Research Paper E-ISSN NO : 2455-295X | VOLUME : 3 | ISSUE : 7 | JULY 2017

COMPARISION BETWEEN TWO GROUP INTERVENTIONS OF ANTHROPOMETRIC PARAMETERS AND FOOD CONSUMPTION: A QUASI-EXPERIMENTAL STUDY

ISABELA PIRES LOYOLA [1] | **LIS PROENÇA VIEIRA*** [1] | Luiz Aparecido Bortolotto [2] | Heno Ferreira Lopes [2]

[1] Nutrition Department- Heart Institute (InCor) da Faculdade de Medicina, University of São Paulo, São Paulo, Brazil.

[2] Hypertension Department- Heart Institute (InCor) da Faculdade de Medicina, University of São Paulo, São Paulo, Brazil.

ABSTRACT

Introduction: *Hypertension is recognized as an important cardiovascular risk factor. Although it is already known that the quality of a diet is fundamental to preventing and treating hypertension, it is still unclear which dietary method is more effective.* ***Objective:*** *The aim of this study was to compare anthropometric and dietary parameters between 2 groups interventions in dietary pattern.* ***Methods:*** *One received an interdisciplinary intervention (intervention group) and the other a standard nutritional intervention (control group). The intervention group comprised 14 individuals, while the control group comprised 10, totaling 24 obese and hypertensive individuals treated at a cardiology institution for 3 months. Height, weight, and waist circumference were measured. To evaluate the consumption of food groups and sources of saturated fat, sodium, and sugar, a food frequency questionnaire were used before and after the interventions. The data were analyzed using Spearman correlations, the Student t test for variables with normal distribution, and the Mann-Whitney test for the nonparametric variables. A p-value < 0.05 was considered statistically significant.* ***Results:*** *There was no difference between groups regarding sex, age or dyslipidemia; however, a difference was noted between groups for diabetes. No difference was noted in weight loss, BMI, and waist circumference reduction. In the intervention group, the reduction of these variables was significant. There was a significant difference between groups regarding food consumption.* ***Conclusion:*** *No differences regarding anthropometric measures were observed. The intervention group had significantly greater improvement in legume consumption and a larger reduction in carbohydrate, sodium, and sugar sources.*

Keywords: Hypetension, Obese, Intervention, Nutritional Education, Multidisciplinary Intervention.

Introduction:

In 2012, cardiovascular diseases (CVD) accounted for an estimated 31% of deaths worldwide. Hypertension (HTN) is one of the main risk factors for CVD, affecting 21,4 % of Brazilian population(WHO, 2015; Andrade et al, 2015). This is a complex multifactorial disorder that can lead to cardiac, brain, and kidney complications (INTERSALT, 1988; Kotchen, 2013; Johnson, 2014)

Much evidence has been found of a relationship between HTN and lifestyle, such as a sedentary lifestyle, obesity, and high sodium and alcohol intake (Weber, 2014).Also, many studies relate lifestyle modification to a reduction in cardiovascular risk factors (Weber 2014; Yosuf, 2004). Among the modifiable risk factors, sedentary lifestyle, obesity, and high sodium and alcohol intake are the most important ones for reducing risks, improving blood pressure (Sociedade Brasileira de Cardiologia, 2016). Adopting healthy eating habits is essential for the prevention and treatment of hypertension. Nutrition education has a significant impact on the process of transformation, recovery, and promotion of these healthy eating habits, because it can provide necessary knowledge for making decisions, and forming healthy attitudes and practices (Bueno, 2011). However, not only nutrition education but also the approach used may be a facilitator for the creation and adoption of these habits. Group interventions seem to be one of these facilitators because they aim to change the environment into an interactive local environment that promotes learning (Alvarez, 2009). Group interventions are characterized by opportunities for social interaction, also it provides empathy, social support, and a healthy dose of competition(Gidron, 2013). It is possible to see that, in group settings, patients begin to get in touch with their difficulties, understanding that they can play an active role in caring for their health (co-responsibility between patient and health team), increasing possibilities for changing habits and improving quality of life (Alvarez, 2009; Johns, 2014).

Because HTN is a multifactorial disorder, a multiprofessional team is preferable for treating this disorder (Sociedade Brasileira de Cardiologia, 2016).

