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Measurement of the Effects of Nutritional Education for Reducing Sodium Intakes and Increasing Potassium Intakes

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Abstract

Background: The Togolese population, like those around the world, frequently consumes foods high in salt/sodium and low in potassium, thus exposing them to cardiovascular disease (CVD). Nutritional intervention can help reverse this consumption pattern and reduce related CVD morbidity and mortality. The objective of this study was to measure the effects of a nutrition education intervention on the consumption frequencies of foods rich in sodium and potassium. **Methods**: The study was a quasi-experimental before-and-after study, conducted from 08 January to 16 April 2023. It involved 200 adults aged 25 - 64 years, randomly selected from two areas: an intervention area and a non-intervention area. Data were collected in two phases at 3-month intervals in both groups. The intervention consisted of nutrition education (awareness raising and cooking demonstrations) on reducing salt/sodium intake and increasing potassium-rich food intake. The kobocollect electronic questionnaire was administered to the respondents to collect data on the frequency of consumption of foods rich in sodium and potassium. **Results**: The median age of the respondents was 33 years old (30; 38) and 56% of the participants were women, 44% and 69% respectively in the control and intervention groups. Most participants lived in rural areas (51%), 52.4% and 49.5% in the control and intervention groups respectively. Overall, 4% ($p < 0.0089$) of individuals reduced their frequency of adding salt at mealtime from more

than 3 times a week to less than 3 times, *i.e.*, 5.6% in the intervention group and 1.7% in the control group. The proportion of individuals who consumed meals with green leafy vegetable sauces was reduced from more than 3 times a week to less than 3 times, *i.e.*, 7.5% ($p < 0.022$), or 1% in the intervention group and 4% in the control group. Education level (0.23 [0.10 - 0.50]; $p < 0.0001$) and male gender (4 [2.06 - 6.35]; $p < 0.0006$) were associated with reduced salt addition at meals. The same trend was observed for increased consumption of green leafy vegetable sauces (0.95 [0.03 - 0.99]; $p < 0.011$), male (2 [1.08 - 1.84]; $p < 0.000$) and other foods which were not significantly associated. **Conclusion:** This study was able to measure the effects of a nutrition education intervention for adequate sodium and potassium intakes on changing favourable dietary behaviour through a quasi-experimental study. The results show that the continuation of the intervention will contribute to the adoption of favourable behaviours for the reduction of dietary sodium intakes and the optimisation of potassium intakes.

Keywords

Nutrition Education, Consumption Frequency, Sodium/Salt, Potassium, Togo

1. Introduction

According to the recent WHO report on salt, the world's populations consume more food rich in salt/sodium than potassium [1]. Togo is concerned by this situation where most of the population does not respect the consumption of the five portions of fruits and vegetables with a high potassium content [2] [3]. Potassium plays an important role in lowering blood pressure. High sodium intake (>2.3 grams/day, equivalent to 5 grams of salt per day) and insufficient potassium intake (less than 3.5 grams per day) contribute to high blood pressure and consequently to increased risk of heart disease and stroke [4] [5] [6] [7]. Thus, by reducing salt intake and increasing the intake of food rich in potassium, high blood pressure is reduced. To fight effectively against cardiovascular diseases, the WHO, through the global programme for the fight against non-communicable diseases, recommends a 30% reduction in salt consumption in the population by 2030 [1]. To achieve this goal, one effective strategy at EU level is to reduce the frequency of consumption of foods high in sodium versus potassium [8] [9] [10] [11]. One effective strategy to reduce salt consumption in favour of potassium-rich foods is to raise awareness of the realities of cardiovascular disease and the consequences of excessive consumption of salt and foods high in sodium versus low in potassium [12] [13] [14] [15] [16]. The objective of this study was to measure the effects of a nutrition education intervention combining awareness-raising and cooking demonstrations on the consumption habits of foods rich in sodium and potassium. To reduce dietary sodium intake and optimise potassium intake in Togo, a pilot nutrition education study is being implemented in Dapaong, capital of the Tône prefecture.

