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Adaptation of the Spanish version of the Self-Efficacy Consumption of Fruit and Vegetables Scale.

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SUMMARY: The objective of this study was to analyse the psychometric properties of the Spanish version of the Self-Efficacy Consumption of Fruit and Vegetables Scale among the Spanish population. The sample was made up of 506 subjects who were selected through a convenience sample. The original version was translated from English to Spanish and later was translated back into English, by different translators. Upon translating, not only did the translators keep in mind the grammatical and linguistic aspects of the text, but also the cultural aspects. In order to validate the content of the Scales, the adapted and agreed-upon version of the scale was evaluated by a panel of experts, in order to obtain the final version. Data collection took place between March and September 2017.The internal consistency was tested using Chronbach's alpha. For the analysis of the structural validity, a factor analysis was carried out on the Self-Efficacy Consumption of Fruit and Vegetables Scale-Spanish version. Kaiser-Meyer Olkin and Bartlett's test of sphericity (0.90) confirmed that the analysis was suitable. A two-factor structure was confirmed, as in the original scale. The value of Chronbach's α for the total questionnaire was 0.877, which shows a good internal consistency. In the analysis of the reliability test-retest, a correlation value of 0.79 ($p<0.05$) was found, demonstrating its temporal stability. The Self-Efficacy Consumption of Fruit and Vegetables questionnaire is a reliable tool to measure self-efficacy in the consumption of fruits and vegetables in the Spanish context.

Key words: Fruit, reliability, self-efficacy, validity, vegetables

RESUMEN: Adaptación de la versión en español de la Escala de Autoeficacia de Consumo de Frutas y Hortalizas. El objetivo de este estudio fue analizar las propiedades psicométricas de la versión española del cuestionario Self-Efficacy Consumption of Fruit and Vegetables Scale en la población española. La muestra estuvo constituida por 506 sujetos, seleccionados a través de un muestreo por conveniencia. La versión original fue traducida del inglés al español y después fue retro-traducida al inglés, por diferentes traductores. En las traducciones se consideró no solo los aspectos gramaticales y lingüísticos, sino también los culturales. Para la validación del contenido, la versión adaptada y consensuada de la escala fue evaluada por el panel de expertos, obteniéndose la versión definitiva. La recogida de datos tuvo lugar de marzo a septiembre de 2017. La consistencia interna de la escala fue valorada a través del alfa de Cronbach. Para el análisis de la validez estructural se realizó un análisis factorial del Self-Efficacy Consumption of Fruit and Vegetables Scale-Spanish versión. El test de Kaiser-Meyer Olkin (0.90) y el test de esfericidad de Bartlett confirmó que el análisis era apropiado. Se confirmó una estructura de dos factores, igual que en la escala original. El valor de α de Cronbach para el cuestionario total fue de 0.877, lo que demuestra una buena consistencia interna. En el análisis de la fiabilidad test-retest, se obtuvo un nivel de correlación de 0.79 ($p<0.05$), demostrando su estabilidad temporal. La Self-Efficacy Consumption of Fruit and Vegetables es una herramienta fiable para medir la autoeficacia en el consumo de frutas y verduras en el contexto español.

Palabras clave: Fruta, fiabilidad, autoeficacia, validez, hortalizas.

INTRODUCTION

A diet with a high fruit and vegetable content may be beneficial to our health. There are several studies that have addressed the positive effects of fruit and vegetable consumption, associating it with a lower occurrence of cancer (1), heart disease and other chronic diseases such as diabetes and hypertension, as well as being an effective strategy for weight control (2).

Consuming fruit and vegetables has been shown to reduce obesity (2), which makes it an important public health factor (3). In European countries, the percentage of the population that consume the daily recommended

amount of fruit and vegetables, five servings a day (or 400 grams), varies considerably (4). In the last few years, obesity figures have increased (5), and it is estimated that 39% of the global adult population is overweight and around 13% are obese (6). In Europe, the trend has increased at the same rate as the global increase, with 50% of Europeans overweight or obese (7). In the last few years, there has been an increase in overweight or obese adults in Spain, with overweight figures at 39.2% and obesity at 18.5% (7). This situation has made obesity a real public health problem in developed countries (8), and its prevention is a fundamental challenge in the 21st century (4). This would suggest that current interventions in place to improve decision-making about consumption of healthy foods are not effective (9). So, increasing fruit and vegetable consumption is a public health objective, as a low consumption has been associated with approximately 2.8% of total deaths (4). Identifying modifiable factors related to the consumption of these foods allows us to develop interventions that change this nutritional behaviour (10).

Several theories regarding changing health-related behaviours demonstrate the importance of environmental and personal factors (11), highlighting positive association between consuming fruit and vegetables and self-efficacy (3). Self-efficacy is individual confidence that one has in their ability to perform a certain behaviour (11). This construct helps predict if changes in conduct will take place in the individual and whether they will be maintained (12), influencing motivation and persistence in the face of obstacles (13), in addition to being a predicting factor for the adherence to health-related behaviour (14). Self-efficacy is associated with a higher consumption of fruit and vegetables (15), as well as with weight loss (13). Improving this self-efficacy is fundamental in the development of healthy habits that involve controlling one's diet (13).

Additionally, self-efficacy is a cognitive factor of the Health Action Process Approach (HAPA), which recognises the vital role it plays in making changes in habits or behaviour (16). This model provides a theoretical framework for the influence of intentional and self-regulatory factors in starting and maintaining a change in health behaviours. This has been frequently applied to changing habits of consumption of fruit and vegetables (17).

Several studies claim that, although interventions to increase fruit and vegetable consumption are put into place, these usually fail if the individual shows low levels of self-efficacy (12). Low self-efficacy makes the individual unable to overcome challenging obstacles that may stand in the way of their healthy habits, such as the temptation to eat unhealthy foods, and as a result, these plans are not accomplished (17), which is why it is important to have knowledge about self-efficacy, in order to design effective interventions to change behaviours (18).

There are different tools that measure fruit and vegetable intake, but none of them evaluate individual self-efficacy in fruit and vegetable intake (19). Among the most widely-used tools, we can find the Behavioural Risk Factor Surveillance System, more specifically, the dimension of fruit and vegetable consumption. Other tools used include direct observation, keeping dietary records or diaries, the 24-hour Reminder method, questionnaires about frequency of consumption of certain foods, and biomarkers (19). These tools have numerous limitations, such as not addressing self-efficacy as it is related to capacity and desire, as well as not considering the availability and the individual intent to consume fruit and vegetables (20).

On the other hand, various instruments have been developed in order to determine self-efficacy in the consumption of fruit and vegetables, but these have not been shown to have enough validity or reliability (21). Only four scales have been analysed for their relevant validity, but the only one that measures self-efficacy of adult individuals, in the consumption of both fruit and vegetables, is the one developed by Ling and Horwath (22).

The Self-Efficacy Consumption of Fruit and Vegetables Scale (F/V scale), developed in China by Ling and Horwath (22), has also been validated in African-American women (19). This scale allows us to monitor and predict changes in eating behaviour related to an increase in consumption of fruit and vegetables (22). Currently, in Spain, there are no instruments available that allow us the measure self-efficacy in fruit and vegetable consumption among the general public.

Having a tool that can evaluate self-efficacy in fruit

and vegetable consumption can be useful in treating patients. Health professionals play an important role in the promotion of healthy behaviours and patient education (23). Additionally, having direct contact between health professionals and patients helps facilitate a change in health behaviours. Health professionals must implement appropriate dietary education and develop effective interventions in order to modify patient behaviour, increasing consumption of fruit and vegetables (24).

The aim of this study was to develop a transcultural adaptation and validation of the Spanish version of the Self-Efficacy Consumption of Fruit and Vegetables Scale questionnaire among the Spanish population.

MATERIALS AND METHODS

Study Sample: In order to carry out the validation of a scale among the general population, the sample must have similar characteristics to the population of study (25). For this reason, a convenience sample was used. The sample was made up of 506 subjects. Inclusion criteria included: being 18 years of age or older and being a native Spaniard. The exclusion criteria included: having any kind of cognitive impairment that impedes full comprehension of the questionnaire. Considering the recommendations of 5 to 10 subjects per test item test (26), an estimated 120 subjects was calculated to be enough to analyse the psychometric properties of the assessment.

Measure: Firstly, the following socio-demographic variables were collected: sex, age, marital status, education level, place of residence, as well as body mass index (BMI), alcohol consumption, any chronic diseases and level of physical activity.

The F/V scale was developed and validated by Ling and Horwath (22). The F/V Scale allows us to evaluate the perceived beliefs of the subjects with regards to the decision to consume fruits and vegetables in different situations. The scale is made up of 12 items, each one rated on a Likert-type scale of 1 to 5, with 1 being totally confident and 5 being not at all confident. The total score is found by adding up the values of each of the items, which may give a range of scores between 12 and 60. Higher scores indicate stronger beliefs about intent to consume fruit and vegetables. The scale is divided into two main dimensions: Remembering to eat (Q1, 3, 4, 6, 11) and Difficult Situations (Q2, 5, 7, 8, 9, 10, 12). The reliability, which verifies the internal consistency of the scale, is quite high, with a total Chronbach value of 0.89, with a minimum accepted value of 0.7.

Procedure: First, the main researcher asked for the corresponding permission from the authors of the original scale, who agreed to its use. The procedure was divided in two phases: (1) transcultural adaptation of the questionnaire and (2) validation of the questionnaire (Figure 1).

First phase: Cross-Cultural adaptation.

To carry out the cultural adaptation, a protocol of translation-back translation based on the standardised recommendations set forth by Beaton et al. (25). The translation of the F/V Scale from its original language to Spanish was carried out individually by two bilingual native Spanish experts, and two different versions of the scale were obtained. These translators were informed of the objective of the study to minimise individual misinterpretations. The two versions were revised, compared, and each item on the translated scales was analysed in a systematic way. Any confusing terms and

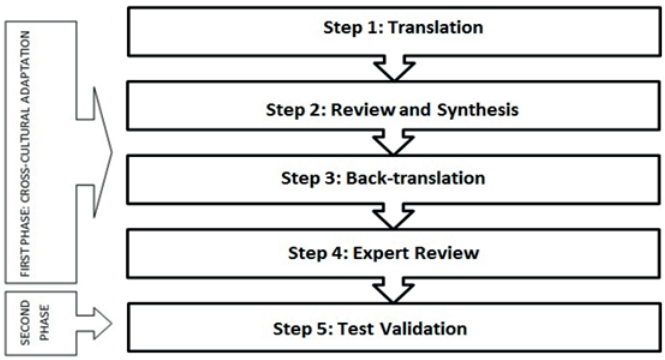

FIGURE 1. Phases of the procedureto (1) Evaluate the cross-cultural adaptation of the Spanish version of the Self-Efficacy Consumption of Fruit and Vegetables Scale questionnaire among the Spanish population, and (2)Validate the questionnaire.

concepts were discussed by various members of the research team and the translators, from which we obtained the first version of the scale in Spanish. Subsequently, a pilot study was performed with the version obtained in order to detect cultural and language errors that may have been produced during the translation. For this study, a representative sample of the study population consisting of 60 participants was selected through a convenience sample, obtaining the second version of the scale.