Although it is well established that lifestyle change is fundamental for prevention and treatment of hypertension, few reports establish which method is more effective to obtain this change (Johns, 2014).

The aim of this study was to compare anthropometric parameters and food consumption of patients with hypertension participating in an interdisciplinary group intervention with others undertaking a standard group intervention at a cardiology institution.

METHOD

Study design:

This was a nonrandomized intervention study conducted

at the Cardiology Institute (InCor) in São Paulo, Brazil. The results of 2 different group intervention strategies were compared for outpatients who were obese and had hypertension and who were followed up for 3 months. The Institute's Ethics Committee approved this study (0881/09).

Population:

Inclusion criteria: we included adults between 18 and 80 years of age, with a diagnosis of hypertension and obesity (BMI ≥ 30kg/m^2), with or without other disorders.

Exclusion criteria: chronic stage 3 kidney disease, type 1 diabetes mellitus, and limited mobility.

For the intervention group, subjects were screened through telephone calls from a list of patients registered at the hypertension outpatient hospital clinic. In the control group, all subjects were referred to the nutrition outpatient hospital clinic from the medical outpatient clinic to undergo standard care.

The standard care consists of 6 group sessions comprising 4 meetings conducted only by dietitians and a further 2 conducted by dietitians and psychologists. Lectures and workshops were about healthy eating habits and weight loss. The first meeting was an explanation of the Brazilian Eating Pyramid (Phillipi, 2014) and food groups. The second was a workshop called "Dietary Errors" in which patients pointed out mistakes of one daily food intake example. In the third, patients described their usual meals using food models. The last workshop was a lecture given concurrently with a practical lesson about food labels and nutrition facts. In the first meetings with the collaboration of psychologists, emotional aspects of the relationship with food patterns were addressed, and in the second meeting, a discussion was conducted about the 24-hour food records completed previously by the patients.

Intervention:

The interdisciplinary intervention group was conducted and developed by health professionals from 5 different disciplines (dietitians, physical therapists, nurses, psychologists, pharmacists, and social workers). Twelve weekly meetings were held for 3 months lasting approximately 1 and a half hours. All meetings consisted of workshops and informative lectures on various topics related to obesity, healthy eating patterns, hypertension, and other chronic diseases, and were always led by 2 or more professionals from different areas.

Four of the 12 meetings were conducted also by a dietitian, the first meeting being an explanation of the Harvard Pyramid and food groups (Harvard School of Public Medicine, 2008). The second meeting was based on the new Brazilian food guide (Ministério da Saúde, 2014), focusing on the consumption of fresh food and avoiding the consumption of processed and ultra-processed foods. In the third meeting, a workshop was conducted about the amount of sugar, salt, and fat in processed food. In addition, a 24-hour recall form was provided to patients to be completed with what they ate during an entire day. On the last day, all the 24-hour recalls were analyzed and discussed with the group.

Analyzes variables:

Demographic data and diagnostics were collected from electronic medical records. Anthropometric measures were taken at baseline and at the end of both interventions. Subjects were weighed without shoes and heavy clothing using an electronic scale with a maximum capacity of 200 kg and a precision of 50 g. Height was measured using a stadiometer with an accuracy of 0.01 cm and with subjects in the standing position with feet and hands parallel to the body.

Waist circumference (WC) was measured using a tape measure placed at the midpoint between the last rib and the ilium crest. The following cutoffs were considered for increased risk of cardiovascular disease: 102 cm for men and 88 cm for women (WHO,2011).

The calculation of BMI was determined by the standard formula of weight (kg) divided by height (meters) squared. The classification of nutritional status was made according to World Health Organization (WHO) (WHO,2000) and Pan American Health Organization (OPAS) guidelines for obesity defined as BMI > 30 kg/m^2.

A validated food frequency questionnaire (FFQ) for adults developed by the research group for food consumption assessment (GAC/USP) (Fisberg, 2008) was applied. Values of certain food portions were analyzed daily.

