at the care center of this study , by reducing the bread salt levels.

Material and methods

Participants

•All participants were patients of the Vale de Figueira's Wellness Social Center (VFWSC), and the first group was made of 27 participants.
•After applying the only exclusion criteria, which was the impossibility of collecting a 24hours urine sample, the participants were reduced to 19 to whom, was presented an informed consent based on a model of the Portugal's North Regional Health Administration, to consent the collection and analyze of the 24 hours urine sample.
•Of the18 participants that signed the consent form , one passed away and other was hospitalized reducing the final group to 16 participants.

Assessments

•Total sodium excretion was assessed through a 24-hour urine samples, in order to estimate the participants daily sodium intake. An 24h-urine sample was collected from each participant to determine creatinuria (alkaline picrate and spectophotometric methods) and urinary sodium (ion-selective electrode).
•Weight, height, age, waist circumference, creatinemia, pharmacological therapy and clinical information like current and chronic pathologies were assessed. The body mass index was determined and the glomerular filtration rate (GFR) was estimated by 3 different methods (direct measurement of creatinine clearance, Cockcroft-Gault[9] equation and the Modification of Diet in Renal Disease equation[10]).
•To determine the bread levels of sodium chloride was used the commonly known Charpentier-Volhard method, with a protocol abide by a PN (Portuguese Norm) 1845 of 1982[11]. For each of the 12 bread samples, collected before and after the enforcement of the law no. 75/2009, 2 tests were realized and the mean and standard deviation were calculated.
• In order to evaluate the quantity and quality of bread consumed by the users of the VFWSC was developed a questionnaire applied to the study participants.
• The same interviewer applied and filled all questionnaires. All written answers were confirmed orally, with a careful and adequate language, with the participants, in order to confirm the obtained data. This checking and confirmation was important due to the ethnographic characteristics presented by the participants, well known and comprehended by the interviewer, a local habitant.
• All data used in this research was collected between July 26th 2010 and January 21th 2011.

Results

- The 16 participants of this study were senior institutionalized individuals with ages between 69 and 89 years old (Mean = 80,4 years old; SD = 5,6 years), 4 males and 12 females.
- Of the 15 hypertensive participants, 7 were taking diuretics .
- All participants presented a considered "normal" renal function according to their age.
- The users of VFWSC only consumed 2 different kinds of bread (*carcaça* and *cortado),* both refined, with wheat flower has key ingredient and with salt.
- Table 1 shows the daily bread consumption, daily salt intake, and daily salt intake values due to bread consumption.

Table 1. daily bread consumption, daily salt intake, and daily salt intake values due to bread consumption(n = 16).

Daily intake (g/day)	Mean (g/day)	Standard Deviation (g/day)	Minimum (g/day)	Maximum (g/day)
Bread (total)	204,1	59,2	114,0	306,0
Salt (total	12,7	5,6	3,9	22,2
Salt (trough bread)	2,7	0,8	1,6	4,1

- By analyzing Table 1, it's possible to understand that the mean salt daily intake due to bread consumption is 2,7 g with close maximum and minimum values (SD = 0,8). This can be explained by a patronized bread consumption in VFWSC, in part related to the bread offer at fixed meals.
- The participants presented a mean daily salt intake of 12,7 g (SD = 5,6), with a mean of 27,5% of the salt intake having its source on the daily bread consumption (Table 2).

Table 2. Percentage of the salt consumed trough bread in the total urinary salt excretion.

Participant ID No.	Percentage of the salt consumed trough bread in the total urinary salt excretion
1	35,89%
2	45,47%
3	11,40%
4	54,88%
5	32,62%
6	19,12%
7	9,08%
8	16,38%
9	32,88%
10	65,97%
11	25,32%
12	20,80%
13	9,40%
14	19,27%
15	14,51%
Mean ± SD	27,53 ± 17,08%

- The salt intake through bread consumption, at the VFWSC, seems to have diminished **after the law no. 75/2009**, resulting in an average reduction of **19,4%** (SD = 0,5) per participant.

Key findings

- Participants of this study revealed an **excessive salt intake, 3,35 times superior** to the 3,8 g/day recommendations for elderly and hypertensive patients of the 2010's Dietary Guidelines for Americans[12].
- **Bread was an important vehicle of salt intake, reflecting more than a quarter of the total daily salt intake.** This findings support the need for creating salt intake reduction measures like a protocol with the local bread industry in order to produce a special kind of bread with lower salt levels
- **The law no. 75/2009 of August 12th 2010 was r**espected by the bread supplier company and **contributed to lower the quantity of salt added to the bread** acquired by VFWSC, lowering the salt intake .

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