2. Methods

2.1. Study Setting

The study took place in the prefecture of Tône, whose capital is Dapaong, located in the Savannah region in the north of Togo, a West African country with a population of 8,095,498, 51.27% of whom are women [17]. It is the largest prefecture (388,775 inhabitants) among the 7 in the Savanes region. The Savanes region is the 3rd largest region in Togo with 1,143,520 inhabitants. The region has a tropical climate with two rainy seasons. Agriculture is the main activity of the inhabitants and food crops such as maize, rice, tubers (yams, manioc, taro) and vegetables are more cultivated. Also, cash crops such as cotton, cashew nuts, and shea nuts are cultivated. In the lean season, the inhabitants make vegetable gardens where different vegetables are grown for their sauces.

2.2. Study Methods

Type of study

This was a quasi-experimental before-and-after study, conducted from 8 January to 16 April 2023. At baseline, sociodemographic data, and the frequency of consumption of foods that provided more sodium and potassium were collected. After interventions (awareness raising and cooking demonstrations), the same data were collected 3 months later from the people studied. These data were collected in the intervention group (here) and in the non-intervention group (elsewhere).

Study populations

The study population was adults aged 25 - 64 years of both sexes residing in the four study locations.

Inclusion criteria

All men and women between the ages of 25 and 64, apparently healthy and not under dietary restriction, who had been living in the study area for at least six months including the study period, were included. It was important to ensure their integration into the living environment, lifestyle and their presence at all meetings in order to minimise the risk of losing sight of them.

Non-inclusion criteria

The following were not included in the study:

- Pregnant and/or breastfeeding women: The various changes related to their physiological state and eating habits could influence their consumption of foods rich in sodium and potassium;
- Those who met the inclusion criteria but had a medical condition that prevented the administration of the questionnaire;
- Those who met the inclusion criteria but deliberately refused to participate in the study.

2.3. Sampling Methods and Techniques

The probability sampling method and the simple random sampling technique

applied to the first stage were used to select the study areas. The intervention and non-intervention (control) areas were each composed of two settings (rural and urban). The 2nd stage consisted of concessions and households and the 3rd stage consisted of individuals in households in each locality/medium. The sampling step was determined by dividing the number of households in the identified locality by the total number of households to be surveyed in each locality. The first randomly selected household was given a random number between 1 and the survey step. The other households were selected by adding the step to the previous number. The head of the household was chosen for the selection of the respondents. When both the father and mother were present at the time of the survey and all are eligible, a simple random selection was applied to identify the successful respondent.

Sample size

To determine the sample size for this study, we used the formula of Hsieh *et al.* [18].

$$n = \left[2*\left(Z\alpha/2 + Z\beta\right)^2 * \left(\sigma_1^2 + \sigma_2^2\right)\right] \Big/ \Delta^2$$

where n is the required sample size per group, $Z\alpha/2$ and $Z\beta$ are the z-values for the desired confidence and power levels, σ_1 and σ_2 are the standard deviations in the intervention and control groups, Δ is the minimum difference to detect between the two groups. A non-communicable disease risk factor study in Sri Lanka reduced mean salt intake by 2 g in the intervention group and 1 g in the control group, after 9 months of intervention [19]. Based on this difference in change at the 95% confidence level and to the power of 85% we have:

$$n = \left[2*\left(1.96 + 1.04\right)^2 * \left(2^2 + 1^2\right)\right] \Big/ 1^2$$

$$n = 90$$

We need about 90 individuals in each group, so a total of about 180 individuals. By increasing the sample size by 10% to cover dropouts and those lost to follow-up during the study, the minimum sample size is 99, or 100 per round per group. In the localities, 50 people were selected by simple random selection.

