INTAKE OF SUGAR-SWEETENED BEVERAGES, MILK AND ITS ASSOCIATION WITH BODY MASS INDEX IN ADOLESCENCE: A SYSTEMATIC REVIEW

Consumo de bebidas açucaradas, leite e sua associação com o índice de massa corporal na adolescência: uma revisão sistemática

Ana Carolina Corrêa Café*, Carlos Alexandre de Oliveira Lopes³, Rommel Larcher Rachid Novais⁴, Wendell Costa Bila⁴, Daniely Karoline da Silva⁵, Márcia Christina Caetano Romano⁶, Joel Alves Lamounier³

Objective: To systematize literature references addressing the association of sugar-sweetened beverage (SSB) and milk intake with body mass index (BMI) in adolescents.

Data source: A search was carried out in PubMed (US National Library of Medicine National Institutes of Health) and BVS (Virtual Library in Health). The descriptors used were: adolescents, young adult, beverages, drinking, obesity, overweight, BMI, and nutritional status. The following filters were applied: age ranging from 10 to 19 years, studies published in Portuguese or English language between 2011-2015.

Data synthesis: Thirty studies were selected (22 cross-sectional studies, 4 cohort studies, 1 randomized clinical trial, 1 case-control study, and 1 quasi-experimental study). There was association between the intake of these beverages and increase in BMI in 55% of all 20 studies that dealt with sugary drinks. When it came to soft drinks, 100% of studies reported association with increase in BMI. As to milk intake, only one article showed association with increased BMI. Three articles reported milk as a protection factor against increase in BMI; three studies found no association between this intake and BMI. Nineteen studies had representative samples and 20 surveys reported random samples. Among papers using questionnaires, 84% had been validated.

Conclusions: There is no consensus in the literature about the association between SSB or milk intake and BMI in adolescents. Keywords: Adolescent; Beverages; Obesity; Body mass index.
INTRODUCTION

Over the last decades, the world — Brazil included — has seen changes in food and nutritional patterns, which has resulted in increased obesity and reduced malnutrition rates. The phenomenon of epidemiological and nutritional transition affects both children and adolescents. Among factors related, changes in lifestyle and eating habits play an important role. Among other foods and beverages consumed by the population, a greater intake of sugar-sweetened non-alcoholic beverages has been seen. At the same time, the intake of milk and dairy products has decreased, especially among adolescents.

Among environmental causes of obesity in adolescence, changes in their nutritional pattern motivated by political and economic transformations are pointed out and occur in all nations. The strong trend towards consumption of processed and ultra-processed foods and beverages is broad. Special emphasis should be given to the high consumption of sugary drinks. The international literature on the topic includes papers addressing soft drinks, sweetened juices, powdered juices, boxed juices, sports drinks, water, sweetened tea and energy drinks fitted within the category of sugar-sweetened beverage (SSB). The excessive intake of this type of beverage is one of the main factors contributing to the obesity epidemic in Brazil and across the world.

In this scenario of changes, the intake of soft drinks in Brazilian households has increased 400% from 1975 to 2003 and 16% from 2003 to 2009. This considerable increase is alarming, as there is evidence that this type of drink is associated with higher calorie intake and excessive weight gain in adolescents. As to milk, consumption rates were shown to reduce in 40% between 1975 and 2003 and in 10% between 2003 and 2009.

A likely explanation for sugary drinks to increase body mass index (BMI) is the fact that the intake of liquid carbohydrates causes less satiety than solid carbohydrates, which leads to higher total energy consumed. On the other hand, several studies in the literature suggest that milk and dairy products in whole versions are protective against obesity, which is explained by the influence of protein, calcium, and fat-soluble vitamins mechanism of action, and by the fact that they induce more satiety.

Adolescents are influenced in school, by friends and the media, which directly interfere in the formation of their eating habits. Eating inadequacies at this age can determine how puberty will evolve, with growth rate delay and even interruption. At this stage of life, adolescents start gaining more autonomy, deciding what, when and how to eat. Eating out comes accompanied by modifications. Snacks over main meals, breakfast omission and low consumption of fruits, vegetables, milk, and dairy products can pose consequences such as inadequate calcium, fiber and water intake.