Statistical Analysis:

Statistical analyses were performed using the Statastatistical program for Windows version 11. The Shapiro-Wilk test was used to determine the normality of variables before the analyses were started. Analyses between groups were done using the Student *t* test for variables with normal distribution and Mann-Whitney test for the nonparametric variables. Differences between the beginning and the end in each group were determined using the Student *t* test for parametric variables and the Wilcoxon test for the nonparametric variables. The Spearman test was performed to analyze correlations. A p-value < 0.05 was considered statistically significant.

RESULTS

At the end of the 3-month intervention, 24 subjects concluded the study (Figure 1).

Baseline characteristics of subjects who completed the study are listed on Table 1. No difference existed regarding sex, age, and lipid profile between groups. However, the number of patients with diabetes was higher in the intervention group.

With respect to the between-group comparison, no difference was noted in weight loss, BMI, and waist circumference (WC) reduction. In the intervention group, the reduction of these variables was significant. Waist circumference decreased by 1.61 cm ($p<0.01$) and 2.6 cm ($p<0.05$) in the intervention and control groups,

respectively (Table 2).

Comparison of food consumption within groups is described in Table 3 and between groups in Table 4. Between groups, there was no difference in the final consumption of legumes and food sources of carbohydrates, sodium, and sugar. In the intervention group, carbohydrate intake decreased to nearly 2 servings/day, while the control group did not vary. With regards to legumes, there was an increase in the intervention group, but in the control group no change occurred. Only in the intervention group did sugar intake decline significantly. There was a significant reduction in sodium consumption in the intervention group also.

Just for saturated fats (fatty meats and dairy products), we found a correlation with BMI (p=0.03). For carbohydrates, there was a tendency toward a correlation with weight (p=0.06). For all the other variables, no correlation was found with weight, WC, and BMI.

DISCUSSION

In this study, subjects were obese individuals who had eating habits divergent from nutritional recommendations and anthropometrical measures relating to cardiovascular risks. Given that the participants were adults with well-established eating habits and beliefs, the chance of a change in eating habits was less likely.

There was no difference between groups for weight values, BMI, and WC. However, only in the interdisciplinary group were these reductions statistically significant.

The results are in line with reports in the current literature. Also in a 3-month long study carried out in Italy, no difference was observed between the interdisciplinary intervention group and the control group for anthropometric parameters. However, the interdisciplinary intervention was effective in reducing weight, BMI, and WC (Scaglioni,2013). Australian researchers also found statistically significant waist measurement reductions after 12 weeks of an interdisciplinary intervention (Share, 2015). A few studies with multidisciplinary interventions that were longer reported more satisfactory results regarding weight, BMI, and WC, which suggests that a longer intervention can produce more expressive results (Marcus, 2016; Lih, 2015).

Waist circumference is strongly correlated with cardiovascular risk and compared to BMI is a better indicator of predicted risk (Zhang,2016). Even a slight reduction like the one found in our study can bring health benefits (Goh,2014).

Consumption of fruits and vegetables is related to less cardiovascular risk and therefore a strong target for prevention (Oyebode, 2014). Before the study, both groups consumed fruits and vegetables within the values recommended by the Brazilian Eating Pyramid. After the study, the computation remained within recommended values. The small increase in fruit and vegetable portions consumed is probably explained by the initial adequate eating pattern.

In the literature, some interdisciplinary and nutritional group interventions resulted in a significant increase in fruit and vegetable intake, which is explained by an initial consumption below the recommended intake (Schiavon, 2015). One example is the Piovesan et al. study, in which subjects with metabolic syndrome increased their intake of fruits and vegetables after a nutritional intervention, due to an initial consumption below the recommendations (Piovesan,2014). According to Deus et al.,after good adherence to nutrition and physical activity interventions, individuals increased their daily consumption of fruits compared with the preintervention period (Deus, 2015).

No recommendation for carbohydrate reduction was provided to our subjects. However, a significant decrease in the consumption of carbohydrates was noted. A decrease in carbohydrate intake is common with individuals trying to lose weight, given the belief in a direct link between obesity and carbohydrate intake. Carbohydrate restriction leads to rapid weight loss which may be probably a consequence of a loss of water(Hall,2015). The tendency of a direct correlation between weight and carbohydrate consumption reinforces the role of this food group in the reduction of body water and weight.

Even though a significant reduction in meat consumption was found, it is important to note that the consumption levels were adequate for the standard consumption values in both groups.

