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Consumption of discretionary salt and bouillon in Senegalese households and related knowledge, attitudes and practices

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Excessive salt intake is associated with high blood pressure, a major risk factor of cardiovascular diseases. The World Health Organization has set a target of 30% reduction in population salt intake by 2020 to contain the prevalence of high blood pressure (HBP). The aim of the study was to measure the consumption of discretionary salt and bouillon in rural and urban Senegalese households. A cross-sectional descriptive study was conducted among 111 households in Dakar and Kaffrine. Quantities of discretionary salt and bouillon used in the preparation of meals were accurately weighed and contribution of bouillon to salt intake assessed using the Senegalese manufacturing standard of bouillon. Knowledge, attitudes and practices related to consumption of salt and bouillon were collected using a questionnaire. In more than two-thirds of households, per capita salt consumption was high (WHO cut-off >5 g/d), particularly in rural areas (94.4%). Whatever the residence, bouillon contributed to 1/3 of discretionary salt intake. Average individual consumption of salt (discretionary + bouillon) was estimated at 6.3 g/day [4.3; 10.3], with a significant difference between rural and urban areas (10.2g /day vs. 4.6g/day; P<0.01). Urban households gave more importance about the limitation/reduction of salt on cooking, than rural households (63.2% vs 40.7%; P<0.05). In our study areas, discretionary salt consumption per capita was above the WHO recommendation, particularly in rural areas, with a high contribution from bouillon.

Key words: Consumption, discretionary salt, bouillon, Senegalese households, urban, rural, hypertension.

INTRODUCTION

Salt is a product that has long been used in all societies for its capacity to increase the preservation of food and to limit the multiplication of micro-organisms and for its benefits to the food industry (SACN, 2003). Cooking or table salt is composed of sodium chloride (NaCl), it combines two mineral elements: 40% Sodium and 60%

chloride. Salt is universally consumed regardless of socioeconomic status, and its consumption is very uniform across regions or countries (Mannar, 2018). The main evidence for the association between high intakes of salt and health issues relates to sodium. About 90% of sodium consumed is from two sources: non-discretionary salt added during food processing and manufacturing and discretionary salt added during cooking or at the table (SACN, 2003; WHO, 2017).

Bouillon are seasoning ingredients, in different forms (cubes, powders, liquids), composed mostly of salt, hydrolysed vegetable proteins, starch, herbs, spices, and flavourings, and may contain flavour enhancers such as monosodium glutamate or some yeast extract (Moretti et al., 2018). The maximum amount of salt in a bouillon is fixed at 12.5 g/L by the Codex Alimentarius. In Senegal, according to current legislation, the amount of salt in bouillon must not exceed 55% of the product's weight (*Codex Alimentarius,* 2015; ASN, 2017), which correspond to 5.5g of salt in 10g of bouillon.

Excessive salt consumption contributes significantly to the development of Non-Communicable Diseases (NCDs). Indeed, the link between health problems and high salt consumption is well established, particularly between the consumption of sodium and the development of high blood pressure and other cardiovascular diseases (Meneton et al., 2005; Kotchen et al., 2013). Sodium intake is directly linked to hypertension, which is the most important risk factor for mortality worldwide (Murray and Lopez, 2013). To reduce the risk of cardiovascular disease, the WHO recommends consuming a maximum of 5 g of salt (equivalent to 2 g of sodium) per person per day (WHO, 2012). However, data from various countries indicate that most populations consume higher amounts. In sub-Saharan Africa and many parts of the world, sodium consumption is above 2 g/day (INTERSALT, 1998; Oyebode et al., 2016). The WHO has set as a target, between 2013 and 2020, of a relative reduction of 30% in the population's average salt (sodium) intake, and also a reduction of 25% in the prevalence of high blood pressure or to contain the prevalence of high blood pressure, depending on national circumstances (WHO, 2013).

The management of NCDs is currently a heavy burden on the health system of developing countries. In Senegal, there is no policy on salt reduction (FAO, 2018; WHO, 2018b), probably as in most African countries, due to the lack of sufficient data on salt and bouillon consumption and their link to population health. Gathering data on salt consumption patterns of the population (salt intake, knowledge, attitudes, and behaviours regarding salt use) is an important step to develop and implement a strategy to reduce salt consumption. People's knowledge, attitudes, and behaviours towards salt can help determine the extent to which consumers think salt is a problem. It can also reveal the sources of salt in their diet, the reasons for their decision to buy a particular food, and how they use salt as a condiment when cooking or eating (WHO, 2017). Compared to other countries that have already measured the sodium intake of their population and have public policies to reduce salt consumption, Senegal does not yet have such data. To our knowledge, no research has been conducted to assess the knowledge, attitudes, and practices regarding excessive salt consumption and its impact on public health, as well as the associated determinants. The aims of this study were to measure the per capita consumption of discretionary salt and bouillon and assess related knowledge, attitudes and practices of households.