From this second version, a translation was then performed back to the scale's original language, by two native English translators, individually, who did not know the objective of the study and the original version of the scale. All the versions obtained, including the original version, were systematically revised by a panel of experts, made up of psychologists, psychiatrists, nutritionists and endocrine doctors with more than 10 years of professional experience, who evaluated its comprehensibility, socio-linguistic characteristics and semantic equivalence. Any terms that created discrepancies were debated, until an agreement was reached, however, always keeping the meaning of the question in mind and making sure to not change the meaning of any items that made up the scale. As a result, the final version of the F/V Scale was obtained.

Second Phase: Test validation

Firstly, the project was approved by the Institutional Review Board of the University. Data collection was carried out in various neighbourhood associations throughout the city of Almeria, on the university campus and at other higher education institutions throughout the city. These places were previously contacted in order to make an appointment and explain the study. The participants were gathered to fill out the questionnaire in a voluntary manner. All the participants were informed about the objective of the research, as well as the anonymity and confidentiality of their data, as well as informing them that they could stop their participation in the study at any time. Those participants that wanted to take part in the study, signed the informed consent form before doing so. Three weeks after the initial questionnaire, a re-test was completed by the same initial sample, in order to evaluate the temporal stability of the responses. Data collection took place between March and September 2017.

In order to validate the content, the adapted and agreed upon F/V scale was evaluated by the panel of experts, and from that, the definitive version was obtained. In regards to the structural validation and the reliability, the relevant analyses were carried out and are described below in the Results section.

Data Analysis: The statistical programme SPSS version 23 was used for data analysis. First, a descriptive statistical analysis was performed on the socio-demographic variables. For the quantitative variables, measures of central tendency and dispersion were calculated (mean and standard deviation), whereas, for the categorical variables, frequencies and percentages were calculated. Construct Validity of the F/V scale was assessed using confirmatory factor analysis (CFA), confirming its suitability using Bartlett's test of sphericity. In addition, the Kaiser-Meyer-Olkin (KMO) test was used to check the sample suitability. For the correlation between items, Pearson's correlation coefficient was used. In order to analyse the internal consistency, the value of Chronbach's alpha was calculated. The test-retest reliability was evaluated with Pearson's correlation coefficient. Statistical significance was set at $p<0.05$.

RESULTS

Socio-demographic characteristics of the participants

Out of the total number of participants (N=506), 43.7% (n=221) were men and 56.3% (n=285) were women. The average age was 35.92 (SD=13.63). Regarding marital status, almost half of the participants were married (45.1%, n=228), and the other half single (48.6%, n=246). The average BMI was 21.13 (SD=3.96). Regarding physical activity, almost half of the sample, 46% (n=233), had moderate physical activity. On the other hand, the majority of the participants did not have cardiovascular disease. The main socio-demographic characteristics of the participants are shown in Table 1.

TABLE 1. Socio-demographic data of participants to analyse the psychometric properties of the Spanish version of the Self-Efficacy Consumption of Fruit and Vegetables Scale among the Spanish population.

Variable	n	%
Gender		
Male	221	43.7
Female	285	56.3
Age (years)	35.92*	13.63**
Marital Status		
Single	246	48.6
Married	228	45.1
Divorced	21	4.1
Widower	11	2.2
BMI	21.13*	3.96**
Residence		
Urban	374	73.9
Rural	132	26.1
Physical activity		
Inactive	24	4.7
Low	191	37.7
Moderate	233	46.0
Vigorous	58	11.5
Alcohol		
Never	122	24.1
Sometimes	271	53.6
Weekends	88	17.4
Daily	25	4.9
Education		
Without studies	16	3,2
Primary school	73	14,4
Secundary school	168	33,2
University	178	35,2
Postgraduate studies	71	14.0
Cardiovascular Disease		
Diabetes	10	2.0
Hypertension	43	8.5
High cholesterol	32	6.3
Others	3	0.6

*Mean **Standard Deviation

TABLE 2. Average scores and standard deviation for each question on the Self-Efficacy Consumption of Fruit and Vegetables questionnaire.

Item	Mean	SD	Range
Q1 I can have some fruit and vegetables after a long day and I am feeling tired	1.81	1.20	1-5
Q2 I can eat other fruits and vegetables when my favorite ones are not available	1.85	1.21	1-5
Q3 I can have some fruit or vegetables even on days when I am in a rush	2.17	1.38	1-5
Q4 I can order at least one vegetable dish when eating at a restaurant	2.36	1.42	1-5
Q5 I can still have fruit even if the only type available needs to be peeled and cut	1.85	1.22	1-5
Q6 I can include some vegetables when I have to prepare a meal for myself	1.82	1.20	1-5
Q7 I can have one small plate of vegetables for dinner on most days	2.57	1.36	1-5
Q8 I can ask for extra vegetables when I order dishes such as chicken or fish	1.98	2.33	1-5
Q9 I can bring along some fruit when I know I won´t be able to buy it at work or when I am out.	2.33	1.42	1-5
Q10 I can eat fruit as a part of my lunch on most days	2.34	1.33	1-5
Q11 I can usually buy a piece of fruit when I eat at a cafeteria or workplace canteen	3.04	1.44	1-5
Q12 I can have fruit after a fast food meal	2.56	1.46	1-5

Item Analysis

In Table 2, the average scores and standard deviations can be seen for each question of the questionnaire. Table 3 shows the inter-item correlation between the F/V scale questions. All the questions correlated with each other with a value of $p<0.01$ and a range from 0.181 to 0.580.

TABLE 3. Correlation between the Fruit and Vegetable (F/V) scale questions items on the Self-Efficacy Consumption of Fruit and Vegetables questionnaire*.

	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12
Q1	-	.580	.556	.312	.490	.449	.331	.340	.438	.499	.347	.410
Q2	-	-	.502	.314	.470	.505	.360	.368	.390	.405	.274	.307
Q3	-	-	-	.392	.460	.399	.328	.271	.494	.477	.374	.366
Q4	-	-	-	-	.306	.420	.448	.465	.345	.241	.371	.270
Q5	-	-	-	-	-	.441	.317	.383	.410	.443	.231	.388
Q6	-	-	-	-	-	-	.513	.511	.339	.307	.181	.272
Q7	-	-	-	-	-	-	-	.476	.310	.341	.301	.238
Q8	-	-	-	-	-	-	-	-	.331	.261	.191	.235
Q9	-	-	-	-	-	-	-	-	-	.473	.372	.326
Q10	-	-	-	-	-	-	-	-	-	-	.460	.454
Q11	-	-	-	-	-	-	-	-	-	-	-	.411

*In all items the correlation is significant at the 0.01 level

Validity

To test the validity of the content, the adapted and agreed-upon version of the F/V scale was evaluated by the panel of experts, and from there, a final version was achieved, as described in the Method section. On the other hand, for the analysis of the structural validity of the questionnaire, a factor analysis was performed. The KMO test gave a value of 0.90, above the minimum acceptable value of 0.70. Additionally, the factor analysis was found appropriate through Bartlett's test of sphericity ($X2(66) = 2242.792$; $p<0.05$).

A two-factor structure, as well as the original scale, were confirmed. Another test used to confirm the two-factor structure was the interpretation of the Scree plot graph, where it is observed that from factor II, the values begin to descend below 1 (Fig. 2). Two factors explaining a total of 53.94% of variances were distinguished in the analyses conducted. The first factor explains a 43.30% variance, while the second factor a 10.63% variance.

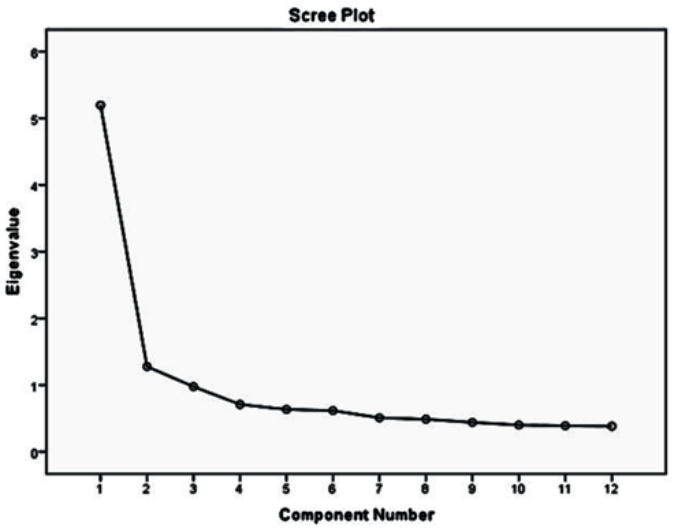

FIGURE 2. Scree plot test for the Self-Efficacy Consumption of Fruit and Vegetables Scale questionnaire among the Spanish population.

Reliability

The F/V scale had a Chronbach's alpha value of 0.877, which indicates good internal consistency. Each one of the items in the scale obtained scores >7, which is the minimum acceptable value, which shows good internal consistency. On the other hand, considering the reliability of each question, Chronbach's α value was taken into consideration when any of the items were eliminated. All values were found to be in a range between 0.863-0.873, and therefore deleting any of the items was not proved beneficial (Table 4). In the analysis of the test-retest reliability, a correlation level of 0.79 was obtained ($p<0.05$).

TABLE 4. Cronbach´s Alpha of the Self-Efficacy Consumption of Fruit and Vegetables Scale among the Spanish population scale if an item is deleted

Item	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total	Squared Multiple Correlation	Correlation Cronbach's Alpha if Item Deleted
Q1	24.88	91.598	0.660	0.503	0.863
Q2	24.83	92.364	0.614	0.456	0.865
Q3	24.51	89.435	0.642	0.470	0.863
Q4	24.32	91.701	0.532	0.383	0.870
Q5	24.84	92.688	0.596	0.404	0.866
Q6	24.87	93.083	0.592	0.471	0.867
Q7	24.11	92.244	0.540	0.388	0.869
Q8	24.70	94.594	0.521	0.398	0.870
Q9	24.35	90.355	0.585	0.373	0.867
Q10	24.34	90.981	0.607	0.453	0.865
Q11	23.64	92.574	0.487	0.352	0.873
Q12	24.13	91.936	0.504	0.316	0.872

DISCUSSION

The objective of this study was to develop a transcultural adaptation and validation of the Spanish version of the Self-Efficacy Consumption of Fruit and Vegetables among the Spanish population.