The reduction in legumes in the control group was not expressive and remained within the recommended amount. It is important to mention the potential of this food group for reducing cardiovascular disease mortality and also the desirable effects that consuming legumes has on arterial pressure and body weight reduction, given that legumes are a source of both fiber and protein (Malika, 2013).

Dairy product consumption significantly increased in the intervention group. Even though it did not increase in the control group, this fact is of practical importance. In conjunction with the increase in dairy product consumption, there was a decrease in the consumption of whole dairy products in both groups. It is possible that there was an increase in the consumption of low-fat dairy products was incentivized by DASH (Dietary Approach to Stop Hypertension), which could explain its possible role in blood pressure control (Johnson, 2014). Besides that, the literature suggests that dairy products given their high calcium content have an important role in body weight control and are inversely correlated with obesity (Visioli, 2014).

When both groups were compared, no difference was found in saturated fat intake. However, in both groups the reduction in saturated fat consumption was significant. Its excess consumption may increase the risk of cardiovascular diseases, so it is also a target of nutritional and interdisciplinary interventions. According to the

literature, interventions focused on reducing saturated fat consumption are successful (Hooper, 2015).

In this study, saturated fat consumption correlated with BMI reduction in the intervention group (p=0.03). No recommendation was made to subjects to replace saturated fatty acids with monounsaturated or polyunsaturated fatty acids, but to keep or reduce vegetable oil intake and saturated fatty acid sources. Thus, it is possible to infer that weight reduction correlates indirectly with a reduction in total fat consumption. In the literature, it is well documented that low-fat diets directly relate to weight reduction (Hooper, 2012).

The reduction in sources of sodium consumption was found in both groups. These results corroborate the findings in many articles in the literature that show the role of group interventions in sodium consumption reduction. Hypertensive subjects undergoing one lifestyle change intervention focusing on healthy eating, physical activity, and sodium and stress reduction showed positive results in the daily intake of this nutrient (Hasandokht, 2015). According to Mattila et al.,beyond these results, subjects undergoing interdisciplinary group intervention also have more positive attitudes towards sodium intake (Yosuf, 2004). Interventions focusing on group nutritional education show similarly positive effects on sodium reduction, making it close to the recommended values (Piovesan, 2014).

Reduction in sodium consumption and improvement in dietary patterns (lowering saturated fat and high-caloric food intake and increasing fruit and vegetable intake) is related to improvement in blood pressure according to Brazilian Hypertension Guidelines (Sociedade Brasileira de Cardiologia, 2016). The intervention group had positive results in the most food consumption variables analyzed, thereby resulting in a possible decrease in blood pressure.

The greater effect of an interdisciplinary intervention on consumption of foods high in sodium can be explained by the presence of other health professionals who reinforced the strong relationship between high sodium intake and high blood pressure. This result shows the need for and the importance of clarifying with patients the relationship between excessive sodium intake and cardiovascular risks.

Regarding consumption of sources high in sugar, a significant decrease was observed in the intervention group. However, from a clinical point of view, a reduction of 1 serving/day in the control group has beneficial health effects. The difference found might be due to a higher number of patients with diabetes in the intervention group compared with the control group or due to the approach focused on the reduction of processed and ultra-processed foods. In the intervention group, part of the reduction in sugar was because of a decrease in intake of artificial juices and soft drinks.

Limitations:

The fact that it was not a randomized study, the sample size and the difference between groups in the number of patients with diabetes are limitations of the study. A randomized study with a larger number of participants and a more homogeneous sample would be helpful.

CONCLUSION

There were no differences between groups regarding anthropometric parameters. The intervention group had significantly greater improvement in legume consumption and a better reduction in carbohydrate, sodium, and sugar intake compared with the control group.

ACKNOWLEDGMENTS

We thank the dietitians who helped on the workshops and informative lectures given to patients in both groups. Also, we thank all the health professionals for their contribution on workshops and lectures in the intervention group. There was no conflict of interest in this article.

Table 1: Characteristics of both groups at baseline.