2.4. Data Collection Procedures

Before proceeding with data collection, the questionnaires were validated by a team of Togolese nutritionists and then pre-tested in the communities where the survey took place. Data collection was done using kobocollect. The forms were set up in the Android mobile phones of the interviewers who were initially trained in the use of kobocollect. The questionnaire was administered to respondents twice at 3-month intervals in both groups. In the non-intervention areas, the survey was conducted directly in the households and the second appointment was made at the time of the first collection. In contrast, in the intervention areas, respondents were invited to the health centre at the end of the first collection phase to participate in nutrition education on the frequency of

salt and sodium/salt-rich food consumption, the benefits of salt reduction, the relationship between dietary intakes of sodium/salt, potassium and cardiovascular risk, health-promoting dietary behaviours and a cooking demonstration on the amount of salt to use during cooking. Their contacts and details were recorded. Three months later, a second collection is carried out at their location, in households exactly like those surveyed in the area without intervention (control).

2.5. Nutritional Education Intervention

A total of four localities in Dapaong, two of which were rural and two urbans, were selected for study. These were the localities of Korbongou, Bamonga located in the rural zone and Daponkpergou and Zongo located in the urban zone. One group (intervention group) composed of two zones, one rural and the other urban (Bamonga and Zongo) benefited from the nutrition education intervention and a second group (control group) composed of the two other zones were without intervention.

Intervention group

In the 2 villages that benefited from the intervention, sub-groups of 8 to 10 participants were formed by affinity. In total, 5 nutrition education sessions followed by cooking demonstrations per village. Each education session was led by the nutrition focal points and health facility managers who cover these localities. They were trained for this purpose. During each session, they used educational sheets with well-defined objectives to develop educational themes. Each nutrition education (awareness-raising) session lasted 1.5 to 2 hours and took the form of a guided discussion. The aim was to reduce the frequency of consumption of foods that provided more salt and increase those that provided more potassium.

For the cooking demonstrations, the amount of salt (5 grams) to be used was presented. A measuring scoop and a teaspoon were used to show the participants how to estimate the amount of salt they should not exceed during the day.

Control group

In the control group, no intervention was conducted.

2.6. Variables Study

The variables consisted mainly of:

- Socio-demographic data describing the respondents;
- The variables of interest which were the frequency of consumption of foods rich in sodium and potassium during the week, through the frequency questionnaire administered to the respondents.

The foods considered as providing more sodium and potassium in Togo were identified through previous studies [20]. They were bread, cooking salt, cube, ham, soy sauce, and cold cuts for sodium intake and green vegetable sauces, fruits, and coconut for potassium intake. The difficulty of assessing salt intake is often the

basis of underestimates, hence the usefulness of identifying behaviours that may contribute to excess intake, such as adding salt at the table and eating foods with too much salt. In our study we explored salt consumption patterns that may contribute to increased sodium intake. Four groups are constructed. 0: never or rarely, 1: several times a week, 2: every day, 3: once a week. A consumption frequency of >3 times/week was considered high.

2.7. Data Processing and Analysis

Qualitative data were described by proportion and confidence interval (CI) and quantitative data by mean with standard deviation (SD) or median with interquartile range (IQ). The data were analysed with STATA software version 16.1. A descriptive analysis made it possible to describe the various sociodemographic characteristics of the people surveyed. This analysis also made it possible to describe the frequency of consumption of foods rich in sodium and potassium before and after the intervention in the two study groups. The relationship between favourable change, *i.e.*, the association between the reduction in the frequency of adding salt to meals and sociodemographic factors on the one hand, and the increase in the frequency of consumption of green leafy sauces and sociodemographic factors on the other hand, in the intervention area was determined by logistic regression with univariate and multivariate analysis.

2.8. Ethical Considerations

This study was carried out on the advice of the ethics committee N˚019/2021/CBRS of 27/05/2021. The agreement of the local authorities (Prefect, Mayor, Regional and Prefectoral Director) was sought before data collection. Information notes were written for the population of Dapaong and its surroundings specifying the dates of the two visits of the interviewers for the collection. The objectives and procedures for data collection were clearly explained to the respondents before the questionnaires were administered. Only subjects who gave their free and informed consent were included in the sample. The data were collected and kept strictly confidential within the study team.