Self-efficacy in fruit and vegetable consumption is associated with various socio-demographic variables, such as age and gender. Various studies report that women usually show higher level of self-efficacy than men, which could be due to the fact that women are more interested in seeking nutritional advice (18, 21). In addition, self-efficacy in fruit and vegetable consumption has been observed to increase with age, which could be related to a change in food preparation habits (21, 22). Another variable to consider is the body mass index; in this study, more than half of the participants were at a healthy weight. This data matched that of previous studies that set overweight and obesity levels in Spain below the European average (27, 28). In addition, regarding physical exercises, the data obtained is similar to that found in other research (29). Regarding cardiovascular diseases, the majority of participants reported not having any; these figures are lower than those reported in other studies, which place the prevalence of heart disease above the average obtained in this study (28, 29).

Regarding the data obtained, after the analysis of the psychometric properties of the transculturally adapted version, and its comparison to the original version, developed by Ling and Howart (22), the two-factor structure was confirmed: "difficult situations" and "being able to remember situations." However, in the adapted and validated version among African-American women by Gittner and Gittner (19), the two factors merged into one. The 12 items that made up the scale have been maintained in both versions. Regarding the correlation between the items, all the values were found to be at a higher range than those found in the adaptation of the study among African-American women. In relation to the psychometric properties of the scale, a good internal consistency was obtained, with a Chronbach's α value of 0.877, similar to that obtained by the original authors (22). On the other hand, the structural validity of the questionnaire was high (0.90), above the minimum acceptable level (0.70). As for the temporal stability of the scale, a high reproducibility level (0.79) was found, which was unable to be compared to other studies, as the original authors did not report data on the temporal stability of the assessment. The results obtained demonstrate the reliability and validity of this tool.

Having a tool that allows us to evaluate self-efficacy in fruit and vegetable consumption is important, because self-efficacy has been shown to be an important predictor and indicator in incorporating and modifying healthy behaviours (17). The promotion and access to a healthy diet, with a high fruit and vegetable content, is key to improving and maintaining the health, wellbeing, and quality of life of the population (30). Additionally, Spaniards have considerably modified their diet, decreasing their adherence to the Mediterranean diet (27). Despite this fact, Spaniards still show a higher adherence to the Mediterranean diet than other countries in the Mediterranean region (31). In addition, the Mediterranean diet, based on high consumption of fruits, vegetable, whole grains, pulses and olive oil as the main source of fat, is being replaced by Western food patterns (32). Along these same lines, calorie and nutrient intake in Spain is characterised by a high consumption of proteins, lipids, and a low consumption of carbohydrates, but there has been an increased intake of meat, processed foods and sweets shown (27). As for the consumption of fruit and vegetables, it has also been associated with age, and the young population has been said to consume less than half of the recommended daily amount (33).

On the other hand, other studies carried out in Spain have linked gender to the consumption of fruit and vegetables, with women being the ones who consume the most (28, 29). This may be due to the desire to lose weight (29) or because they tend to have a healthier lifestyle (34). In general, the Spanish population has a low consumption of fruits and vegetables (31).

Therefore, it is important to improve adherence to the Mediterranean Diet, which has been proposed and commonly accepted as a mode of prevention and control of chronic non-communicable diseases (32). Specifically, fruits and vegetables have also been shown to reduce numerous chronic diseases, hence the importance of promoting their consumption (30).

Despite the results obtained, which indicate a strong reliability and validity of the questionnaire, the study data should be contemplated while keeping in mind a set of limitations. The sample was selected by a convenience sample, which affects the generalisation of the results among the general population. The ideal population on which to carry out a validation study would have been a representative sample of adults on a national level, but this type of recruitment has been attempted without success (35). Secondly, the data reported on fruit and vegetable consumption are based on self-reporting, and could be slanted due to recall bias. Future studies should complete the self-reporting with biomarkers, widely used in food behaviour research. The lack of instruments of study which are transculturally adapted and validated to the Spanish context makes it difficult to compare the results with other studies, hence the importance of this study.

CONCLUSION

The Self-Efficacy Consumption of Fruit and Vegetables Questionnaire has been shown to be a reliable and valid took to measure self-efficacy in fruit and vegetable consumption. Having a tool that allows us to measure self-efficacy in fruit and vegetable consumption is important, because at a clinical level, it has been shown that self-efficacy is an important predictor of incorporating and modifying healthy behaviours. Health professionals, therefore, could have a new tool at their disposal to promote lifestyle changes among their patients, and to acquire healthy habits that allow for the reduction of excess weight and obesity.

REFERENCES

1. Key TJ. Fruit and vegetables and cancer risk. Br J Cancer.2011; 104(1):6-11.
2. Boeing H., Bechthold A, Bub A, Ellinger S, Haller D, Kroke A, *et al*. Critical review: vegetables and fruit in the prevention of chronic diseases. Eur J Nutr. 2012; 51(6):637-663.
3. Rasmussen M, Krølner R, Klepp KI, Lytle L, Brug J, Bere E, *et al*. Determinants of fruit and vegetable consumption among children and adolescents: a review of the literature. Part I: quantitative studies. Int J Behav Nutr Phys Act. 2006; 3(1):22-41.
4. World Health Organization: Global Strategy on Diet, Physical Activity and Health. Promoting Fruit and Vegetable Consumption around the World; Geneva; 2018 [cited 2018 Mar 19]. Avaliable from:http://www.who.int/dietphysicalactivity/fruit/en/index2.html.
5. Bastien M, Poirier P, Lemieux I, Després JP. Overview of epidemiology and contribution of obesity to cardiovascular disease. Prog Cardiovasc Dis.2014; 56(4):369–381.

6. World Health Organization: Health topics: obesity; Geneva¸2011 [cited 2018 Apr 03]. Avaliable from: http://www.who.int/media-centre/factsheets/fs311/en/.
7. Marqueta de Salas M, Martín-Ramiro JJ, Rodríguez Gómez L, Enjuto Martínez D, Juárez Soto JJ. Eating habits and physical activity in relation to excess weight and obesity in Spain. Rev Esp Nutr Hum Diet. 2016; 20(3):224-235.
8. Berthoud HR, Klein S. Advances in Obesity: Causes, Consequences and Therapy. Gastroenterology. 2017; 152(7):1635–1636.
9. Zhou G, Gan Y, Hamilton K, Schwarzer R. The role of social support and self-efficacy for planning fruit and vegetable intake. J Nutr Educ Behav. 2017; 49(2):100-106.
10. Lytle LA, Varnell S, Murray DM, Story M, Perry C, Birnbaum AS. *et al*. Predicting adolescents' intake of fruits and vegetables. J Nutr Educ Behav.2003; 35(4):170-178.
11. Bandura A. Self-efficacy: toward a unifying theory of behavioral change. Psychol Review.1977; 84(2):191-215.
12. Hagger MS, Luszczynska A. Implementation intention and action planning interventions in health contexts: State of the research and proposals for the way forward. Appl Psychol-Health Well Being.2014; 6(1):1-47.
13. Martin PD, Dutton GR, Brantley PJ. Self-Efficacy as a Predictor of Weight Change in African-American Women. Obes Res.2004; 12(4):646–651.
14. Findorff MJ, Wyman JF, Gross CR. Predictors of long-term exercise adherence in a community-based sample of older women. J Womens Health.2009; 18(11):1769-1776.
15. Shaikh AR, Yaroch AL, Nebeling L, Yeh MC, Resnicow K. Psychosocial predictors of fruit and vegetable consumption in adults: a review of the literature. Am J Prev Med.2008; 34(6):535-543.
16. Schwarzer R. Modeling health behavior change: How to predict and modify the adoption and maintenance of health behaviors. Appl Psychol.2008; 57(1):1-29.
17. Schwarzer R, Luszczynska A, Health action process approach. In: Conner PN (ed) Predicting health behaviours, 3rd edn. New York: McGraw Hill; 2015, pp. 252-278.
18. Schwarzer R, Warner LM, Fleig L, Gholami M, Serra-Majem L, Ngo J. *et al*. Dietary planning, self-efficacy, and outcome expectancies play a role in an online intervention on fruit and vegetable consumption. Psychol Health. 2017:33(5); 652-668.
19. Gittner LS, Gittner KB. Psychometrics of the "Self-Efficacy Consumption of Fruit and Vegetables Scale" in African American women. Eat Behav.2017; (26):133-136.
20. Thomson CA, Ravia J. A Systematic Review of Behavioral Interventions to Promote Intake of Fruit and Vegetables. J Am Diet Assoc.2011; 111(10):1523-1535.
21. Mainvil LA, Lawson R, Horwath CC, McKenzie JE, Reeder AI. Validated scales to assess adult self-efficacy to eat fruits and vegetables. Am J Health Promot.2009; 23(3):210-217.
22. Ling AMC, Horwath C. Self-Efficacy and Consumption of Fruit and Vegetables: Validation of a Summated Scale. Am J Health Promot.1999; 13(5):290-298.
23. Neall RA, Atherton IM, Kyle RG. Nurses' health related behaviours: protocol for a quantitative systematic review of prevalence of tobacco smoking, physical activity, alcohol consumption and dietary habits. J Adv Nur.2016; 72(1):197-204.
24. Blake H, Harrison C. Health behaviours and attitudes towards being role models. Br J Nurs. 2013; 22(2):86-94.
25. Beaton D, Bombardier C, Guillemin F, Ferraz MB. Recommendations for the cross-cultural adaptation of the DASH & Quick-DASH outcome measures. Inst Work Health 2007; 1: 1-45.
26. Fayers PM, Manchin D. The Assessment Analysis and Interpretation of Patient-Reported Outcomes. 2nd ed. United Kingdom: Wiley; 2007.
27. Benhammou S, Heras-González L, Ibáñez-Peinado D, Barceló C, Hamdan M, Rivas A. *et al*. Comparison of Mediterranean diet compliance between European and non-European populations in the Mediterranean basin. Appetite. 2016; 107:521-526.
28. Bully P, Sanchez A, Grandes G, Pombo H, Arietalenizbeaskoa MS, Arce V. *et al*. Metric properties of the "prescribe healthy life" screening questionnaire to detect healthy behaviors: a cross-sectional pilot study. BMC Public Health. 2016; 16(1):1228-1239.
29. Livingstone K, Celis-Morales C, NavasCarretero S, San Cristobal R, O'Donovan C, Forster H. *et al*. Profile of European adults interested in internet-based personalised nutrition: The Food-4Me study. Eur J Nutr.2016; 55(2):759-769.
30. Södergren M, McNaughton SA, Salmon J, Ball K, Crawford DA. Associations between fruit and vegetable intake, leisure-time physical activity, sitting time and self-rated health among older adults: cross-sectional data from the WELL study. BMC Public Health.2012; 12(1):551-559.
31. Rodríguez-Rodríguez E, Aparicio A, Aranceta-Bartrina J, Gil Á, González-Gross M, Serra-Majem L. *et al*. Low Adherence to Dietary Guidelines in Spain, Especially in the Overweight/Obese Population: The ANIBES Study. J Am Coll Nutr.2017; 36(4):240-247.
32. Chiva-Blanch G, Badimon L, Estruch R. Latest evidence of the effects of the Mediterranean diet in prevention of cardiovascular disease. Curr Atheroscleros Rep.2014; 16(10):446-453.
33. Keller K, Rodríguez-López S, Carmenate-Moreno M. ¿Cómo se asocian las conductas de consumo de alimentos con la ingesta de frutas y verduras en adultos españoles? Nutr Clin Diet Hosp. 2015; 35(1):8-15.
34. Ferreira-Pêgo C, Babio N, Salas-Salvadó J. A higher Mediterranean diet adherence and exercise practice are associated with a healthier drinking profile in a healthy Spanish adult population. Eur J Nutr.2017; 56(2):739-748.
35. Krebs-Smith SM, Heimendinger J, Subar AF, Patterson BH, Pivonka E. Using food frequency questionnaires to estimate fruit and vegetable intake: association between the number of questions and total intakes. J Nutr Educ. 1995; 27(2):80-85.