	Intervention (n=14)	***Control (n=10)***	***p***
Age (years)	*57.1 ± 8.8*	*63.3 ± 8.1*	*0.09*
Woman, n (%)	*11 (78.6)*	*6 (60)*	*0.32*
Diabetes Mellitus, n (%)	*11 (78.6)*	*3 (30)*	*0.02*
Dyslipidemias, n (%)	*10 (71.4)*	*6 (60)*	*0.55*

Table 2: Changes in anthropometric measures and difference in variation between intervention and control groups.

	Intervention (n=14)			***Control (n=10)***				
	Before	***After***	***Difference***	***Before***	***After***	***Difference***	***Difference (I – C)***	***p***

Body weight, kg	*92.16 (83.8–100.5)*	*89.96* (82.0–97.9)*	*2.20 (1.19–3.23)*	*92.9 (81.1–104.8)*	*91.3 (77.9–104.6)*	*1.67 (-0.86–4.21)*	*-0.53 (-1.7–2.8)*	*0.70*
BMI, kg/m²	*35.51 (32.2–38.8)*	*34.68* (31.4–37.9)*	*-0.82 (-1.18 to -0.45)*	*34.25 (32.1–36.4)*	*33.56 (30.8–36.3)*	*-0.69 (-1.58–0.20)*	*-0.13 (-0.7–0.9)*	*0.72*
WC, cm	*110.1 (102.8–117.4)*	*108.5* (101.4–115.6)*	*1.61 (1.51–2.06)*	*114.2 (105.6–122.8)*	*111.6* (103.0–120.2)*	*2.6 (0.04–5.16)*	*-0.99 (-3.0–1.0)*	*0.17*

*p<0.05 for before and after interventions difference in intervention and control group

Ranges are 95% CI.

Table 3: Average food intake in the beginning, in the end, and the variation between intervention and control groups (serving/day).

	Intervention (n=14)			***p***	***Control (n=10)***			***p***
	Before	***After***	***Difference***		***Before***	***After***	***Diffference***	
Fruits	*3.27 (1.78–4.77)*	*4.06 (3.14–4.99)*	*0.79 (-0.28–1.87)*	*0.13*	*5.12 (3.05–7.19)*	*5.25 (3.59–6.90)*	*0.13 (-1.36–1.61)*	*0.85*
Carbohydrates	*4.33 (3.22–5.44)*	*2.39* (1.92–2.86)*	*-1.94 (-3.04 to -0.83)*	*0.01*	*3.39 (2.30–4.48)*	*3.43 (1.90–4.95)*	*0.04 (-0.92–1.000)*	*0.26*

Meats	*1.91 (1.16–2.67)*	*0.99* (0.86–1.12)*	*-0.92 (-1.63 to -0.21)*	*0.04*	*2.50 (0.05–4.95)*	*1.39 (0.93–1.85)*	*-1.11 (-3.18–0.96)*	*0.26*
Legumes	*1.00 (0.51–1.49)*	*1.56* (1.05–2.08)*	*0.56 (-0.89–0.18)*	*<0.01*	*1.02 (0.60–1.45)*	*0.92 (0.29–1.54)*	*0.36 (0.15–0.97)*	*0.19*
Dairy	*2.13 (1.37–2.89)*	*2.73 (2.10–3.37)*	*0.61 (-0.02–1.23)*	*0.04*	*2.60 (1.85–3.35)*	*3.90 (2.0–5.82)*	*1.31 (0.48–3.10)*	*0.05*

Vegetables	*3.56 (1.54–5.58)*	*5.39* (3.98–6.81)*	*1.83 (0.16–3.51)*	*0.03*	*3.97 (2.07–5.86)*	*5.11 (3.07–7.15)*	*1.14 (-0.51–2.80)*	*0.16*
Fatty meats	*0.60 (0.19–1.00)*	*0.013* (0.000–0.02)*	*-0.58 (-0.99 to -0.18)*	*<0.01*	*1.15 (-0.54–2.85)*	*0.24 (0.00–0.47)*	*-0.92* (-.44–0.61)*	*0.01*
Wholed dairy	*1.20 (0.22–2.18)*	*0.16* (-0.049–0.36)*	*-1.04 (-1.98 to -0.11)*	*0.01*	*1.11 (0.44–1.78)*	*0.21 (-0.11–0.53)*	*-0.90* (-1.45 to -0.36)*	*0.01*