The strength of media and social valorization of ultra-processed foods, nowadays accessible to a large portion of the population, stimulate the consumption of high-calorie products. Among the wide range of food available, beverage was the topic chosen for our study because it is currently and constantly present in discussions published in the literature and in the media. Brazilian non-alcoholic beverage companies agreed by consensus not to air advertisements about soft drinks and artificial juices for children up to 12 years of age. In addition, the end of commercialization of these drinks in schools across the country is in discussion. According to these companies, the end of advertising aimed at this age group is a global trend, inspired by other countries’ examples. In Brazil, draft bills on the subject, such as 4,910/2016 and 1,755/2007, are in the pipeline. Market research has shown that there will be a drop in consumption of soft drinks in the future, and companies seem to be preparing for it commercially.

Sugary drinks is a theme in ascendency in foreign research, but is still little discussed in Brazil. Despite the large number of international papers addressing the topic, there is still no consensus on the relationship between intake of sugar-sweetened non-alcoholic drinks or milk and obesity in adolescents. The aim of this study was to systematize the literature references studying the association between intake of sugar-sweetened non-alcoholic drinks or milk and BMI in adolescents. This research may support clinical practice of pediatric health professionals and collaborate with further studies, the differential being the systematic review that evaluates whether a questionnaire on the consumption of certain beverages has been validated, and the analysis of evidence level according to study design, sample randomness and representativeness in the papers selected.

METHOD

This is a systematic literature review. The search of relevant articles was carried out in July 2015, on the following databases Lilacs (Latin American and Caribbean Literature in Health Sciences), MEDLINE (Medical Literature Analysis and Retrieval System Online), and Ibeccs (Spanish Bibliographical Index of Cheers). PubMed (US National Library of Medicine National Institutes of Health) and VHL (Virtual Health Library) were also used. Descriptors used were included in the list of Descriptors in Health Sciences (DeCs) and Medical Subject Headings (MeSH). The boolean operators
were “or” and “and”. The following combinations were used in Portuguese: (adolescente OR adulto jovem) AND (bebidas OR ingestão de líquidos) AND (obesidade OR sobrepeso) AND (índice de massa corporal OR estado nutricional); in English, combinations were: (adolescent OR young adult) AND (beverages OR drinking) AND (obesity OR overweight) AND (body mass index OR nutritional status). Later on, filters were applied: age range between 10 and 19 years, as recommended by the World Health Organization (WHO); and articles published in Portuguese and English between January 1, 2011 and July 31, 2015, when the last search was made.

Critically and independently selected publications were evaluated by two authors. Doubts about the selection of articles were evaluated and agreed among researchers until a consensus was reached. In order to classify the level of evidence of articles, the categorization by the Agency for Healthcare Research and Quality (AHRQ) of 2016 was used, according to which level 1 is considered the greatest strength of evidence and includes meta-analyses of multiple controlled studies. Individual projects with experimental design, such as randomized clinical trials, are considered as level 2. Cohort studies, case-control and quasi-experimental studies, such as non-randomized studies, are classified as level 3. Non-experimental studies such as cross-sectional ones are sorted as level of evidence 4. Case reports are level 5, and opinions of reputable authorities based on clinical competence or opinions of expert committees and interpretations of non-research based information are at level 6.

The search strategy was conducted according to the proposal by PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses, 2009) and to PICOS eligibility criteria (participants, intervention, comparison, outcomes — results — and study design). From the guiding question “Is there an association between consumption of sugar-sweetened non-alcoholic drinks or milk and BMI in adolescents”, PICOS criteria were: participants of both genders and aging 10 to 19 years. The intervention considered was consumption of sugar-sweetened non-alcoholic beverages, such as juice and soda, or milk. As for comparison, the intake or no intake of the beverages in question was observed. For outcomes, it was analyzed whether the consumption of the mentioned beverages had relation with increase in BMI. In cases of association, it was verified whether it was direct or inverse. In direct association, beverage consumption increased BMI. Therefore, in inverse association, consumption of beverages reduced BMI. Therefore, the studies selected were inputted to three tables taking into account their design and level of evidence.

Table 1 covers articles with cross-sectional studies exclusively on sugar-sweetened beverage. Table 2 shows cross-sectional articles dealing with sugar-sweetened beverage and milk consumption. In Table 3 lists all articles with other study designs.