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Consumo de carnes e percepção dos universitários de Lavras-MG em relação a carne de peixe e seus benefícios à saúde.

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Resumo: O consumo de carnes é amplamente apreciado devido a qualidades organolépticas e nutricionais, em especial a carne de peixe ganha grande destaque por ser uma carne com elevada quantidade e qualidade de proteínas, baixos níveis de colesterol e fonte de ácidos graxos. A frequência de sua ingestão e o conhecimento referente à importância de sua inclusão na dieta foram avaliados em universitários do município de Lavras. Onde a carne de peixe é consumida por estudantes entre 21-30 anos, com nível de escolaridade superior incompleto e renda mensal de 1-2 salários mínimos, em uma frequência abaixo do recomendado para este consumo. O sabor é o principal motivo para escolha, adquirida em supermercados, escolhida de acordo com a espécie, com ampla preferência pelo peixe fresco, e consumida a domicílio de modo frito. Grande parte acredita que o consumo de carne possa interferir na saúde. A presença de ácidos graxos essenciais foi o principal benefício para a saúde citado diante do consumo da carne de peixe. Ainda, o consumo de carne bovina foi significativamente associado ao fator idade, onde 93,3% dos indivíduos até 20 anos declararam consumo frequente. Não houve diferença significativa (p>0,05) entre o tipo de carne consumido, variáveis socioeconômicas, visão do consumidor relacionada à saúde e benefícios associados aos diferentes tipos de carne.

Palavras-chave: Hábitos alimentares, ingestão de alimentos, saúde pública, pescado.

Summary: Meat consumption and perception of the university students of Lavras-MG in relation to fish meat and its health benefits. Meat consumption is greatly appreciated because of its flavor and nutritional qualities, in particular the fish meat have many important for your quantity and quality of protein, low cholesterol levels and source of fatty acids. The frequency of its intake and the knowledge regarding the importance of its inclusion in the diet were evaluated in academics in the city of Lavras. In both fish meat is consumed by students between 21-30 years old, with incomplete upper level of education and monthly income of 1-2 minimum wages, in frequency below expectations. Flavor is the main reason for choice, acquired in supermarkets, chosen according to species, wide preference for fresh fish, and consumed at home in the fried way. Most believe that eating meat may interfere with health. The presence of essential fatty acids was the main health benefit cited in the consumption of fish meat. Beef consumption was significantly associated with the age factor, where 93.3% of individuals up to 20 years declared frequent consumption. There was no significant difference between the type of meat consumed, socioeconomic variables, health-related consumer view, and benefits associated with different types of meat.

Key words: Eating habits, food intake, public health, fishing.

INTRODUÇÃO

As carnes são importantes fontes de proteínas ricas em aminoácidos essenciais, com elevado valor biológico e outros importantes fatores nutricionais, como a presença de vitaminas. Em especial a carne de carne de peixe possui alto valor dietético e proteico, com teor de gordura reduzido, sendo fonte de vitaminas e minerais, além de também possuir um baixo nível de colesterol, tornando-se assim um alimento aliado à prevenção do risco de doenças cardíacas, depressão e acidente vascular cerebral (1).

Comparado a outras carnes, o peixe possui destaque nutricional quanto à quantidade e qualidade das proteínas e, principalmente, por ser fonte de ácidos graxos essenciais. É um alimento rico em nutrientes e sais minerais, como ferro, iodo, magnésio, cálcio,

sódio e fósforo. Além disso, possui vitaminas como A, E, D, B2, B3, B12 e ácido fólico. Recentemente, tem-se demonstrado que sua ingestão regular pode trazer benefícios à saúde humana, contribuindo na qualidade de vida e reduzindo a probabilidade de desenvolver doenças, como arritmias e complicações cardiovasculares (1).

A frequência no consumo de pescado pode ter um significado social e cultural, mas também pode ser relacionada a prática de alimentação saudável. Comer tem um sentido amplo, sendo que a busca por alimentos com melhor teor nutricional, pode ser também correlacionada com a hábitos alimentares saudáveis e com menor risco a saúde (2).

O meio universitário envolve uma série de responsabilidades, onde, muitas vezes, ocorre a sobreposição de atividades, associada a mudanças comportamentais, principalmente alimentares (3). É comum nesse tipo de população uma alimentação inadequada, incluindo pratos rápidos e sem horários estabelecidos, ou até mesmo a omissão de refeições (3). Diversos estudos revelam o aumento do consumo de produtos industrializados, principalmente aqueles preparados de maneira rápida e prática, como do tipo fast-food (3).

Nesta perspectiva, considerando os benefícios associados ao consumo da carne de peixe, foi avaliada em uma amostra da população de duas universidades localizadas no município de Lavras, Minas Gerais, Brasil, a frequência da ingestão desta fonte proteica e o conhecimento referente à importância de sua inclusão na dieta quando comparada a outros produtos de origem animal.

MATERIAL E MÉTODOS

A pesquisa foi desenvolvida no município de Lavras, Minas Gerais, que de acordo com dados do Instituto Brasileiro de Geografia e Estatística (IBGE) (4), possui uma população de 100.243 habitantes. A amostra avaliada foi composta por docentes, discentes e demais funcionários de duas instituições de ensino superior do município, sendo elas a Universidade Federal de Lavras – UFLA (pública) e o Centro Universitário de Lavras – Unilavras (privada). Juntas, possuem uma população aproximada de 12910 indivíduos, equivalente a cerca de 13% do número total de habitantes de Lavras.

Foi realizada uma análise transversal das classes que compõem a população universitária, incluindo de forma aleatória professores, estudantes e funcionários, sendo considerado a percepção e consumo dos discentes, classe de maior representatividade neste senário. Nesta pesquisa, foi analisado o hábito alimentar destes indivíduos em relação ao consumo da carne de peixe através de um questionário aplicado a uma amostra significativa escolhida aleatoriamente entre os diferentes integrantes da população das duas universidades previamente selecionadas.

Foram amostrados 200 indivíduos, calculados sob margem de erro de 7%, através da fórmula descrita por Barbetta (5): n0 = 1/ E0 2 e n= N. n0 / N+ n0, onde: n0 = primeira aproximação do tamanho da amostra; Eo = erro amostral tolerável; n = tamanho da amostra; N = tamanho da população).

Nos critérios de inclusão estavam aqueles indivíduos de qualquer idade, ambos os gêneros, vinculados a uma das Instituições de ensino selecionadas, alfabetizados, sem déficits visuais e/ou auditivos, não possuindo quaisquer impedimentos para responder o questionário. Após a aceitação da participação por parte dos indivíduos, todos os dados foram analisados, sem exclusões.

A metodologia foi submetida e aprovada pelo Comitê de Ética em Pesquisa com seres humanos (CAAE 57619316.2.0000.5116), estando de acordo com a resolução 466/2012 do Conselho Nacional de Saúde (6). Os indivíduos que aceitaram responder ao questionário assinaram um termo de consentimento, onde afirmaram estar cientes sobre os possíveis riscos e benefícios provenientes da pesquisa.

O questionário utilizado foi adaptado de estudos anteriores (7; 8), e composto por dezessete questões objetivas referentes às características socioeconômicas do entrevistado, frequência de consumo de carne, hábito dos consumidores (fatores limitantes e/ou facilitadores, motivos do consumo,

local de aquisição e modo de preparo), consumo específico de pescado e benefícios para a saúde.

Após a coleta de dados, análises de correlação foram feitas mediante análise descritiva com porcentagem, média e desvio padrão. Para a análise dos dados, foi utilizado o teste de Qui-quadrado. Sendo aplicado para tanto software SPSS - versão 20.0. Com nível de significância adotado em $p < 0,05$.

RESULTADOS

Dentre os 200 entrevistados, 5% eram docentes, 10% funcionários e a maior representatividade (85%) era composta de discentes, o público foi predominantemente feminino, idade entre 21-30 anos, nível de escolaridade superior incompleto e renda mensal entre 2 e 4 salários mínimos (Figura 1).

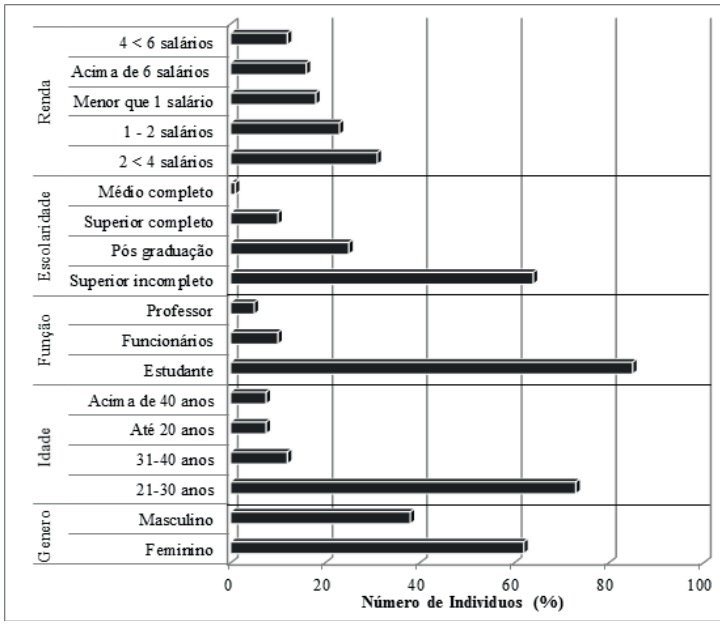

FIGURA 1: Caracterização do perfil socioeconômico (gênero, idade, função exercida, grau de escolaridade e renda mensal) de uma amostra de entrevistados de duas universidades do município de Lavras.

Em relação ao consumo, foi questionado o tipo de carne consumida e sua frequência diária, onde a carne bovina foi apontada como de consumo frequente pelo maior número de entrevistados (52,5%), as demais foram ditas principalmente como de consumo habitual por 48,5%, 68% e 71,5% dos entrevistados, respectivamente para carne de frango, suína e de peixe (Figura 2).