Industrial sources of sodium	*2.21 (0.94–3.49)*	*0.56* (0.27–0.85)*	*-1.78 (-3.07 to -0.49)*	*<0.01*	*2.83 (-0.76–6.37)*	*1.36 (0.47–2.25)*	*-1.47* (-4.25–1.30)*	*0.04*
Sugar sources	*3.76 (2.58–4.93)*	*0.62* (0.10–1.14)*	*-3.14 (-4.15 to -2.13)*	*<0.01*	*2.31 (0.10–3.63)*	*1.33 (-0.13–2.78)*	*-0.99 (-2.39–0.42)*	*0.06*

*p<0.05 for before and after interventions difference in intervention and control group.

Ranges are 95% CI.

Table 4: Comparing the variation in consumption between groups (serving/day).

	Intervention (n=14)	***Control (n=10)***	***Difference***	***p***
Fruits	*0.79 (-0.28–1.87)*	*0.13 (-1.36–1.61)*	*0.7 (-1.0–2.3)*	*0.4*
Carbohydrates	*-1.94 (-3.04 to -0.83)*	*0.04 (-0.92–1.00)*	*-2.0* (-3.4 to -0.5)*	*<0.01*
Meats	*-0.92 (-1.63 to -0.21)*	*-1.11 (-3.18–0.96)*	*0.2 (-1.6–2.0)*	*0.5*
Legumes	*0.56 (-0.89–0.18)*	*0.36 (0.15–0.97)*	*0.9* (0.3–1.5)*	*<0.01*
Dairy	*0.61 (-0.02–1.23)*	*1.31 (0.48–3.10)*	*0.7 (-2.2–0.8)*	*0.4*
Vegetables	*1.83 (0.16–3.51)*	*1.14 (-0.51–2.80)*	*0.7 (-1.6–3.0)*	*0.5*
Fatty meats	*-0.58 (-0.99 to -0.18)*	*-0.92 (-2.44–0.61)*	*0.3 (-0.9–1.6)*	*0.4*
Whole dairy	*-1.04 (-1.98 to -0.11)*	*-0.90 (-1.45 to -0.36)*	*-0.1 (-1.3–1.0)*	*0.5*
Industrial sources of sodium	*-1.78 (-3.07 to -0.49)*	*-1.47 (-4.25–1.30)*	*-0.3* (-2.9–2.3)*	*<0.01*
Sugar sources	*-3.14 (-4.15 to -2.13)*	*-0.99 (-2.39–0.42)*	*-2.1* (-3.7 to -0.6)*	*<0.01*

*p<0.05 for before and after interventions difference in intervention and control group.

Ranges are 95% CI.

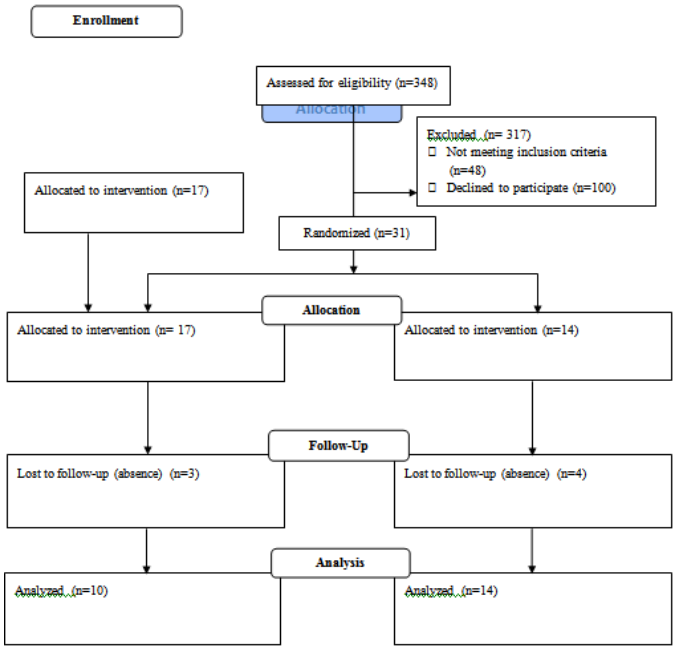

Figure 1: Flow diagram.