In order to evaluate possible risks of bias between studies, the instruments used to measure the intake of beverages was analyzed, being it a 24-hour record, the food frequency questionnaire (QFA) or any other tool. In the case of the questionnaire, its validation was checked and assured. Also regarding instruments and anthropometry, possible self-registration of data was taken into account, or data collection by trained researchers. In order to evaluate other possible bias risks in each study, the item limitation, to cover the limitations of each article chosen for the literature review, was included in the data collection tool.

RESULTS
The search with descriptors, according to the mentioned combinations, first retrieved 907 articles. Five repeated articles were removed at screening. After filtering and limiting them, 513 papers were excluded, with 389 articles remaining eligible. After reading of titles and abstracts, the following exclusion criteria were applied to 353 articles: pregnant women, alcoholic beverages, case reports, and literature reviews. A total of 36 eligible papers were read, of which six were excluded for not answering the research questioning. Finally, 30 studies that answered the guiding question of the investigation were included in the sample (Figure 1).

The studies had samples that, together, included 77,869 subjects. The 30 papers selected presented international samples. No national articles were found addressing the topic in question and matching the predefined criteria. Among the selected, 22 articles had cross-sectional design and were characterized as level 4 of evidence, corresponding to 73.3% of the total. Five papers were cohort studies; one was a case-control; and another one was quasi-experimental: these were level 3 and accounted for 23.3% of the total. One paper was a randomized clinical trial classified as level 2 of evidence. The 30 relevant articles were divided into three tables. Table 1 lists 15 articles with cross-sectional design, of which 11 addressed sugar-sweetened beverages in general, such as soft drinks, various types of juice, teas, and sports drinks, while 4 of them investigated only soft drinks. Table 2 shows seven cross-sectional articles dealing with sugar-sweetened beverages or milk intake, and Table 3 lists eight studies with different designs: cohort, randomized clinical trial, case-control, and quasi-experimental.
Among the studies evaluated, 22 (73.3%) reported association of the beverages intake with increased BMI. In all 30 articles together, 34 types of beverage were evaluated: four articles addressed two types of beverage in the same study, i.e., milk and sugary drinks. In the analysis comprising 34 beverages, 19 of them (56%) were shown to have a direct association with increase in BMI; six of them reported an inverse association, with reduction of BMI; and, finally, eight studies (26.7%) on nine types of beverage showed no association between their intake and BMI.

Among 30 papers selected for review, 18 (60.0%) addressed the relationship between sugar-sweetened beverages in general and BMI; five (16.7%) addressed only soft drinks intake; three (10.0%) dealt only with milk intake; two (6.7%) of them were on the association of soft drink or milk with BMI; and two (6.7%) of them reported the relation between sugar-sweetened beverages in general or milk and BMI. Among all studies, 20 of them approached on sugary drinks; 7 exclusively addressed soft drinks and seven, milk.

From the 20 studies (66.7%) that addressed sugary drinks in general, 55% reported an association between their intake and increased BMI. The seven studies on soft drinks agreed 100% in their findings that there was an association between intake and increase in BMI, and one of them considered soft drinks in diet version in the analysis. Finally, from seven studies on milk, only one (14.3%) showed association between its

Table 1 Cross-sectional studies (n=15) that analyzed the association of sugar-sweetened beverages intake with body mass index in adolescents.