O consumo de carne bovina foi significativamente associado ao fator idade ($p<0,05$) (Tabela 1), onde 93,3% dos indivíduos até 20 anos declararam consumo frequente, seguidos por 80% dos indivíduos acima de 40 anos, 62,5% de 31-40 anos e 50% de 21-30 anos.

Neste estudo, o principal motivo para escolha do tipo de carne mais consumida, tanto no consumo geral quanto para a carne de peixe, foi o sabor, sendo indicado também como um fator facilitador ao consumo das carnes. Na sequência, considerando motivos declarados, o preço apareceu como principal causa para o consumo de carnes em geral (14%), enquanto para a carne de peixe foi representado por apenas 4% (Figura 3). O preço também é evidenciado como um fator limitante por alguns, para o consumo de carnes.

Foi questionado aos entrevistados a maneira como a carne de peixe era adquirida, sendo observada uma preferência, em 62% dos entrevistados, pelos supermercados como forma de aquisição. Ainda, 48% escolhem o produto de acordo com a espécie, e mais da

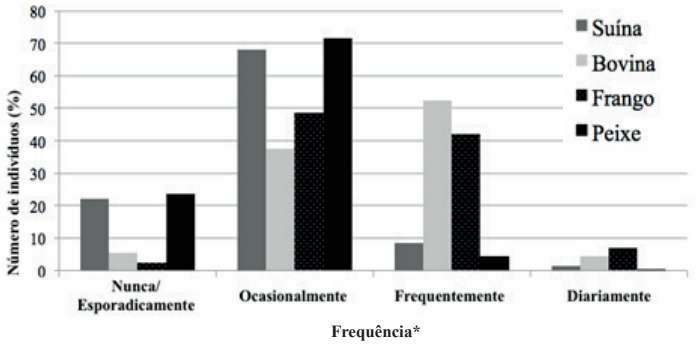

FIGURA 2: Frequência do consumo de carnes em geral (bovina, suína, frango e peixe) dos entrevistados na amostra das duas universidades do município de Lavras. *Nunca/esporadicamente: nenhuma/ uma vez por semana; Ocasionalmente: entre uma e duas vezes por semana; Frequentemente: entre 3 e 5 vezes por semana; Diariamente: 7 vezes por semana.

TABELA 1. Resultados do teste de qui-quadrado de Pearson, ao nível de significância de 5%, para a avaliação da associação entre o tipo de carne consumido e as variáveis socioeconômicas dos entrevistados (n = 200).

Tipo de Carne	Variáveis socioeconômicas	Valor p
Suína	Instituição	0,571 (NS)
	Gênero	0,376 (NS)
	Idade	0,579 (NS)
	Função	0,389 (NS)
	Escolaridade	0,632 (NS)
	Renda Mensal	0,373 (NS)
Bovina	Instituição	0,383 (NS)
	Gênero	0,925 (NS)
	Idade	0, 002 *
	Função	0,231 (NS)
	Escolaridade	0,515 (NS)
	Renda Mensal	0,305 (NS)
Frango	Instituição	0,960 (NS)
	Gênero	0,588 (NS)
	Idade	0,284 (NS)
	Função	0,610 (NS)
	Escolaridade	0,471 (NS)
	Renda Mensal	0,507 (NS)
Peixe	Instituição	0,502 (NS)
	Gênero	0,061 (NS)
	Idade	0,218 (NS)
	Função	0,381 (NS)
	Escolaridade	0,538 (NS)
	Renda Mensal	0,346 (NS)

* Teste significativo, ao nível de 5% de probabilidade. Indicando que quanto maior a idade, menor o consumo observado de carne bovina. NS: Teste não significativo, ao nível de 5% de probabilidade.

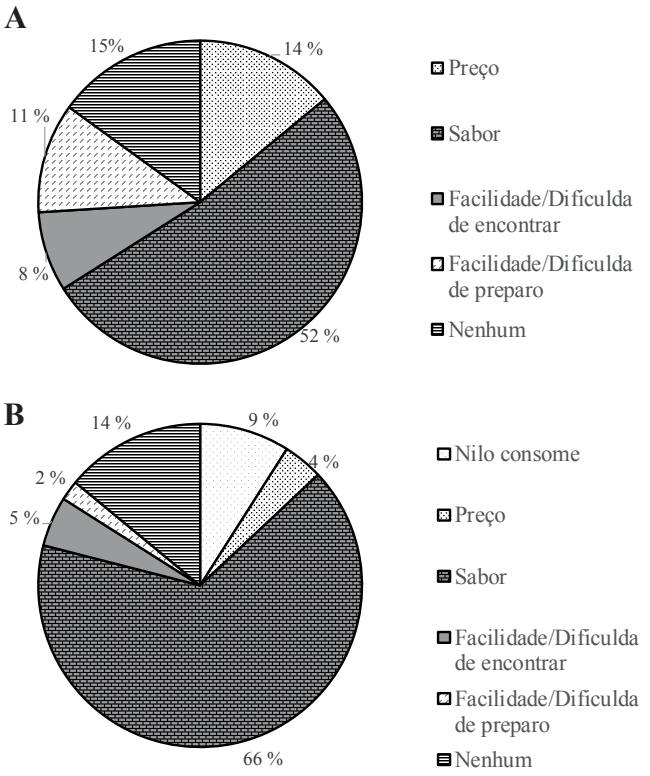

FIGURA 3. Principais motivos relacionados ao consumo de carnes em geral e de carne de peixe por parte dos entrevistados nas duas universidades do município de Lavras. A: Motivos associados ao consumo de carnes em geral por parte dos entrevistados das duas universidades do município de Lavras; B: Motivos associados ao consumo da carne de peixe por parte dos entrevistados das duas universidades do município de Lavras.

metade (60 %) indicam com forma de armazenamento ou processamento adquirido da forma fresca. Em relação ao consumo de outros tipos de pescado, 36% da população avaliada, consome apenas raramente.

Para local de consumo e modo de preparo, a maioria dos entrevistados que consumia carne de peixe declarou fazê-lo em sua própria residência (39,5%) e no modo de preparo frito (50,5%).

Em relação aos aspectos de tipo de carne consumida, variáveis socioeconômicas e visão do consumidor relacionada à saúde e benefícios associados aos

diferentes tipos de carne, não foram observadas diferenças significativas ($p<0,05$).

O questionamento sobre consumo de outros pescados, como crustáceos, moluscos, anfíbios, quelônios e mamíferos de água doce, foi utilizado apenas para evitar possíveis confusões por parte dos entrevistados em relação à definição de carne de peixe.

A grande maioria dos entrevistados neste estudo acreditava que o consumo de carne poderia interferir na sua saúde, além de caracterizar a presença de ácidos graxos essenciais, (como o ômega 3 e ômega 6), na carne de peixe como sendo o maior benefício causado pelo consumo da mesma (Figura 4).

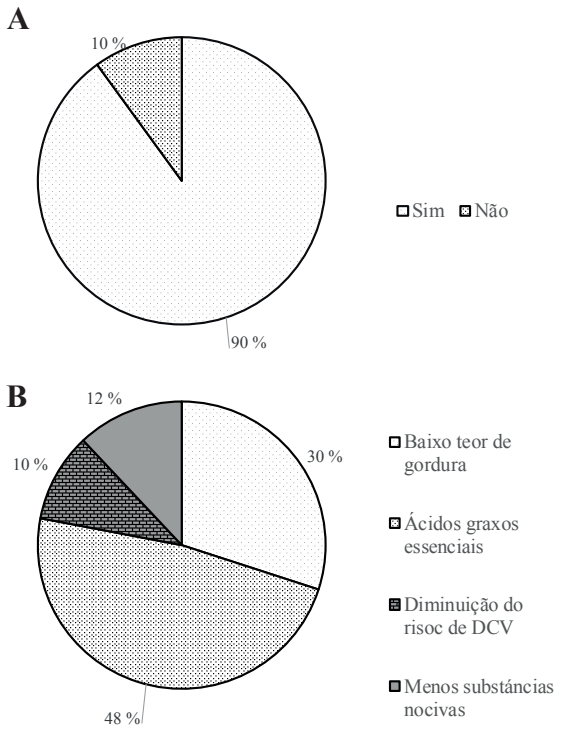

FIGURA 4. Perfil do consumidor entre os entrevistados nas duas universidades do município de Lavras em relação à saúde. A: Crença dos consumidores das duas universidades do município de Lavras entrevistados frente à possibilidade do consumo de carne possuir interferência na saúde; B: Principais benefícios associados ao consumo da carne de peixe de acordo com os consumidores das duas universidades entrevistados no município de Lavras.

DISCUSSÃO

A caracterização socioeconômica observada era esperada, considerando que a maioria (85%) dos questionários foram aplicados em estudantes de graduação e pós-graduação, classes de grande representatividade na comunidade acadêmica das duas universidades.

Em uma amostra da Universidade Federal do Sergipe, também composta em sua maioria por estudantes do gênero feminino, 80% dos indivíduos relataram ingestão de carne, sugerindo que seu consumo entre os universitários é relevante (9). O que vai de encontro com o consumo frequente observado nos entrevistados.

Em um estudo realizado, também no município de Lavras (10), porém em residentes, houve preferência no consumo de carne bovina por 45,4% dos entrevistados, enquanto a carne de peixe apareceu em 4o lugar no ranking (menos de 6%). Em uma população semelhante a entrevistada neste estudo, foi encontrado uma relação positiva e significativa entre o nível de escolaridade e a preferência por pescado (11).

Na população universitária, à baixa frequência do consumo de pescado pode estar relacionado a mudanças de comportamento devido ao ingresso no ensino superior, uma vez que é comum nesta fase da vida a omissão de refeições, e ingestão de alimentos nutricionalmente pobres (12). Em um estudo que avaliou 62 universitários, maioria do sexo feminino, com idade entre 19 e 41 anos, solteiros, sedentários, não-fumantes e não consumidores de bebidas alcoólicas regularmente, também observou-se consumo baixo (menos de 4 vezes na semana) de peixes e frutos do mar pelos estudantes (13).

O mercado interno de carne no Brasil triplicou sua demanda nos últimos 30 anos, tornando-a o componente alimentar central das refeições (14). Houve um crescimento no consumo de carne bovina e de frango por parte dos brasileiros nos últimos 10 anos, superior na carne de frango devido seu menor custo. Porém, a carne bovina ainda é a mais consumida, e seus consumidores possuem hábitos bem estabelecidos. Além disso, ações de mercado e alianças para produção reforçam sua qualidade de carne saborosa (15).

O aumento da idade associa-se de maneira significativa às preferências alimentares mais saudáveis

(16). Os resultados encontrados no presente estudo envolvem uma amostragem com média geral de idade baixa, podendo justificar a relação com a preferência da carne bovina, já que a carne de peixe é considerada mais saudável.