3. Results

3.1. Socio-Demographic Characteristics

A total of 100% of the people had given their consent to participate in this study. The median age of the respondents was 33 years (30; 38) and 56% of the participants were women, *i.e.*, 43.9% and 68.8% respectively in the control and intervention groups. Most participants lived in rural areas (51%), *i.e.*, 52.4% and 49.5% in the control and intervention groups respectively. Among the people surveyed, 28.25% had not attended school (36.8% in the control group and 19.8% in the intervention group) and were mainly housewives (27.8%), *i.e.*, 24% and 32% in the control and intervention groups, mainly (Table 1).

Table 1. Socio-demographic distribution of those surveyed.

Socio-demographic characteristics	Control		Intervention		Total		p
	n	%	n	%	n	%	
Age							0.306
Median (Q1 - Q3)	**212**	33 (30 - 38)	**202**	33 (30 - 38)	414	33 (30 - 38)	
Sex							0.000
Female	93	43.9	139	68.8	232	56	
Male	119	56.1	63	31.2	182	44	
Level of education							0.000
Uneducated	78	36.8	40	19.8	118	28.5	
Primary	74	34.9	106	52.5	180	43.5	
Secondary plus	60	28.3	56	27.7	116	28	
Profession							0.000
Farmer	65	30.7	33	16.3	98	23.7	
Dealer/Trader	63	29.7	31	15.3	94	22.7	
Housewife	51	24.1	64	31.7	115	27.8	
Craftsman	33	15.6	74	36.6	107	25.8	
Place of residence							0.562
Urban	101	47.6	102	50.5	203	49	
Rural	111	52.4	100	49.5	211	51	
Locality							Pr = 0.000
Zongo	101	47.6	0	0	101	24.4	
Korbongou	111	52.4	0	0	111	26.8	
Boumonga	0	0	100	49.5	100	24.2	
Dapkanpergou	0	0	102	50.5	102	24.6	

p for chi^2 test.

3.2. High Frequency of Sodium/Salt and Potassium Intakes: Pre- and Post-Intervention Variation in Both Groups

3.2.1. High Frequency (>3 Times/Week) of Consumption of Sodium/Salt Rich Foods: Variation before and after the Intervention

At the subgroup level, statistical analysis shows a significant decrease in the proportion of individuals consuming bread by 8.7% ($p < 0.004$) and soy sauce by 10.7% ($p < 0.0008$) in the control group. In the intervention group, the decrease was significant only for the addition of salt during meals by 5.6% ($p < 0.011$) (Table 2).

In general, the statistical analysis shows a significant decrease in the addition of salt at mealtime for all the groups studied. We note that approximately 4% ($p < 0.0089$) of people reduced their frequency of adding salt at mealtimes, including 5.6% in the intervention group and 1.7% in the control group (Table 3).

Table 2. Distribution of individuals according to the frequency of high consumption (>3 times/week) of sodium-rich foods before and after the intervention in the control group and in the intervention group.

Rich foods Sodium	Control (%)		Change	p	Rich foods Sodium	Intervention (%)		Change	p
	Before	After				Before	After		
Bread	35.7	27	−8.7	**0.004**	Bread	3.9	4	−0.9	0.2472
Cooking salt	92.9	93	0.1	0.9528	Cooking salt	93.1	94	0.9	0.5421
Adding salt	2.7	1	−1.7	0.7717	**Adding salt**	**17.6**	**12**	**−5.6**	**0.0117**
Cube	89.3	87	−2.3	0.6515	Cube	47.1	62	14.9	0.5421
Soy sauce	10.7	0	−10.7	**0.0008**	Soy sauce	2.9	0	−2.9	0.0721
Ham	2.7	5	2.3	0.9937	Ham	1	2	1.0	1
Mustard	2.7	1	−1.7	0.7717	Mustard	1	0	−1.0	0.2341
Cold cuts	1.8	1	−0.8	0.8921	Cold cuts	2.9	4	−1.1	0.2215

p for student test.

Table 3. Distribution of individuals according to the frequency of high consumption (>3 times/week) of sodium-rich foods in the two groups before and after the intervention.