METHODS

Study design and socio-demographic characteristics

This descriptive cross-sectional pilot study was conducted from July to November 2019 in rural (Kaffrine, groundnut basin in central-western of Senegal) and urban areas (Dakar, capital of Senegal). It was conducted as part of a study on nutritional status (Thiam et al., 2022). In this study, 60 mother-child pairs were selected for nutrient intakes measurement in rural area, using weighed food record method, and their respective households were all enrolled. The same sample size of households was also retained in urban area using purposive sampling approach, in which households were selected in each neighborhood, on the only condition that they were willing to participate. Overall, we finally got the consent of 111 households, which were then selected, 54 urban and 57 rural households. In Dakar, households located in eight (8) neighborhoods: Parcelles Assainies units 04 and 16, Dalifort, Khar Yalla, Djida Thiaroye Kao, Daroukhane, Fass, and Jaxaay. In Kaffrine, the households selected were in the villages of Mbaracounda and Malem Thialène in the department of Malem Hodar. The socio-demographic variables collected were the composition of the household, energy sources, access to drinking water, and type of combustible material used for household cooking.

The size of the household was calculated by considering the number of people living in the same house and sharing the same meals from morning to night.

Determination of salt and bouillon consumption

The weight food record (gold-standard method) was used to quantify the amount of discretionary salt and bouillon consumed by the household throughout all day of the survey (Gibson, 2005; Thompson and Subar, 2013; FAO, 2018). In each household, an interviewer spent all day and asked respondents to indicate the quantity of salt and/or bouillon that was used for the preparation of each meal consumed by the whole household. Thus, each quantity of salt or bouillon was systematically weighed just before being added to the cooking/preparation, using a precision food scale (Gram, Barcelona, Spain; Soehnle, Roma, 65847). For packaged salt or bouillon, which was fully used, quantity was collected by recording the weight marked on the package. The contribution of bouillon to daily salt intake was estimated by applying the maximum percentage of 55% salt in accordance with the standard of the Senegalese Association for Standardization (Association Sénégalaise de Normalisation - ASN, 2017). Total household salt

Table 1. Characteristics of households.

Parameter	All (N= 111)	Rural (N= 54)	Urban (N= 57)	*P*
Household size	13 ± 7	15 ± 8	11 ± 7	0.013
Number of adults	7 ± 4	8 ± 4	6 ± 5	0.166
Number of children and adolescents	6 ± 4	7 ± 4	4 ± 3	0.001
Number of meals per day	2.17 ± 0.5	2.4 ± 0.6	1.9 ± 0.3	<0.001
Utilities				
Clean Water	100	100	100	-
Electricity	73	64.8	80.7	0.059
Television	62.2	27.8	94.7	0.000
Freezer/refrigerator	41.4	7.4	73.7	0.000
Combustibles				
Wood/Charcoal	57.7	66.7	49.1	0.061
Gas	42.3	33.3	50.9	

Values are expressed as mean ± SD or as percentage.
Source: Authors

consumption was determined by adding the amount of discretionary salt and that of salt contained in the bouillon used during the preparation of meals over the day. Individual salt consumption (g/day) was then estimated per capita by dividing the total amount of salt consumed by the household size. The level of household per capita salt consumption was determined using the WHO cut-off (WHO, 2012).

Assessment of Knowledge's, attitudes and practices related to salt consumption

Data on knowledge, attitudes and practices (KAP) were collected using a questionnaire based on the WHO STEPS manual (WHO, 2005). The questionnaire was translated in French, respecting all procedures for validation. Following this, the questionnaire was included in a mobile data collection application: ODK (Open Data Kit, v1.18.1) and the information's were collected using a tablet computer.

Statistical analysis

Data analysis was carried out with Excel 2016 (Microsoft Corporation) and Stata/SE version 12.1 (STATA Corporation). A descriptive analysis was used to determine the main characteristics of interviewed households. The results are expressed as mean ± standard deviation and as a percentage. Variables with a non-symmetrical distribution such as salt consumption are expressed in median and interquartile range. The student's t-test and the Kruskal-Wallis test were used respectively for the comparison of means and medians of bouillon or salt consumption, between rural and urban areas, and Pearson's χ^2 test for the comparison of percentages. A significance level of 5% was used for all analyses.