| Reference                     | Sample size and age groups | Food survey and validations | Association between beverage intake and body mass index |
|-------------------------------|---------------------------|----------------------------|--------------------------------------------------------|
| Al-Hazzaa et al., 2011        | n=2,908 14-19 years       | Questionnaire*              | Sugar-sweetened beverages: Inverse association         |
| Al-Hazzaa et al., 2012        | n=2,906 14-19 years       | Questionnaire*              | Sugar-sweetened beverages: Inverse association         |
| Danyliw et al., 2012          | n=10,038 2-18 years       | 24-hour record             | Soft drink: Direct association                        |
| Jia et al., 2012              | n=702 11-15 years         | 24-hour record             | Sugar-sweetened beverages: Direct association         |
| Liu et al., 2012              | n=2,286 12-19 years       | 24-hour record             | Sugar-sweetened beverages: Direct association         |
| Emandi et al., 2013           | n=3,626 7-18 years        | Questionnaire**             | Sugar-sweetened beverages: Direct association         |
| French et al., 2013           | n=1,015 16-65 years       | Questionnaire*              | Soft drink: Direct association                        |
| Sluyter et al., 2013          | n=5,714 12-22 years       | Questionnaire**             | Soft drink: Direct association                        |
| Wate et al., 2013             | n=6,871 13-18 years       | FFQ*                       | Sugar-sweetened beverages: Inverse association         |
| Chan et al., 2014             | n=2,727 12-16 years       | FFQ**                      | Sugar-sweetened beverages: Direct association         |
| Chan et al., 2014             | n=200 12-16 years         | FFQ *                      | Sugar-sweetened beverages: Direct association         |
| Mässe et al., 2014            | n=11,385 12-19 years      | Questionnaire*              | Sugar-sweetened beverages: Direct association         |
| Nasreddine et al., 2014       | n=868 6-19 years          | 24-hour record             | Sugar-sweetened beverages: Direct association         |
| Schröder et al., 2014         | n=1,149 10-18 years       | 24-hour record             | Soft drink: Direct association                        |
| Vanderlee et al., 2014        | n=10,188 13-18 years      | Questionnaire*              | Sugar-sweetened beverages: No association            |

N: number of subjects; FFQ: Food Frequency Questionnaire; *Validated questionnaire; **Not mentioned in questionnaire validation.
intake and increased BMI, while three (42.8%) reported protection from milk consumption against increase in BMI, and three found no association with increased or decreased BMI.

Regarding level-4 evidence and cross-sectional studies, in which a positive association between consumption and BMI was found, eight (57.1%) were related to the intake of sugar-sweetened beverages in general; six (42.8%) were related only to soft drink intake; and one (7.1%) involved milk consumption. Among level-3 studies, in which an association between consumption and increased BMI was identified, 75% addressed

### Table 2 Cross-sectional studies (n=7) that analyzed the association of milk and sugar-sweetened beverages intake with body mass index in adolescents.

| Reference               | Sample size and age groups | Food survey and validations | Association between beverage intake and body mass index |
|-------------------------|---------------------------|-----------------------------|---------------------------------------------------------|
| Abreu et al., 2014      | n=1,209 15-18 years       | FFQ*                        | Milk: No association                                     |
| Gates et al., 2013      | n=443 9-18 years          | 24-hour record and questionnaire* | Milk: Inverse association                               |
| Liu et al., 2012        | n=14,332 2-19 years       | 24-hour record              | Milk: Direct association Sugar-sweetened beverages: Direct association |
| Fayet et al., 2013      | n=4,487 2-16 years        | 24-hour record              | Milk: No association                                     |
| Albar et al., 2014      | n=636 11-18 years         | Food diary                  | Milk: Inverse association Soft drink: Direct association |
| Beck et al., 2014       | n=319 8-10 years          | FFQ*                        | Milk: Inverse association Soft drink: Direct association |
| Nassar et al., 2014     | n=190 16-18 years         | Questionnaire*              | Milk: No association Sugar-sweetened beverages: No association |

N: number of subjects; FFQ: Food Frequency Questionnaire; *Validated questionnaire.

### Table 3 Randomized clinical trials, cohort, case-control, quasi-experimental studies (n=8) that evaluated the association of beverages intake with body mass index in adolescents.

| References and study design | Sample size and age groups | Food survey and validations | Association between beverage intake and body mass index |
|-----------------------------|---------------------------|-----------------------------|---------------------------------------------------------|
| Stoof et al., 2013 Cohort study | n=238 13 years            | 24-hour record              | Sugar-sweetened beverages: No association               |
| Ebbeling et al., 2012 Randomized clinical trial | n=224 14-16 years         | FFQ*                        | Sugar-sweetened beverages: No association               |
| Laska et al., 2012 Cohort study | n=723 11-17 years         | 24-hour record              | Diet soft drink: Direct association                     |
| Rhee et al., 2012 Case-control study | n=2,045 18-86 years      | FFQ*                        | Sugar-sweetened beverages: Direct association           |
| Ambrosini et al., 2013 Cohort study | n= 433 14-17 years       | FFQ*                        | Sugar-sweetened beverages: Direct association           |
| Jensen et al., 2013 Quasi-experimental study | n=1,465 4-18 years       | Questionnaire*              | Sugar-sweetened beverages: Direct association           |
| Jensen et al., 2013 Cohort study | n=324 6.9-13.0 years     | Food diary                  | Sugar-sweetened beverages: No association               |
| Vericker, 2014 Cohort study | n=1,550 13-14 years       | Questionnaire*              | Sugar-sweetened beverages: No association               |