Rich foods Sodium	Control		Intervention		Change/Na	p
	Before	After	Before	After		
Bread	35.7	27	3.9	3	7.8	0.9359
Cooking salt	92.9	93	93.1	94	0.8	0.144
Adding salt	**2.7**	**1**	**17.6**	**12**	**−3.9**	**0.0089**
Cube	89.3	87	47.1	62	17.2	0.9997
Soy sauce	10.7	0	2.9	0	7.8	0.9359
Ham	2.7	5	1	2	−1.3	0.072
Mustard	2.7	1	1	0	0.7	0.1362
Cold cuts	1.8	1	4	2.9	−0.3	0.0766

p for student test.

3.2.2. High Frequency (>3 Times/Week) of Consumption of Foods Rich in Potassium: Variation before and after the Intervention

At the subgroup level, statistical analysis shows that in the control group, about 28% ($p < 0.006$) significantly increased their exercise. In the intervention group, only 1% ($p < 0.0028$) of individuals significantly increased their frequency of consumption of five fruits and vegetables. The increase related to the frequency of consumption of other foods that provided more potassium was not statistically significant in either the intervention or the control group (Table 4).

However, in general, the statistical analysis shows a significant increase in the proportion of individuals who consumed meals based on green leafy vegetable sauces of 7.5% ($p < 0.022$); including 1% in the intervention group and 4% in the control group (Table 5).

Table 4. Distribution of people according to the frequency of high consumption (>3 times/week) of foods rich in potassium before and after the intervention in the control group and in the intervention group.

Rich foods Potassium	Control		Change	p	Rich foods Potassium	Intervention		Change	p
	Before	After				Before	After		
Vegetable salad	7.1	5	−2.1	0.9294	Vegetable salad	3.9	4	0.1	0.8801
Leafy green sauces	32.1	25	−7.1	0.9782	Leafy green sauces	20.6	21	0.4	0.241
Fruit and vegetable	31.3	35	3.7	0.7573	Fruit and vegetable	3.9	4	0.1	0.8801
Five portions of fruit_vegetables	1.8	5	3.2	0.7305	Five portions of fruit_vegetables	1	2	1	**0.0028**
Coconut	16.1	34	17.9	**0.0508**	Coconut	2	2	0	0.9377
Physical exercise	22.3	50	27.7	**0.0061**	Physical exercise	3.9	4	0.1	0.8801

p for student test.

Table 5. Distribution of people according to the frequency of high consumption (>3 times/week) of foods rich in potassium in the two groups before and after the intervention.

Rich foods Potassium	Control		Intervention		Change/K	p
	Before	After	Before	After		
Vegetable salad	7.1	5	3.9	4	2.2	0.0756
Leafy green sauces	**31.3**	**35**	**20.6**	**21**	**7.5**	**0.022**
Fruit and vegetable	32.1	25	3.9	4	−3.6	0.2818
Five portions of fruit_vegetables	1.8	5	1	2	−2.2	0.2102
Coconut	16.1	34	2	2	−17.9	0.9512
Physical exercise	22.3	50	3.9	4	−27.6	0.9939

p for student test.

3.3. Factors Associated with the Addition of Salt to Meals and the Consumption of Meals Made with Green Leafy Vegetable Sauces in the Intervention Area

3.3.1. Factors Associated with the Decrease in the Frequency of Adding Salt to Meals

Based on statistical analysis, it was found that education level, gender and occupation were associated with the reduction in frequency of salt addition at mealtime among those who received the intervention. Otherwise, educated individuals, males, housewives and artisans tended to reduce the addition of salt at mealtimes to less than 3 times a week. However, educated people at the primary level plus were more likely to reduce salt intake than those at the secondary level and above (0.23 [0.10 - 0.50]; $p < 0.0001$). Similarly, this reduction was 4 times greater for men than for women (4 [2.06-6.35]; $p < 0.0006$). Moreover, housewives and craftsmen were more favoured by this reduction than shopkeepers (Table 6).

Table 6. Socio-demographic factors associated with reduced salt/sodium addition at mealtime.