RESULTS

Socio-demographic characteristics of households

The socio-demographic characteristics of the households

are described in Table 1. The average size of a household was significantly higher in rural areas (15 ± 8 persons) than in urban areas (11 ± 7 persons), as well as the number of children and adolescents living in these households (P<0.05). There was no statical difference between the numbers of adult members in households. In each household, members who shared the meals were considered to represent the size of the household. The number of cooked meals was an average of 1.9 in urban households and 2.4 in rural households with a significant difference (P<0.001) between the two areas.

Consumption of discretionary salt

Overall, households consumed a median of 45 g of salt per day (Table 2). This quantity of salt added during meal preparation was significantly higher in rural (89.5 g/day) than in urban areas (23 g/day) (P<0.001). At the individual level, the same trend was observed with a significantly higher per capita salt consumption in rural (7.1 g/day) compared to urban areas (2.7 g/day) (P<0.001). Considering the main meal, the amount of discretionary salt is still significantly higher in rural households (39.5 g/day vs. 17 g/day; P<0.001).

Contribution of bouillon to salt intake

The majority of households (94.6%) were using bouillon for cooking. Most of them used several brands at the same time. The median consumption of bouillon by households (Table 2) was 50 g per day, which was significantly higher in rural areas than in urban areas (62.5 g vs. 30 g; P<0.001), and it was the same when

Table 2. Consumption of salt and bouillon by households.

Parameter	All (N= 111)	Rural (N= 54)	Urban (N= 57)	*P*
Discretionary salt by household (g/day)	45 [23 ; 90]	89.5 [49 ; 162]	23 [17 ; 40]	< 0.001
Discretionary salt per individual (g/day)	4 [2.4 ; 6.9]	7.1 [4.3 ; 9.9]	2.7 [2.0 ; 3.4]	< 0.001
Consumption of bouillon per household (g/day)	50 [30 ; 65]	62.5 [50 ;89]	30 [20 ; 50]	< 0.001
Consumption of bouillon per individual (g/day)	4.5 ± 2.6	5.3 ± 2.8	3.6 ± 2.1	< 0.010
Salt contribution of bouillon per household (g/day)	27.5 [16.5 ; 35.7]	34.4 [27.5 ; 48.9]	16.5 [11 ; 27.5]	< 0.001
Discretionary salt for the main meal by household (g/day)	26 [15 ; 46]	39.5 [26 ; 58]	17 [10 ; 27]	<0.001
consumption of bouillon for the main meal by household (g/day)	20 [10 ; 30]	30 [20 ; 48]	10 [10 ; 20]	<0.001
Salt contribution of bouillon for the main meal per household (g/day)	11 [5.5 ; 16.5]	16.5 [11 ; 26.4]	5.5 [5.5 ; 11]	<0.001

Values are expressed as mean ± SD or median with interquartile rang.
Source: Authors

Table 3. Estimate of individual salt intake and level of salt consumption.

Characteristics	All (N= 111)	Rural (N= 54)	Urban (N= 57)	*P*
Total salt consumption (discretionary salt + salt contribution of bouillon) per household (g/day)	74.5 [42 ; 139.5]	136.6 [86.1 ; 212.3]	43.4 [31.5 ; 64]	< 0.001
Total salt consumption for the main meal (discretionary salt + salt contribution of bouillon) per household (g/day)	38 [23 ; 59]	56.4 [40 ; 82.5]	24 [16.2 ; 34]	< 0.001
Total salt consumption (discretionary salt + salt contribution of bouillon) per capita (g/day)	6.3 [4.3 ; 10.3]	10.2 [6.8 ; 13.4]	4.6 [3.6 ; 5.7]	< 0.001
Total salt consumption for the main meal (discretionary salt + salt contribution of bouillon) per capita (g/day)	3.3 [2.3 ; 4.7]	4.5 [3.1 ; 6.2]	2.6 [1.9 ; 3.4]	< 0.001
Level of consumption (%)				
High (>5g/person/day)	66.7	94.4	40.4	<0.001

Values are expressed as median with interquartile range or percentage.
Source: Authors

reported at the individual level, 5.3 g/day ± 2.8 in rural areas and 3.6 ± 2.1 g/day in urban areas (P<0.01). The median salt intake from bouillon was estimated at 27.5 g of salt per household, representing an average of 2.5 g/day for each individual in the household. The median amount of bouillon added to the main meal was 20 g/day overall and significantly higher in rural areas (30 g/day).