N: number of subjects; FFQ: Food Frequency Questionnaire; *Validated questionnaire.
the ingestion of sugary beverages in general. In 42.9% of level 3 studies, there was no association between sugary beverages and BMI. Only one paper in this review was a randomized clinical trial in which the intake of sugar-sweetened beverage was not associated with BMI.

**DISCUSSION**

First to mention, we have seen a lack of national papers on the subject. It should be emphasized, though, that research on this topic is fundamental to discuss the association between BMI and the intake of these beverages.

Most studies were cross-sectional (73.3%), characterized as level 4 of evidence. Thus, the conduction of other types of study favoring the identification of risk factors for increased BMI in adolescents should be encouraged. Despite the smaller number of studies that did not report association between these beverages and increase in BMI, 50% of them were level 3 or 2 of evidence, one of which was a randomized clinical trial with a high level of evidence, and three were cohort studies (37.5%). Further studies on drinks and BMI are therefore needed in order for a stronger conclusion to be drawn. The systematic review by Malik et al. shows evidence that the non-intake of sugary beverages allows control and reduction of adiposity indicators. Another systematic review published in 2013 pointed out signs to the establishment of a positive association between sugar-sweetened beverages and increased BMI. In the same review, however, one of the three articles selected did not report a significant association between BMI and their consumption.

Regarding the stratification of beverages, the sugar-sweetened group had the highest number of publications (66.7%). There is an obstacle to identifying the beverages analyzed, as the term “sugar-sweetened drink” involves a variety of products, making it difficult to sort and draw conclusions about each drink. Although there were more papers about sugary drinks, soft drinks, when analyzed in isolation, were mostly associated (100%) with increase in BMI, and this is a red flag for the drawbacks of their intake.

After evaluating the studies, we noticed that in order to measure the intake of beverages, general and food frequency questionnaires (FFQ) were frequently applied (60.0%), as well as food diaries (30%). Two articles (7.0%) used food diary and one applied an FFQ along with a 24-hour record, which strengthens knowledge about dietary habits. The negative points of these data collection instruments are worth noting: the 24-hour record is often underreported, as it depends on memory and there is the difficulty in estimating portion sizes, thus not representing the actual variability of day-to-day food intake. In some cases, questionnaires lacked information.
about their validation. Among 19 articles using questionnaires and FFQ, 84% had been validated. On the other hand, 24-hour reports and food diaries require no validation, only the annotation of all foods and beverages consumed by either the researcher or the participant.

The questionnaire being self-administered or administered by trained researchers was also something to consider. From the total of questionnaires applied, 26% were self-reported by adolescents. Self-report can induce errors that tend to mask or attenuate existing associations. In addition, in two articles the questionnaire had been applied by phone call. It is known that questions answered by phone can have memory bias, sub-registration, and social desirability. In other cases, a record was applied in person. The data collection instrument is a quality control measure when administered by trained researchers. In the study by Albar et al., the food diary was kept for more than four consecutive days, during which a trained researcher visited each participant three times at their residence. This type of investigation allows greater food variability. The trained researcher’s visit makes it possible to review the diary, deal with problems, edit possible flaws — such as omissions —, and include more details.

Regarding information collection to obtain BMI, there were also variations. In some studies, weight and height were obtained by self-report, which leads us to the complexity in obtaining consistent conclusions, considering the tendency to overestimate height and underestimate weight. In addition, the range of instruments used for data collection is an obstacle to the homogeneity of discussion about the findings.

As to sample representativeness and randomness, 19 (63.3%) studies had representative samples and 20 (66.7%) had random samples. Thus, it is difficult to judge whether the data collected in this group of articles were representative of a population. The representativeness and randomness of samples are fundamental from the statistical point of view in order to extrapolate the information collected to the population.

The limitations of this study are related to the difficulty in drawing conclusions from articles that, for the most part, do not evaluate individual follow-ups, the variety of collection instruments or the way they are applied. In addition, some articles do not bring descriptions of the randomness and representativeness of their samples.