Outro fator possivelmente associado à escolha da carne, como já citado, envolve a renda. Sugere-se que um aumento na renda eleva a probabilidade de consumo e o dispêndio domiciliar com carnes (17). Em geral, os produtos da avicultura são de baixo custo e de fácil acesso, principalmente para os consumidores de baixa renda (8).

Estudantes da Universidade Federal Rural do Semi Árido também demonstraram preferência pela carne bovina, seguido de aves, com menor percentual para o pescado (18). Na Universidade Federal de Santa Maria, 77% dos estudantes consomem mais a carne bovina, seguidos por frango e peixe, e com apenas 1% de consumidores para a carne suína (15), que pode ser justificado por dois fatores: atribuição de mitos relacionados a possíveis impactos negativos causados sobre a saúde e a dificuldade na acessibilidade devido a falta de cortes específicos de baixo valor (17).

Já foi demonstrado, em indivíduos supostamente saudáveis, estudantes de graduação de uma universidade pública brasileira, uma maior frequência diária de ingestão de alimentos considerados de proteção para doenças cardiovasculares (2). Porém, o consumo de peixe, no referido estudo, foi considerado insuficiente, onde nenhum dos 97 estudantes entrevistados, sendo maioria mulheres entre 18-25 anos, consumia este tipo de carne diariamente.

Dados da Pesquisa de Orçamentos Familiares (POF) (2008-9) utilizados em estudos (19), demonstraram que, no Brasil, o consumo de peixe e frutos do mar era maior por parte dos homens em relação às mulheres (27,5g/dia e 21,5g/dia, respectivamente), sendo que 12% possuíam idade entre 20/59 anos e 13,3% pertenciam à região Sudeste, onde o município de Lavras se encontra.

Apenas 9% dos entrevistados neste estudo não consumiam carne de peixe. Em estudo semelhante (20), com de 224 voluntários, sendo também em sua maioria estudantes universitários do gênero feminino, encontrou-se uma amostra de 3,59% de não consumidores da carne de peixe. Em contraste, na Universidade Federal de Santa Maria, apenas de 6% a 7% dos entrevistados consumiam carne de peixe como primeira opção (15).

Em outro trabalho (21) avaliou-se o hábito e o consumo alimentar de acadêmicos ingressos e egressos do curso de nutrição, sendo considerado inadequado, principalmente no que se refere ao consumo de alimentos protetores da saúde. No entanto, assim como encontrado neste estudo, a renda mensal era baixa. Novamente observa-se a probabilidade que indivíduos com menor poder aquisitivo optem pela menor diversidade de alimentos no ato da compra, onde, por muitas vezes, o preço alto é motivo para a baixa frequência do consumo da carne de peixe (10).

O sabor pode ser considerado como fator determinante para o consumo, visto que foi o principal motivo pra escolha de carnes. Alguns estudos encontraram resultados semelhantes, onde o sabor da carne de peixe aparece como importante fator de influência na decisão de compra (7), ou ainda onde o sabor da carne de peixe estava diretamente associado ao seu consumo (20).

Em termos de comparação ao que foi encontrado neste estudo, onde preço e sabor foram os principais motivos relacionados para a escolha da carne consumida, encontraram-se em outros trabalhos (18) razões para uma baixa frequência de consumo de carne de peixe associadas a menor oferta frente a outras carnes, a alergia a crustáceos, a falta de hábito e preço alto. O alto preço e a dificuldade de acesso também foram associados como motivos referidos para o não-consumo da carne de peixe (8).

Em relação ao local de aquisição dos pescados os supermercados apresentaram lugar de destaque, concomitantemente outros estudos também encontraram uma maioria de consumidores da carne de peixe em supermercados (7; 20), porém, valor nutritivo e sabor apareceram como qualidades elegidas pelos consumidores durante a decisão da compra, sendo que a principal fator de escolha, neste estudo, foi a espécie (48%), seguida pela aparência (23%).

O estudo aponta as feiras livres como segunda opção para local de compra, sustentando uma hipótese de que os consumidores acreditam que os produtos comercializados em feiras apresentam qualidade inferior, onde as condições higiênico-sanitárias não tende a ser de grande atração para compra, ainda que o custo seja mais

barato (22). Além disso, a predominância de compra em supermercados é decorrente da concentração da compra em único local por parte dos consumidores, não sendo necessário deslocar-se até uma peixaria, por exemplo (7).

Os resultados encontrados reforçam a ideia de que variáveis culturais determinam o comportamento do consumidor de peixe, sustentada por outros pesquisadores (20), aspectos socioeconômicos, como a renda domiciliar, também apresentam reflexos no consumo e dispêndio familiar com carnes (17). Porém neste estudo não foram observadas diferenças significativas ($p<0,05$) em relação a alguns aspectos socioeconômicos, ligados ao consumo das carnes, o que pode ser um indicativo que os consumidores tendem a estarem cada vez mais interessados nos benefícios à saúde dos produtos que adquirem, como já observado em outros trabalhos (7).

Considerando que hábitos estabelecidos durante o período universitário podem permanecer na vida adulta, existe uma necessidade em orientar os indivíduos quanto ao preparo dos alimentos no intuito de prevenir doenças (23).

A preferência dos consumidores por peixe fresco e congelado era esperada, por tratarem-se de modalidades mais conhecidas e seguras em relação à qualidade buscada pelo consumidor, semelhante ao encontrado, também com outros universitários (18).

A literatura confirma que a ingestão regular da carne de peixe faz parte de uma dieta saudável, sendo uma das principais razões para o seu consumo. Em populações do Mediterrâneo, os hábitos alimentares tradicionais oferecem a escolha do consumo de peixe, onde existe evidência consistente para as propriedades promotoras de saúde (24).

As diferenças encontradas entre os grupos de consumidores, envolvendo tanto a conscientização quanto a compreensão dos benefícios relacionados à saúde, podem modificar todo o padrão de consumo da carne de peixe (25). Estudos citados na literatura (1) comprovam que os valores nutricionais e, a divulgação de resultados de pesquisas envolvendo melhorias para a saúde vem causando um aumento de interesse por esse alimento.

Limitações: Uma das limitações encontradas neste estudo foi a dificuldade de estabelecer uma tendência do consumo de carnes por parte dos universitários a longo prazo, uma vez que o perfil e número de discentes é bastante variado divido a rotatividade de ingressos e egressos no ambiente acadêmico.

CONCLUSÕES

Nas duas universidades avaliadas no município de Lavras a carne de peixe é consumida, mesmo não sendo a primeira opção quando comparada a outras carnes. Algumas variáveis socioeconômicas como idade, escolaridade e renda encontradas estão intimamente ligadas a questões de escolha e consumo alimentar e embasam os dados observados em ralação ao consumo das carnes.

O sabor é o principal motivo para a escolha do tipo de carne por parte dos consumidores, sendo que a carne de peixe é adquirida em maior parte em supermercados. Além disso, é escolhida de acordo com a espécie, com preferência pelo peixe fresco, em sua maioria consumida em domicílio no modo de preparo frito. Grande parte da população avaliada acredita que o consumo de carne possa interferir na saúde, sendo a presença de ácidos graxos essenciais declarada como sendo o principal benefício para a saúde relacionado ao consumo da carne de peixe.

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REFERÊNCIAS

1. Satori AGDeO, Amancio RD. Pescado: importância nutricional e consumo no Brasil. Segur Aliment Nutr. 2012; 19 (2):83-93.
2. Oliveira GA, Oliveira SHV, Morais CAS, Lima LM. Hábitos alimentares e risco de doenças cardiovasculares em universitários. Medicina Ribeirão Preto. 2014; 47 (4):399-405.

3. Rosa PBZ, Giusti L, Ramos M. Educação alimentar e nutricional com universitários residentes de moradia estudantil. Ciência & Saúde. 2016; 9(1):15-20.
4. IBGE-Instituto Brasileiro de Geografia e Estatística, estimativa da população residente para municípios e para as unidades da federação brasileiros com data de referência em 1º de julho de 2015. Ministério do planejamento orçamento e gestão, Brasília, 2015.
5. Barbetta PA. Estatística Aplicada às Ciências Sociais. São Paulo, 1994.
6. BRASIL. Ministério da saúde. Conselho Nacional de Saúde. Resolução 466, de 12 de dezembro de 2012. Brasília, 2012.
7. Tavares GC, Aquino RMA, Palhares MM, Santos RRD, Bonfim LM, Teixeira LV. Perfil do consumo de pescado na cidade de Belo Horizonte, MG. B. Indústria Animal. 2013; 70(3):230-236.
8. Schneider BC, Silva SM, Assunção MCF. Consumo de carnes por adultos do sul do brasil: um estudo de base populacional. 2013; 19(8):3583-3592.
9. Feitosa EPS. Hábitos alimentares de estudantes de uma universidade pública no Nordeste, Brasil. Alimen Nutr Araraquara. 2010; 21(2):225-230.
10. Melo CCV, Fabrini BC, Costa AC, Mattos BO, Santos LC, Freitas RTF. Caracterização dos consumidores de peixe do Município de Lavras, Minas Gerais. Boletim de indústria animal. 2015; 72(3):178-184.
11. Minozzo MG, Haracemiv SMC, Waszczynskji N. Perfil dos consumidores de pescado nas cidades de São Paulo (SP), Toledo (PR) e Curitiba (PR) no Brasil. Rev Alim Hum. 2008; 14(3):133-40.
12. Vieira VCR, Priore SE, Ribeiro SMR, Franceschini SCC, Almeira LP. Perfil socioeconômico, nutricional e de saúde de adolescentes recém- ingressos em uma universidade pública brasileira. Revista de Nutrição. 2002; 15(3): 273- 282.
13. Nogueira LR, Mello AV, Toimil RFSL. Fator de risco para doenças cardiovasculares e avaliação qualitativa da alimentação em universitários. Revista UNIVAP. 2015; 21(38):36-45.
14. Ribeiro CSG, Corção M. O consumo de carne no Brasil: entre valores socioculturais e nutricionais. Demetra. 2013; 8(3):425-38.
15. Kirinus JK, Fabricio EA, Fruet APB, Dörr AC, Mello RO, Nörnberg JL. Consumo de carnes por estudantes dos diferentes centros de ensino da Universidade Federal de Santa Maria, RS, Brasil. Rev Eletrônica Gest, Edu Tecnolo Ambientais. 2013; 11(11):2511-2517.
16. Defante LR, Nascimento LDO, Lima-Filho DO. Comportamento de consumo de alimentos de famílias de baixa renda de pequenas cidades brasileiras: o caso de Mato Grosso do Sul. Interações, Campo Grande. 2015; 16 (2):265-276.
17. Schlindwein MM, Kassouf AL. Análise da influência de alguns fatores socioeconômicos e demográficos no consumo domiciliar de carnes no Brasil. RER, Rio de Janeiro. 2006; 44(3):549-572.
18. Silva DCF, Gonçalves AA. Perfil de consumo de pescado dos usuários do restaurante universitário da UFERSA. Rev Caating, Mossoró. 2012; 25(3):125-129.
19. Bezerra IN, Souza AM, Pereira RA, Sichieri R. Consumption of foods Most consumed foods away from home in Brazil. Rev Saúde Pública. 2013;47(1):200S-11S.
20. Maciel ES, Savay-Da-Silva LK, Vasconcelos JS, Galvão JA, Conati JG, Silva DDa, Oetterer M. Application of exploratory factor analysis to assess fish consumption in a university community. Food Sci Technol. 2013; 33(1):99-106.
21. Aquino JK, Pereira P, Reis VMCP. Hábito e consumo alimentar de estudantes do curso de Nutrição das faculdades de Montes Claros-Minas Gerais. Revista Multitexto. 2015; 3(1):82-88.
22. Santos EL, Soares EC, Silva TJ, Januário ICM, Garcia PHM, Moura SCC. Perfil do consumo de pescados na cidade de Coruripe, Alagoas. Acta Veterinaria Brasilica. 2015; 9(2):153-159.
23. Scherr C, Ribeiro JP. Influência do modo de preparo de alimentos na prevenção da aterosclerose. Revista da Associação Médica Brasileira. 2013; 59(2):148-154.
24. Tyrovolas S, Panagiotakos D. The role of Mediterranean type of diet on the development of cancer and cardiovascular disease, in the elderly: a systematic review. Maturitas. 2010; 65:122-130.
25. Dijk HV, Fischer ARH, Honkanen P, Frewer LJ. Perceptions of health risks and benefits associated with fish consumption among Russian consumers. Appetite. 2011; 56(2):227-234