Socio-demographic characteristics	After intervention Univariate analysis	p	After intervention Multivariate analysis	p
Education				
Uneducated	1		1	
Primary	0.25 [0.12 - 0.49]	0.0001	0.23 [0.10 - 0.505]	0.0001
Secondary and above	1.11 [1.005 - 7.35]	0.0001	1.09 [1.01 - 7.21]	0.0001
Age				
25 - 33	1		1	
33 - 65	1.89 [0.42 - 8.42]	0.002	1.21 [1.09 - 8.42]	0.252
Sex				
Female	1		1	
Male	2.11 [1.28 - 3.38]	0.003	4.02 [2.06 - 6.35]	0.006
Place of residence				
Urban	1		1	
Rural	0.93 [0.58 - 1.50]	0.235	0.51 [0.42 - 1.56]	0.135
Profession				
Farmer	1		1	
Dealer/Trader	1.12 [0.81 - 2.61]	0.41	1.01 [0.09 - 1.95]	0.221
Housekeeper	0.75 [0.28 - 0.81]	0.005	0.71 [0.26 - 0.79]	0.005
Craftsman	0.43 [0.15 - 0.73]	0.001	0.38 [0.09 - 0.79]	0.005

3.3.2. Factors Associated with the Increased Frequency of Consumption of Green Leafy Sauces

According to the statistical analysis, the same trends are observed; educational level, gender and occupation were associated with increased frequency of high consumption of green leafy sauces. However, in contrast to the addition of salt, educated people at secondary level and above were more likely to increase the consumption of meals consisting of green leafy vegetable sauces than those at primary level (0.95 [0.03 - 0.99]; $p < 0.011$). This increase was more favourable for males (2 [1.08 - 1.84]; $p < 0.000$). Furthermore, craftsmen were more likely than shopkeepers to increase their consumption of meals consisting of green leafy vegetable sauces (Table 7).

4. Discussion

This study describes the effects of a behaviour change intervention in people whose diet was more favourable to sodium/salt intakes than potassium. These effects were observed in both the intervention and control groups. However, the frequency of adding salt to meals was the most significant behaviour in both groups about salt/sodium intakes and the consumption of meals based on leafy

Table 7. Socio-demographic factors associated with increased consumption of green sauces.

Caractéristiques sociodémographiques	After intervention Univariate analysis	p	After intervention Multivariate analysis	p
Education				
Uneducated	1		1	
Primary	2.38 [1.32 - 4.25]	0.003	1.09 [1.01 - 1.76]	0.001
Secondary and above	2.16 [1.16 - 4.03]	0.014	0.95 [0.03 - 0.99]	0.011
Age				
25 - 33	1		1	
33 - 65	1.08 [0.67 - 1.72]	0.76	0.43 [0.12 - 1.98]	0.13
Sex				
Female	1		1	
Male	0.33 [0.20 - 0.54]	0.000	1.41 [1.08 - 1.84]	0.000
Place of residence				
Urban	1		1	
Rural	0.59 [0.37 - 0.94]	0.027	0.40 [0.08 - 0.92]	0.153
Profession				
Farmer	1		1	
Dealer/Trader	1.59 [0.80 - 3.18]	0.188	0.08 [0.01 - 1.05]	0.972
Housekeeper	2.06 [1.04 - 4.094]	0.038	0.06 [−0.75 - 0.88]	0.879
Craftsman	0.43 [2.305 - 9.23]	0.000$	1.27 [1.0 - 1.88]	0.002

green vegetable sauces about potassium. To explain these variations, logistic regression analysis showed that certain sociodemographic factors predisposed to these beneficial changes in both the control and intervention groups.