REFERENCES

1. WHO (2015).Enfermedades cardiovasculares, available at http://www.who.int/mediacentre/factsheets/fs317/es/, accessed 07 may 2017.

2. Andrade SSA, Stopa SR, Brito AS, Chueri PS, et al.

(2015). Prevalence of self-reported hypertension in the Brazilian population: analysis of the National Health Survey. 2013. Epidemiol Serv Saúde, 24, p. 297–304.

3. INTERSALT Cooperative Research Group. (1988) INTERSALT: an international study of electrolyte excretion and blood pressure: results for 24-hour urinary sodium and potassium excretion. BMJ, 297, p.319-28.

4. Kotchen T, Jr Cowley AW, Frohlich E. (2013). Salt in health and disease – A delicate balance. N. Engl. J Med, 368, p.1129-1237.

5. Johnson H, Olson A, LaMantia J, Kind A, Pandhi N, Mendonça E, Craven M, Smith M.(2014). Documented Lifestyle. Education Among Young Adults with Incident Hypertension. J Gen Intern Med,30, p.556-64.

6. Weber MA, Schiffrin EL, White WB, Mann S, Lindholm LH., Kenerson JG, Flack JM et.al. (2014). Clinical Practice Guidelines for the Management of Hypertension in the Community. J Clin Hypertens, 16, p. 14–26. doi:10.1111/jch.12237

7. Yosuf S, Hawkewn S, Ôunpuu S, Dans T, Avezum A, Lanas F, et al. (2004) Effect of potentially modifiable risk factors associated with myocardial infarction in 52 countries (the INTERHEARTH study): case-control study. Lancet, 364, p.937-52.

8. Sociedade Brasileira de Cardiologia / Sociedade Brasileira de Hipertensão. (2017). VII Diretrizes Brasileiras de Hipertensão. Arq Bras Cardiol, 107, p. 30-32.

9. Bueno JM, Leal FS, Saquy LP, Santos CB, Ribeiro RP. (2011). Educação alimentar na obesidade: adesão e resultados antropométricos. Rev Nutr, 24, p.575-84.

10. Alvarez T, Zanella MT. (2009). Impacto de dois programas de educação nutricional sobre o risco cardiovascular em pacientes hipertensos e com exesso de peso. Rev Nutr, 22, p. 71-9.

11. Gidron Y. Group Therapy/Intervention.(2013). In: Gellman M, Turner RJ, editors. Encyclopedia of Behavioral Medicine. New York: Springer-Verlag,1, p. 880-88.

12. Barros, Camila, Cezaretto A, Salvador E, dos Santos T; Siqueira-Catania A; Ferreira S. (2013).Implementation of a structured healthy lifestyle program to reduce cardiometabolic risk.. Arq Bras Endocrinol Metab.,57, p. 7-18.

13. Johns D, Hartmann-Boyce J; Jebb S,Aveyard P. (2014). Diet or Exercise Interventions vs Combined Behavioral Weight Management Programs: A Systematic Review and Meta-Analysis of Direct Comparisons. J Acad Nutr Diet.,14, p.1557-68.

14. Philippi, ST.(2014).Pirâmide Dos Alimentos - Fundamentos Básicos da Nutrição. (2a Ed), Manole. São Paulo.

15. Harvard School of Public Medicine. (2008). Healthy Eating plate and Healthy eating pyramid, available athttp://www.hsph.harvard.edu/nutritionsource, accessed 17 jan, 2017.

16. Brasil. Ministério da Saúde. Secretaria de Atenção à Saúde. Departamento de Atenção Básica. (2014). Guia alimentar para a população brasileira / Ministério da Saúde, Secretaria de Atenção à Saúde, Departamento de Atenção Básica. – 2. ed., 1. reimpr. – Brasília : Ministério da Saúde.

17. World Health Organization (WHO). (2011)Waist circumference and waist–hip ratio: report of a WHO expert consultation. Geneva: World Health Organization.

18. WHO Consultation on Obesity. (2000) Obesity: preventing and managing the global epidemic: report of a WHO consultation. Geneva: World Health Organization. (WHO Technical Report Series, 854).