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Qualitative and quantitative analysis of the relevance, clarity, and comprehensibility of the Scale of Quality of Diet (ESQUADA)

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Summary: The study of the diet quality should include not just the nutritional adequacy but also incorporate the multidimensional understanding and the current dietary recommendations. This study aimed to evaluate the relevance, clarity, and comprehensibility of the Scale of Quality of Diet (ESQUADA). Nutritionists' perspectives about the relevance and clarity of the items were evaluated through focus groups between November and December 2016. An exploratory content analysis investigated the themes that emerged from the focus groups, which were organized in a structured codebook. Two reviewers applied it to the data. Inter-rater reliability was analyzed by the kappa coefficient. The coding was analyzed using the frequencies and central aspects of the sub-themes. Laypersons' comprehension of the items was evaluated using a question regarding whether they understood each item in online questionnaire in February 2018. Descriptive statistics investigated the comprehensibility of each item. The reviewers presented adequate reliability on coding the data. Three themes emerged from the data considering the nutritionists' suggestions. The theme Item relevance indicated that the items assessed diet quality while considering sociocultural influences. However, the nutritionists suggested attention was needed to how some items were expressed and their response options. Of relevance, the themes Item clarity and Clarity of alternatives primarily encompassed discussions regarding item text (44%) and discrimination of alternatives (24%). The study of the comprehensibility indicated that all items were readily understood. These results support the relevance of the ESQUADA for evaluating quality of diet as well the comprehensibility of all the items by individuals uneducated in public health.

Key words: Surveys and questionnaires, dietary guidelines, psychometric, comprehension, qualitative research.

Resumen: Análisis cualitativo y cuantitativo de la relevancia, claridad y comprensibilidad de la Escala de Calidad de la Dieta (ESQUADA). El estudio de la calidad de la dieta debe incluir la adecuación nutricional además sus dimensiones y las recomendaciones dietéticas actuales. Este estudio evaluó la relevancia, claridad y comprensibilidad de la Escala de Calidad de la Dieta (ESQUADA). Las perspectivas de los nutricionistas sobre la relevancia y claridad de los ítems se evaluaron en grupos focales entre noviembre y diciembre de 2016. Un análisis de contenido exploratorio investigó los temas que surgieron de los grupos. Estos temas fueron ordenados en un libro de códigos estructurado. Dos revisores lo aplicaron a los datos. La fiabilidad inter-evaluadores fue analizada por el coeficiente kappa. La codificación se analizó utilizando las frecuencias y aspectos centrales de los subtemas. La comprensión de los ítems por personas sin conocimientos de nutrición se evaluó mediante una pregunta sobre el entendimiento de cada ítem en uno cuestionario online in febrero de 2018. Las estadísticas descriptivas investigaron la comprensibilidad de cada ítem. Los revisores presentaron adecuada fiabilidad en la codificación de los datos. Tres temas surgieron de los datos. El tema Relevancia del ítem indicó que los ítems evaluaron la calidad de la dieta mientras consideraban las influencias socioculturales. Sin embargo, los nutricionistas sugirieron la necesidad de atención en el texto de algunos ítems y sus opciones de respuesta. Los temas Claridad del ítem y Claridad de las opciones abarcaron principalmente las discusiones sobre el texto del ítem (44%) y la discriminación de las opciones (24%). El estudio de la comprensibilidad indicó que todos los ítems se entendían fácilmente. Estos resultados apoyan la relevancia de ESQUADA para evaluar la calidad de la dieta y la comprensión de todos los ítems por personas sin conocimientos de nutrición.

Palabras clave: Encuestas y cuestionarios, guías alimentarias, psicometría, comprensión, investigación cualitativa.

INTRODUCTION

Obesity and related diseases have been described as important public health problems with increasing prevalence in Brazil (1,2). Unhealthy diets contribute to this epidemiological status (3,4).

In Brazil, the quality of diet has been evaluated using the Healthy Eating Index and the Revised Diet Quality Index (5). These indices only focus on nutrient intake, which is insufficient to assess the complexity of the diet.

To comprehensively evaluate diet, it is necessary to extend the concept of quality of diet beyond nutritional adequacy (6,7). Quality of diet should encompass healthy and unhealthy foods, where meals are eaten, and habitual activities that take place during mealtime (7,8).

Accordingly, the 2014 Dietary Guidelines for the Brazilian Population (DGBP) (7) are based on a broad understanding of diet, incorporating recommendations for ways to eat and suitable food combinations. The guidelines also adopted the NOVA food classification, which considers industrial food-processing (9).

Public health research requires an easy-to-use instrument that comprehensively considers the quality of diet and the current dietary guidelines. Thus, the current study reported the initial stages of development of the Scale of Quality of Diet (ESQUADA), which evaluates diet considering the different settings that influence eating according to the DGBP. The present study focused on assessment of the relevance, clarity, and comprehensibility of the items of the ESQUADA.

MATERIAL AND METHODS

Development of the ESQUADA was guided by recommendations for psychometric studies. The first step is a theoretical analysis of the survey items, discussing their content with experts, and assessing how laypersons interpret the items. The second step assesses the validity and accuracy of the items (10). Note that the term "item" was adopted to refer to "questions." Additionally, the current analysis concentrated on the first step, namely qualitative and quantitative study of the relevance, clarity, and comprehensibility of each item of the ESQUADA. A subsequent study will assess the accuracy of the items for the assessment of the quality of diet (manuscript in development).

Item Development

The DGBP was the theoretical reference for item development (7). The response options were based on dietary recommendations (7,9). Three nutritionists (TSSS, BSV, and MAAA) developed 56 items between January and November 2016.

Item Content

Nutritionists working in public health fields were invited to participate in focus group discussions at the School of Public Health (University of São Paulo – USP) and at the Nutrition Department of the Federal University of Santa Catarina. This study aimed to assess the relevance and clarity of the developed items. The invitation was sent by email or telephone with the possibility of the recipient referring other nutritionists who might participate (11,12). The nutritionists were reminded of the focus group by the research team, the day before the group was scheduled. Each nutritionist agreed to participate in the study by signing a consent form, and completed a questionnaire that collected personal information.

Item Comprehensibility

After considering the nutritionists' suggestions, Brazilian adolescents and adults were invited to complete the questionnaire in February 2018, in order to study the comprehensibility of the items. All participants were Brazilian, lived in Brazil, were 15 to 50 years old, and signed an online consent form.

Focus Groups

Considering the objective to discuss the relevance and clarity of all items, the focus groups were organized as per three topics: 1.- food practices, 2.- unprocessed or minimally processed foods and processed culinary ingredients, and 3.- processed and ultra-processed foods. The number of focus groups was defined by the saturation criterion (11,12). Six focus groups were held between November and December 2016. Therefore, each topic was discussed in two different focus groups.

An interviewer mediated the interactions among the participants and encouraged dialogue among them.

Each focus group was conducted in the presence of an observer, who assisted with annotating the principal points of the discussions and relevant expressions of the participants. The interviewer and the observer were trained in focus group methods, and the script was previously pilot tested (11,12).

Participants were asked to introduce themselves to others and to try to express their opinions aloud in turn. Furthermore, some examples were presented of unprocessed or minimally processed foods, processed culinary ingredients, processed foods, and ultra-processed foods, to help the participants understand the NOVA food classification.

Each of the focus groups was composed of six to eight nutritionists and carried out in an easily accessible and neutral environment (11). The groups were conducted in an atmosphere of conversation and trust so that the nutritionists would feel free to share their opinions. The discussions were guided by a semi-structured script. Some probing questions were also used to encourage discussions regarding the inclusion, exclusion, or change in the expression of the items. The discussions were audiotaped and subsequently transcribed (12).

Online Questionnaire

To reduce the tedium associated with answering an extensive questionnaire, and measurement bias, the items were organized in booklets using a balanced incomplete blocks (BIB) design(13) using the package crossdress in R software. The booklets were loaded on the Survey Monkey platform and named in ascending order. The booklets were accessed through one link that organized the presentation of each booklet in ascending order. This link was shared in social media.

Each item was accompanied by an extra question that evaluated whether the participants understood the item. This question presented the following response options: I did not understand anything; I understood a little; I understood more or less; I understood almost everything, but I had some doubts; I understood almost everything; I understood perfectly, and I had no doubts(14). Besides the items that addressed the quality of diet and item comprehensibility, the booklets also included items that collected sociodemographic data.

Data Analysis

Exploratory content analysis was used to investigate the themes and sub-themes that emerged from the focus groups' data (15). The transcripts were read extensively by two authors (TSSS and PMS) to become familiar with the data and to identify emerging themes. Separately, they completed a first exploratory coding of the data, using excerpts as units of analysis. From those initial codes, a structured codebook was created to organize and characterize each sub-theme (15).

The transcripts and the codebook were imported into the MAXQDA version 12 software package, which assisted the analysis. Two authors (TSSS and MRC) independently applied the codebook to excerpts of the transcripts. Coding agreement was analyzed using the kappa coefficient for inter-rater reliability, as calculated using GraphPad software. Agreement was considered almost perfect when the kappa coefficient was larger than 0.8 (16). Differences in the coding were discussed until the coders reached consensus. The number and frequency of excerpts coded were also calculated. Each sub-theme was described in terms of central and peripheral aspects and the range of meanings in the data were identified.