4.1. Change in Behaviors with Salt Addition at Meals

Our results are similar to those of Liyanage IK *et al.* and Wentzel-Viljoen E *et al.* [19] [21] where the proportion of people who reduced salt addition at the table was about 1% and 5% respectively in the intervention zones. However, in the control area, in contrast to our results, Liyanage IK *et al.* found that the proportion of people who added salt at meals increased by about 8%. This difference could be explained by the migratory effect (communicating vessels) of the people studied in our study who would have indirectly benefited from the same intervention (nutrition education) as those in the intervention zone. Furthermore, it should be noted that the national programme for the fight against diseases carries out promotional activities on salt consumption in relation to cardiovascular diseases, which could boost the effect obtained in the two groups of our study. This is the place to underline the importance of nutritional education in the effort to reduce salt consumption, as confirmed by He *et al.* [22] in a study of salt

consumption reduction carried out in schools in China.

4.2. Factors Associated with Reduced Salt Addition at Mealtime

Our study showed that there were some factors associated with salt addition at mealtime. Our results are similar to those of McLaren *et al.* [23] where males reduced salt addition at mealtime more after intervention. Also, in the study by Castro Rda *et al.* [24], apart from male gender, the hypertensive status of the individuals studied was also associated with salt addition during meals, but the level of education was not. This difference could be explained by the target of our study; in fact, we excluded in our study any person who was hypertense or suffering from a cardiovascular disease. Also, in our study, more than a third of the populations were mostly uneducated.

4.3. Behavioural Changes Related to the Consumption of Green Leafy Vegetable Sauces

Our results show a slight increase in consumption of foods that provide more potassium (green leafy vegetable sauces) for both the control and intervention groups. These results are consistent with those of He FJ *et al.* [22] and Grimes CA *et al.* [25]. The progressive consumption of leafy vegetable sauces could be explained by the fact that the study was conducted in households where the diet is based on basic meals made of maize paste, which are usually accompanied by vegetable sauces. Also, the permanent availability of these vegetable sauces could be explained by the vegetable gardens that are often practiced in this northern zone at the end of the rainy season in January.

4.4. Factors Associated with High Consumption of Green Leafy Vegetable Sauces

Our study showed that there were factors associated with the consumption of green leafy vegetable sauces. These results differ from those of Christian MS *et al.* [26] where only dietary practices and behaviours were associated with the increase. This difference could be explained by the choice of explanatory factors identified for the study. However, in another study carried out by the same author and his colleagues [27] on the evaluation of the impact of the level of education on the consumption of fruit and vegetables (potential source of potassium), the level of education played an important role in the increase in consumption of fruit and vegetables.

All in all, a good level of knowledge about the consumption of sodium versus potassium foods predisposes to a healthy diet. A study in the same locality found that people had poor knowledge of health-promoting behaviours regarding dietary intakes of sodium and potassium [28]. Thus, regardless of sociodemographic factors, it is important to have optimal knowledge of dietary sodium and potassium intakes, hence the importance of promoting a diet based on a healthy lifestyle and favourable to the fight against cardiovascular disease [29]. This promotion should be done through the development of normative programmes,

training of actors and community awareness raising.

4.5. Strengths and Weaknesses of the Study

The strengths of this study lie in its methodological character. Indeed, it is the first nutritional study to have adopted a quasi-experimental method in this region of Togo where salt consumption is high. The participation rate was 100% despite the pandemic context in Covid 19 and the intervention was able to reduce the frequency of salt consumption and increase the consumption of potassium-rich foods.

However, the weaknesses lie in the self-reporting of the respondents; all the data were obtained on the basis of self-reporting by the subjects and some bias can be noted. Indeed, not all the people surveyed in phase 1 were found in phase 2, about 75% were found. For a better follow-up of behavioural change at the individual level, it was important to find the same people before and after the intervention in the groups. However, we preferred to use a population-based approach to measure the effects observed after the intervention. The participants in the non-intervention (control) group and those exposed to the intervention were different at the beginning of the study (gender, education level, frequency of consumption of Na-rich and K-rich foods), but the average age was the same in both groups (intervention and control).

5. Conclusion

This study was able to measure the effects of a nutrition education intervention for adequate sodium and potassium intakes on changing favourable dietary behaviour through a quasi-experimental study. The results show that the continuation of the intervention will contribute to the adoption of behaviours favourable to the reduction of dietary sodium intakes and the optimisation of potassium intakes.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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