19. Fisberg RM, Colucci AC, Morimoto J, Marchioni DM. (2008). Questionário de freqüência alimentar para adultos com base em estudo populacional. Rev Saúde Públ.,42, p.550-4.

20. Scaglioni F, Marino M, Ciccia S, Procaccini A, Busacchi M, Loria P, et al. (2013). Short-term multidisciplinary non-pharmacological intervention is effective in reducing liver fat content assessed non-invasively in patients with nonalcoholic fatty liver disease (NAFLD). Clin Res Hepatol Gastroenterol, 37, p.353-8.

21. Share BL, Naughton GA, Obert P, Peat JK, Aumand EA, Kemp JG. (2015). Effects of a MultiDisciplinary Lifestyle Intervention on Cardiometabolic Risk Factors in Young Women with Abdominal Obesity: A Randomised Controlled Trial. PLoS One,10,e0130270.

22. Marcus Y, Segev E, Shefer G, Sack J, Tal B, Yaron M et. al.(2016). Multidisciplinary treatment of the metabolic syndrome lowers blood pressure variability independent of blood pressure control. J Clin Hypertens,18, p.19-24.

23. Lih A, Pereira L, Bishay RH, Zang J, Omari A, Atlantis E, Kormas N. (2015). A novel multidisciplinary intervention for long-term and glycaemic control in obese patients with diabetes. J Diabetes Res., 2015. doi:10.1155/2015/729567

24. Zhang M, Zhao Y, Wang G, et al. (2016). Body mass index and waist circumference combined predicts obesity-related hypertension better than either alone

in a rural Chinese population. Scientific Report.,6, p. 31935. doi:10.1038/srep31935.

25. Goh LGH, Dhaliwal SS, Welborn TA, et al. (2014). Anthropometric measurements of general and central obesity and the prediction of cardiovascular disease risk in women: a cross-sectional study. BMJ Open. doi: 10.1136/bmjopen-2013-004138.

26. Oyebode O, Gordon-Dseagu V, Walker A, Mindell JS. (2014). Fruit and vegetable consumption and all-cause, cancer and CVD mortality: analysis of Health Survey for England data. J Epidemiol Community Health, 68, p.856–862.

27. Schiavon CC, Vieira FG, Ceccatto V, et al. (2015). Nutrition Education Intervention for Women with Breast Cancer: effect on nutritional factors and oxidative stress. J Nutr Educ Behav, 47, p. 2-9.

28. Piovesan C, Macagnan F, Bodanese LC, Feoli AM. (2014). Dietary quality improvement after a short-term nutritional couseling program in individuals with metabolic syndrome.Arch Latinoam Nutr, 64, p.91-8.

29. Deus RM, Mingoti SA, Jaime PC, Lopes AC.(2015) Impacto de intervenção nutricional sobre o perfil alimentar e antropométrico de usuárias do Programa academia da saúde. Ciênc. Saúde Colet,20, p.1937-46.

30. Hall K, Bemis T, Brychta R, Chen K, et.al. (2015). Calorie for Calorie, Dietary Fat Restriction Results in More Body Fat Loss than Carbohydrate Restriction in People with Obesity. Cell Metab, 22, p.427 - 436

31. Malika Bouchenak and Myriem Lamri-Senhadji. (2013). Nutritional Quality of Legumes, and Their Role in Cardiometabolic Risk Prevention: A Review. J Med Food, 16, p. 185-198.

32. Visioli F, Strata A. (2014). Milk, dairy products, and their functional effects in humans: A narrative review of recent evidence. Adv Nutr,5, p.131-43.

33. Hooper L, Martin N, Abdelhamid A, Davey Smith G. (2015). Reduction in saturated fat intake for cardiovascular disease. The Cochrane Library,6,CD011737.

34. Hooper L, Abdelhamid A, Moore H, Douthwaite W, Skeaff M, Summerbell C. (2012). Effect of reducing total fat intake on body weight: systematic review and meta-analysis of randomised controlled trials and cohort studies.BMJ,345:e7666.

35. Hasandokht T, Farajzadegan Z, Siadat ZD, Paknahad Z, Rajati F.(2015). Lifestyle interventions for hypertension treatment among Iranian women in primary health-care settings: results of a randomized controlled trial. J Res Med Sci,20, p.54-61.