The potential of this work is the detailed analysis of papers selected as to the evaluation of: relationship between sugary beverage or milk consumption and BMI of adolescents, the instruments used in studies, the randomness and representativeness of their samples, the way surveys were carried out, and how anthropometric data were measured.

One can conclude that there is no consensus in the literature about the association between the intake of sugar-sweetened non-alcoholic drinks or milk and the BMI of adolescents. The overall rate of consumption of sugar-sweetened non-alcoholic beverage by adolescents is high, and additional follow-up studies should be conducted to elucidate these effects on adolescents’ BMI and overall health.

ACKNOWLEDGMENTS

Fundação de Amparo à Pesquisa do Estado de Minas Gerais (FAPEMIG), Universidade Federal de São João del-Rei (UFSJ), and Universidade Federal de Ouro Preto (UFOP).

Funding

This study did not receive funding.

Conflict of interest

The authors declare no conflict of interests.

REFERENCES

1. Batista Filho M, Batista LV. Transição alimentar/nutricional ou mutação antropológica? Cienc Cult. 2010;62:26-30.
2. Cimadon HM, Geremia R, Pellanda LC. Dietary habits and risk factors for atherosclerosis in students from Bento Gonçalves (state of Rio Grande do Sul). Arq Bras Cardiol. 2010;95:166-72.
3. Muito além do peso [filme]. Direção: Maria Estela Renner. São Paulo: Farinha Filmes Brasil; 2012. 4. Brasil. Ministério do Planejamento, Orçamento e gestão. Instituto Brasileiro de Geografia e Estatística – IBGE. Pesquisa de Orçamentos Familiares 2008–2009: Avaliação nutricional da disponibilidade domiciliar de alimentos no Brasil. Rio de Janeiro: IBGE; 2010.
4. Committee on Accelerating Progress in Obesity Prevention Food; Committee on Accelerating Progress in Obesity Prevention Food; Glickman D, Parker L, Sim L, Cook H, et al. Accelerating progress in obesity prevention: Solving the weight of the nation. Washington, D.C.: National Academies Press; 2012.
5. Malik VS, Schulze MB, Hu FB. Intake of sugar-sweetened beverages and weight gain: a systematic review. Am J Clin Nutr. 2006;84:274-88.
7. Association Heart Association. Sugar-sweetened beverages initiatives can help fight childhood obesity [homepage on internet]. [Cited November 2015]. Available from: http://www.heart.org/idc/groups/heart-public/@wcm/@adv/documents/downloadable/ucm_462756.pdf

8. Ludwig DS, Peterson KE, Gortmaker SL. Relation between consumption of sugar-sweetened drinks and childhood obesity: a prospective, observational analysis. Lancet. 2001;357:505-8.

9. Pan A, Hu FB. Effects of carbohydrates on satiety: differences between liquid and solid food. Curr Opin Clin Nutr Metab Care. 2011;14:385-90.

10. Al-Hazzaa HM, Abahussain NA, Al-Sobayel HI, Qahwaji DM, Musaiger AO. Lifestyle factors associated with overweight and obesity among Saudi adolescents. BMC Public Health. 2012;12:1-11.

11. Gates M, Hanning RM, Gates A, Martin ID, Tsuji LJ. Intakes of milk and alternatives among on-reserve First Nations youth in northern and southern Ontario, Canada. Public Health Nutr. 2013;16:515-23.

12. Schröder H, Mendez MA, Ribas L, Funtikova AN, Gomez SF, Fito M, et al. Caloric beverage drinking patterns are differentially associated with diet quality and adiposity among Spanish girls and boys. Eur J Pediatr. 2014;173:1169-77.

13. Albar SA, Alwan NA, Evans CE, Cade JE. Is there an association between food portion size and BMI among British adolescents? Br J Nutr. 2014;112:841-51.

14. World Health Organization. Health topics: adolescent health [homepage on the Internet]. [Cited March 2016]. Available from: http://www.who.int/topics/adolescent_health/en/

15. Sociedade Brasileira de Pediatria. Departamento de Nutrologia. Manual de orientação para alimentação do lactente, do pré-escolar, do escolar, do adolescente e na escola. 3rd ed. Rio de Janeiro: SBP; 2012.