Assessment of household and per capita total salt consumption (discretionary salt + bouillon salt)

The median household total salt consumption was 74.5 g per day (Table 3). This quantity was significantly higher in rural area compared to urban area (136.6 g/d vs 43.4 g/d ; P<0.001). The average per capita salt consumption was 6.3 g per day, with a significant difference between rural and urban area, respectively (10.2 g/d vs 4.6 g/d ; P<0.001). Compared to the WHO recommendation, 66.7% of households' had a per capita consumption of salt more than 5g per day. When considering salt consumed at the main meal in rural households vs. salt consumed at the main meal in urban households, there was still a significant difference between the two areas (56.4

Table 4. Knowledge, attitudes and practices related to salt and bouillon use.

Characteristics	All (N= 111)	Rural (N= 54)	Urban (N= 57)	*P*
Consumption of bouillon	94.6	98.2	91.2	
Knowledge of the composition of bouillon	23.4	20.4	26.3	
Health consequences of excessive salt	75.7	70.4	80.7	
Frequency of adding bouillon to meals				
Always/Often	91.9	96.3	87.7	
Sometimes	1.8	1.9	1.8	
Never	6.3	1.8	10.5	
Cooking without bouillon	49.5	30.2	69.2	<0.001
Reasons for using bouillon				
To enhance the taste	85.7	86.8	84.6	
By habit	19.1	20.8	17.3	
Perception on the amount of salt consumed (How do you rate the amount of salt you eat?)				
Low	6.3	5.6	7	
Adequate	82.9	85.2	80.7	
High	10.8	9.3	12.3	
Limitation/reduction of salt in diet (Is it important for you to reduce the salt in your diet?)				
Very important	52.3	40.7	63.2	0.018
Less important	11.7	7.4	15.8	
Not important	29.7	46.3	14	<0.001

Values are expressed as percentage.
Source: Authors

g/day vs. 24 g/day; P<0.001).

Knowledge, attitudes and practices related to salt and bouillon consumption

As described on Table 4, 75.7% of the households were informed about excessive salt consumption. Among possible diseases related to salt consumption, high blood pressure was cited by more than half (57%) of respondents. A large majority (83%) believed that they were consuming the right amount of salt, however, more than half (52.3%) attached great importance to reducing/limiting salt in their diet. Overall, 94.6% of these households were using bouillon when preparing meals, but less than a quarter of the respondents (23.4%) knew at least one of the components of bouillon. They were mainly used to enhance the taste of food (85.7%) or as a cooking habit. Nearly half (49.5%) of households felt they could cook their meals without bouillon, with significant difference between urban and rural households (69.2% vs 30.2%; P<0.001).

DISCUSSION

In this study, the average salt consumption per individual

(6.3 g/day) was comparable to findings of studies conducted in Malawi (Prynn et al., 2018) Italy (Donfrancesco et al., 2021) and Vanuatu (Paterson et al., 2019), using the standard 24-hour urine collection method, which found that these populations consumed 7.1g, 7.2g and 5.9g of salt/day respectively. However, the salt consumption of our population was lower than the average consumption of adult population over 20 years old (8g/day) reported in the Senegal profile for non-communicable diseases (WHO, 2018a). Results from other studies using the same methodology as ours in Nepal (Ghimire et al., 2019), or by measurement through standard 24-hour urine collection in various countries (Lazda et al., 2018; Menyanu et al., 2020; Neupane et al., 2020) also found higher quantities. Differences in methodology and geographical location explain the differences in estimated salt consumption. The 24-hour collection of urine is a direct and more accurate method that directly reflects individual consumption. On the other hand, the per capita estimate of salt consumption is an aggregate measure that represents the average salt consumption in a given population. Overall, higher per capita consumption suggests greater availability of salt in the diet which could be associated with higher levels of urinary sodium in the population. It also depends on the culture, economic context, and dietary habits.

The consumption of salt by rural households was

double that of urban households (10.2 vs. 4.6 g/day), which is probably because rural households were preparing significantly more meals than urban households. Indeed, rural households were more likely to prepare and consume the three main daily meals together as a whole household.