16. Teixeira AM, Filippi ST, Leal GV, Araki EL, Estima CC, Guerreiro RE. Substituição de refeições por lanches em adolescentes. Rev Paul Pediatr. 2012;30.

17. Keller S, Schulz P. Distorted food pyramid in kids programmes: a content analysis of television advertising watched in Switzerland. Eur J Public Health. 2011;21:300-5.

18. Machado AP, Vines J. Empresas não venderão mais refrigerares para escolas. Folha de S.Paulo. 2016 Jun 23. p. A16.

19. Bergamo M. Baixa Caloria. Folha de S.Paulo. 2016 Mar 2. p. C2.

20. Criança e consumo. Iniciativa Alana [homepage on the Internet]. 2016 [cited September 2016]. Available from: http://criancaeconsomo.org.br/ noticias/ou-novos-regulamentos-publicidade-dirigidas-acas-criancas/

21. Brasil. Conselho Nacional de Segurança Alimentar e Nutricional (CONSEA). Indústria de Suco e Refrigerante anuncia fim de propaganda para crianças [homepage on the Internet]. 2016 [cited April 2016]. Available from: http://www4.planalto.gov.br/consea/comunicacao/noticias/2016/indice-de-suco-e-refrigerante-anuncia-fim-de-propaganda-para-crianca

22. Brasil. Portal da Câmara dos Deputados. Proposições [homepage on the Internet]. Projeto de lei [cited October 2016]. Available from: http://www2.camara.leg.br/

23. Agency for Health Care Research and Quality (AHRQ) [homepage on the Internet]. Quality indicators [cited June 2016]. Available from: http://www.qualityindicators.ahrq.gov

24. Moher D, Liberati A, Tetzlaff J, Altman DG, PRISMA Group. Preferred reporting items for systematic reviews and meta-Analyses: the PRISMA statement. PLoS Med. 2009;6.

25. Malik VS, Pan A, Willett WC, Hu FB. Sugar-sweetened beverages and weight gain in children and adults: a systematic review and meta-analysis. Am J Clin Nutr. 2013;98:1084-102.

26. Jiménez-Cruz A, Gómez-Miranda LM, Bacardi-Gascón M. Randomized clinical trials of the effect of sugar sweetened beverages consumption on adiposity in younger than 16 y old; systematic review. Nutr Hosp. 2013;28:1797-801.

27. Nasreddine L, Naja F, Akl C, Chamieh MC, Karam S, Sibai AM, et al. Dietary, lifestyle and socio-economic correlates of overweight, obesity and central adiposity in Lebanese children and adolescents. Nutrients. 2014;6:1038-62.

28. Mässle NC, Niest-Fitzgerald JE, Watts AW, Naylor PJ, Saewyc EM. Associations between the school food environment, student consumption and body mass index of Canadian adolescents. Int J Behav Nutr Phys Act. 2014;11:1-9.

29. Jensen BW, Nichols M, Allender S, Silva-Sangiosis A, Millar L, Kremer P, et al. Inconsistent associations between sweet drink intake and 2-year change in BMI among Victorian children and adolescents. Pediatr Obes. 2013;8:271-83.

30. French S, Rosenberg M, Wood L, Maitland C, Shilton T, Pratt IS, et al. Soft drink consumption patterns among Western Australians. J Nut Educ Behav. 2013;45:525-32.

31. Vanderlee L, Manske S, Murnaghan D, Hanning R, Hammond D. Sugar-sweetened beverage consumption among a subset of Canadian youth. J Sch Health. 2014;84:168-76.

32. Laska MN, Murray DM, Lytle LA, Harnack LJ. Longitudinal associations between key dietary behaviors and weight gain over time: transitions through the adolescent years. Obesity (Silver Spring). 2012;20:118-25.

33. Vieira S. Introdução à bioestatística [recurso eletrônico]. Rio de Janeiro: Elsevier; 2011.

34. Al-Hazzaa HM, Abahussain NA, Al-Sobayel HI, Qahwaji DM, Musaiger AO. Physical activity, sedentary behaviors and dietary habits among Saudi adolescents relative to age, gender and region. Int J Behav Nutr Phys Act. 2011;8:1-14.

35. Danyluk AW, Vatanparast H, Nikparrtow N, Whiting SJ. Beverage patterns among Canadian children and relationship to overweight and obesity. Appl Physiol Nutr Metab. 2012;37:900-6.