In urban areas, the main meal consumed by all members of the household was lunch, while breakfast and dinner were often eaten outside the household. The number of cooked meals was an average of 1.9 in urban households and 2.4 in rural households with a significant difference (P<0.001) between the two areas. When considering salt consumed at the main meal in rural households vs. salt consumed at the main meal in urban households, there was still a significant difference between the two areas. This confirms the same pattern observed when all the meals prepared in the household were taken into account.

The per-individual consumption of bouillon estimated in this study was almost double the amount estimated in the national survey on household use of adequately iodized salt and bouillon in Senegal (IPDSR, 2014). The proportion of households consuming bouillon was equal to that reported at the national level (94%) in a survey on the status of certain micronutrients (UCAD/COSFAM/NI, 2011). The rate of bouillon use in urban areas was comparable to observations made in Benin and Guinea according to a meta-analysis of urban populations in five sub-Saharan African countries (Leyvraz et al., 2018). Our results showed that rural households were adding twice the amount of bouillon than urban households. This quantity of bouillon added was probably linked to the quantity of food cooked and consequently to the larger household size in rural areas. Given that a bouillon cube weighs on average 10-12 g, this means that a rural household added approximately 6 bouillon cubes per day for meal preparation, compared to 3 cubes for an urban household.

In general, the per capita salt consumption of these Senegalese households was well above the WHO standard, indicating that actions should be taken to improve awareness and promote a reduction of salt consumption. In particular, the use of seasoning bouillon, which represented more than a third (37%) of the salt consumed by our households, should be rationalised. The situation is particularly alarming as discretionary sources account for about 15-20% of total dietary sodium intake (SACN, 2003). This suggests that total salt consumption from all sources is considerably very high.

Urinary sodium analysis, which is the gold standard method that accurately gives the amount of salt consumed at the individual level (McLean, 2014), was not used in this study due to a lack of resources and time. The consumption of discretionary salt at the household level measured by weighing method did not take into account all sources of salt in our diet. But, in developing countries, the majority of dietary salt is added during food preparation (Brown et al., 2009).

Another limitation of this study is that the sample was not representative at national level but given that salt consumption patterns are generally uniform across the same population and context (Mannar, 2018), the data from this study provides a good overview of the overall situation in the country. However, this study should be complemented by measuring salt from processed foods (industrial or artisanal) and foods prepared and/or eaten outside the home (e.g., from street vendors, fast-food) to have a better estimate of total salt consumption in Senegalese households.

Our study population's knowledge about the harmful effects of excessive salt consumption and the importance of reducing salt in the diet was comparable to results obtained in Ethiopia and Kenya (EPHI, 2015; KNBS, 2015). However, there was less awareness in our study population (75.7%) about the consequences of high salt consumption, compared to the national STEPS survey conducted in 2015 (ANSD, 2015), which reported that 88.3% of Senegalese think that salt can harm their health. In rural areas, the lack of importance given to limiting or reducing salt in the diet was due to limited knowledge and the absence of communication and awareness-raising strategies on salt consumption and their link with cardiovascular diseases. Indeed, in the program to strengthen nutrition, the talks organised by community health workers were generally limited to infant and child feeding, hygiene measures and precautions, pre- and post-natal care and the use of iodised salt... Despite the very frequent and widespread use of bouillon, few of the people in charge of cooking in the households visited could name at least one ingredient in their composition. This indicates a lack of knowledge and nutritional education, which was more marked in rural areas. This could be explained by the fact that women were more interested in the flavour enhancer function of bouillon than in their composition or their nutritional value.

At least two-thirds of the households surveyed had a per capita consumption of discretionary salt above the WHO recommendations (5 g/day), yet most think they were consuming the right amount of salt. This perception of individuals was similar to that reported at national level (ANSD, 2015). Individuals with a high preference for salt also had a higher salt consumption but they assessed the right amount according to their attraction for salty taste, which leads to false perceptions on the quality of their diet (Pilic et al., 2020). Dependence on high salt intake in humans is induced early in life, so as people grow older, their dependence on salty foods, reinforced by exposure to manufactured products, worsens (Roberts, 2001).

Conclusion

This study showed that Senegalese households (rural

and urban) use high quantities of salt and consequently per capita salt consumption was above WHO recommendations. The consumption of bouillon contributed significantly to salt intake, particularly in rural areas. Since the contribution of potentially salt-rich processed foods was not considered in this study, salt consumption would probably be higher, particularly in urban areas. The current levels of salt consumption would expose urban as well as rural population to a high risk of hypertension and other diet-related non-communicable diseases.

CONFLICT OF INTERESTS

The authors have not declared any conflict of interests.

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