36. Jia M, Wang C, Zhang Y, Zheng Y, Zhang L, Huang Y, et al. Sugary beverage intakes and obesity prevalence among junior high school students in Beijing – a cross-sectional research on SSBs intake. Asia Pac J Clin Nutr. 2012;21:425-30.

37. Liu J, Chu Y, Frongillo E, Probst J. Generation and acculturation status are associated with dietary intake and body weight in Mexican American adolescents. J Nutr. 2012;142:298-305.

38. Emadi AC, Puiu M, Gafencu M, Pienar C. Overweight and obesity in school age children in western Romania. Rev Med Chir Soc Med Nat Iasi. 2013;117:36-45.
39. Sluyter JD, Scragg RK, Plank LD, Waqa GD, Fotu KF, Swinburn BA. Sizing the association between lifestyle behaviours and fatness in a large, heterogeneous sample of youth of multiple ethnicities from 4 countries. Int. J Behav Nutr Phys Act. 2013;10:1-14.

40. Wate JT, Snowdon W, Millar L, Nichols M, Mavoa H, Goundar R, et al. Adolescent dietary patterns in Fiji and their relationships with standardized body mass index. Int. J Behav Nutr Phys Act. 2013;10:1-12.

41. Chan TF, Lin WT, Huang HL, Lee CY, Wu PW, Chiu YW, et al. Consumption of sugar-sweetened beverages is associated with components of the metabolic syndrome in adolescents. Nutrients. 2014;6:2088-103.

42. Chan TF, Lin WT, Chen YL, Huang HL, Yang WZ, Lee CY, et al. Elevated serum triglyceride and retinol-binding protein 4 levels associated with fructose-sweetened beverages in adolescents. PloS One. 2014;9:1-9.

43. Abreu S, Santos R, Moreira C, Santos PC, Vale S, Soares-Miranda L, et al. Relationship of milk intake and physical activity to abdominal obesity among adolescents. Pediatr Obes. 2014;9:71-80.

44. Liu JH, Jones SJ, Sun H, Probst JC, Merchant AT, Cavicchia P. Diet, physical activity, and sedentary behaviors as risk factors for childhood obesity: an urban and rural comparison. Child Obes. 2012;8:440-8.

45. Fayet F, Ridges LA, Wright JK, Petocz P. Australian children who drink milk (plain or flavored) have higher milk and micronutrient intakes but similar body mass index to those who do not drink milk. Nutr Res. 2013;33:95-102.

46. Beck AL, Tschann J, Butte NF, Penilla C, Greenspan LC. Association of beverage consumption with obesity in Mexican American children. Public Health Nutr. 2014;17:338-44.

47. Nassar MF, AbdelKader AM, Al-Refaee FA, Al-Dhafiri SS. Pattern of beverage intake and milk and dairy products sufficiency among high-school students in Kuwait. East Mediterr Health J. 2014;20:738-44.

48. Stoof SP, Twisk JW, Olthof MR. Is the intake of sugar-containing beverages during adolescence related to adult weight status? Public Health Nutr. 2013;16:1257-62.

49. Ebbeling CB, Feldman HA, Chomitz VR, Antonelli TA, Gortmaker SL, Osganian SK, et al. A randomized trial of sugar-sweetened beverages and adolescent body weight. N Engl J Med. 2012;367:1407-16.

50. Rhee JJ, Mattei J, Campos H. Association between commercial and traditional sugar-sweetened beverages and measures of adiposity in Costa Rica. Public Health Nutr. 2012;15:1347-54.

51. Ambrosini GL, Oddy WH, Huang RC, Mori TA, Belin LJ, Jebb SA. Prospective associations between sugar-sweetened beverage intakes and cardiometabolic risk factors in adolescents. Am J Clin Nutr. 2013;98:327-34.

52. Jensen BW, Nielsen BM, Husby I, Bugge A, El-Naaman B, Andersen LB, et al. Association between sweet drink intake and adiposity in Danish children participating in a long-term intervention study. Pediatr Obes. 2013;8:259-70.

53. Vericker TC. Children’s school-related food and physical activity behaviors are associated with body mass index. J Acad Nutr Diet. 2014;114:250-6.