To evaluate the comprehensibility of the items, responses to the extra question regarding the individuals' understanding were inspected. The items with the highest frequency of response for the first three categories (I did not understand anything, I understood a little, and I understood more or less) were rewritten(14).

The Ethics Committee on Human Research at the Faculty of Public Health approved the study protocol (number 1.943.099).

RESULTS

Six focus groups were conducted to allow discussions among the experts regarding the 56 items. These items are listed in Table 1. The session duration ranged from 99 to 160 minutes. The focus groups included 35 nutritionists (ranging from four to eight participants per group) with a median age of 30 years (range: 23 to 71 years), 33 of whom were female.

TABLE 1: Items evaluated by nutritionists on focus groups, São Paulo, Brazil, 2016–2017

Items	
How many days do you have breakfast in a week?	How many days do you use vegetable oil or olive oil to prepare food in a week?
What kind of foods do you usually eat at breakfast?	How many days do you use butter (such as Tirolez®, Itambé®, or Aviação®) to prepare food in a week?
How many days do you have lunch in a week?	When do you usually add vegetable oil or olive oil in cooked food?
What kind of foods do you usually eat at lunch?	When do you usually add butter (such as Tirolez®, Itambé®, or Aviação®) in cooked food?
How many days do you have dinner in a week?	How many days do you eat foods with peas, corn, palm hearts, pickles, olives, or vegetable mixtures?
What kind of foods do you usually eat at dinner?	How many days do you drink alcoholic beverages (such as beer, cider, or wine) in a week?
Do you usually eat with family, friends, or colleagues at least once a day?	How many days do you add cheeses (such as mozzarella or fresh cheese) to food in a week?
How many days do you replace lunch or dinner with sandwiches, pizza, or other snacks in a week?	How many days do you eat industrialized cakes and cookies in a week?
Do you usually cook food to eat at meals such as lunch or dinner?	How many days do you eat sweets (such as chocolate, ice cream, bubble gum, or candies) in a week?
Do you usually eat at restaurants (such as self-service or executive-service) or you carry home-made food for lunch or dinner away from home?	How many days do you drink spirits (such as brandy, whiskey, vodka, or rum) in a week?
Do you usually eat ready-to-heat foods, instant noodles, powdered soups, or other easy-to-prepare foods when you are at home?	How many days do you use ready-made sauces (such as tomato, white, wood, barbecue, Italian, and cheese sauces) in a week?
Where do you usually buy fruits and vegetables?	How many days do you add ketchup or mustard in foods (such as sandwiches, salty foods, or potato chips) in a week?
Do you usually snack between meals?	How many days do you eat snacks (such as fried or salted snacks, sandwiches, hot dogs, or pizza) in a week?
Do you usually choose the largest portion of food if there is a small difference in price?	How many days do you eat breakfast cereals (such as Sucrilhos®, All Bran®, Corn Flakes®, and Crunch®) and industrialized cereal bars in a week?
Do you usually cook with friends or family?	How many days do you eat packaged snacks or packaged French fries in a week?
Do you usually eat while watching TV, using a computer, studying, or reading?	How many days do you drink soft drinks or juices (such as Del Valle®, Maguary®, Sufresh®, Mid®, and Taeq®) in a week?
What place at home do you usually eat at?	How many days do you use seasoning (such as Knorr®, Sazon®, and Maggi®) in a week?
How many days do you eat oats or whole wheat flour or use these foods in recipes in a week?	How many days do you eat breads (such as baguette, sandwich, and hot dog) in a week?
How many days do you eat rice with beans in a week?	How many days do you use margarine, mayonnaise, non-fresh milk cream, or vegetable cream to prepare foods such as salads, sauces for pasta or pies, or stroganoff in a week?
How many days do you eat raw vegetables, or as ingredients in cooked dishes such as soups, in a week?	How many days do you add margarine to breads and biscuits or put non-fresh milk cream or whipped cream on fruit in a week?
How many days do you eat fruits or fruit salads in a week?	How many days do you eat fruit jams in syrup or industrialized jellies in a week?
How many days do you eat skimmed or semi-skimmed milk in a week?	How many days do you take non-natural yogurt and dairy drinks (such as Toddynho®) in a week?
Do you usually remove the fat or skin when you eat beef, pork, or chicken?	How many days do you add cream cheese, Polenguinho®, or industrialized pâté to ready-made food in a week?
How do you usually eat beef, pork, or chicken?	How many days do you eat mortadella, salami, turkey breast, ham, or nuggets in a week?
How do you usually eat fish?	
How many days do you eat boiled, scrambled, or fried eggs or omelet in a week?	
How many days do you eat cakes, breads, or homemade cookies in a week?	
How many days do you eat Brazil nuts, cashew nuts, walnuts, or peanuts without salt or sugar in a week?	
When do you usually drink water?	
When do you usually drink coffee or tea?	
When do you usually add sugar, honey, molasses, or “rapadura” in drinks such as coffee, tea, milk or juice?	
When do you usually add salt in ready-to-eat foods (such as salads or cooked foods)?	

Three themes (Item Relevance, Item Clarity, and Clarity of alternatives) and nine sub-themes emerged through the analysis (Table 2). The results of the inter-rater reliability analysis are shown in Table 3. The kappa coefficient indicated almost perfect agreement for all sub-themes. The sub-theme "Need to change the text or order of the alternatives" had the lowest inter-rater reliability (0.88).

Item relevance was composed of three sub-themes. The sub-theme "Relationship between eating behavior and consumption" considered that eating behavior might indicate the quality of diet. Regarding the item about breakfast, a related excerpt showed the item's relevance to the relationship between eating breakfast and the quality of diet: "It already indicates that he organized the meal and reserved a time to eat…It already is an indicator of quality." This sub-theme ranged from discussions about item relevance to discussions about the relevance of the questionnaire.

The sub-theme "Characteristics of food habits"

TABLE 2: Description of the sub-themes that emerged though exploratory content analysis, São Paulo, Brazil, 2016–2017.

Sub-themes	Description
Item relevance	
Relationship between eating behavior and consumption	Whether the item was relevant for addressing the relationship between eating behavior and food consumption based on quality of diet.
Characteristics of food habits	Whether the item was relevant for addressing the characteristics of the habitual food consumption of the individual. This relevance was also indicated for items not present in the questionnaire.
Marketing influence	Whether the item was relevant for addressing the influence of food packaging or marketing on feeding behavior.
Item clarity	
Need to change the item text	Whether the item needed to be written more clearly, considering the variety of meanings of the words and their comprehensibility, and the requirement that they did not imply the correct answer.
Need to include a new item	Whether a new item was needed or whether a current item should be split into multiple items to improve clarity.
Difficulty with NOVA food classification	Whether the item was unclear because of difficulties for individuals in identifying foods according to the NOVA food classification.
Difficulty in reaching the objective	Whether the item did not reach the objective proposed or was not sufficiently clear to reach it.
Alternative clarity	
Need to include alternatives with better discrimination	Whether the response alternatives needed to be changed to permit better discrimination of eating practices, by adding detail and/or separating the options presented.
Need to change the text or order of the alternatives	Whether the item text or order of the alternatives should be changed for clarity, logic, or to facilitate more fluent reading.

TABLE 3: Absolute and relative frequencies and kappa coefficients for each sub-theme identified in focus groups, São Paulo, Brazil, 2016–2017

Sub-themes	n	%	k	95% CI
Item relevance				
Relationship between eating behavior and consumption	56	5.77	0.96	0.91–1.00
Characteristics of food habits	18	1.86	1.00	1.00–1.00
Marketing influence	6	0.62	1.00	1.00–1.00
Item clarity				
Need to chance the item writing	430	44.33	0.91	0.88–0.95
Need to include a new item	47	4.85	0.98	0.93–1.00
Difficulty with NOVA food classification	12	1.24	1.00	1.00–1.00
Difficulty in reaching the objective	38	3.92	0.97	0.92–1.00
Alternative clarity				
Need to include alternatives with a better discrimination	236	24.33	0.92	0.88–0.96
Need to change the writing or order of the alternatives	127	13.09	0.88	0.82–0.94

k: kappa coefficient. 95% CI: 95% confidence interval of kappa coefficient.

primarily referred to item relevance for evaluating the habitual food consumption patterns of individuals, as reflected in a quote: "It is a very important item because they consume a lot of cookies." This sub-theme ranged from opinions about the importance of the item for food consumption trends to discussions about the relevance of item as an indicator of healthy eating. For instance, a quote related to milk consumption independent of the fat content was as follows: "…I believe that when the issue is healthy eating, milk usually is associated [with it] a lot… they replaced milk with artificial juices or soda. So, I also agree that you should take out if it is full-fat or not…So, drinking milk is an indicator of healthy eating…"

The sub-theme "Marketing influence" focused on the effect of marketing on the quality of diet. The sub-theme's range encompassed the item's relevance for the study of the probable marketing influence on buying large portions of healthy and unhealthy foods, as in this quote: "They always think about the advantages. It is cheaper! They do not think about the quality."

Item clarity was discussed in terms of four sub-themes. The sub-theme "Need to change the item's expression" identified the excerpts about the need to write differently in order to guarantee better clarity. This was characterized primarily by discussions regarding poor comprehensibility of technical terms, as can be seen in a quote: "...they will not know what unnatural yogurt is..." The sub-theme's range encompassed this need to change the terms presented in the item (including local terms or the way the item was expressed), such as in a quote related to the item "Do you usually choose the largest portion of food if there is a small difference in price?" ("…between a medium or large pizza, if the price difference is small, would you choose the large one?").

The sub-theme "Need to include a new item" focused on the discussions about the need for new items, including the suggestion to include an item addressing the number of meals because of its relationship with daily eating practices: "And the item about how many meals a person eats? It would also be an interesting question..." The sub-theme's range also included advice for dividing the

items considering the culinary use of the foods, as in this quote: "...they never know any ingredients in the recipes. Maybe separating these items regarding what they use at the time of consumption and creating another about what they use in culinary preparations...maybe it would make it easier for them."

The sub-theme "Difficulty with NOVA food classification" was predominately characterized by reports indicating potential difficulty for the respondents in discriminating the foods according to the NOVA food classification and urging the item to be clarified without using technical terms ("I do not think you have to use the word 'processed' because…it's very technical nomenclature. So, I think if you want to facilitate the understanding of the person I think you have to avoid this kind of word."). In contrast, this sub-theme was peripherally exemplified by encouraging the use of the term "processed," as can be seen in this quote: "But to stimulate the use of this nomenclature we should use it in research."

The sub-theme "Difficulty in reaching the objective" focused on discussions of items that did not addressing their objectives ("…if the objective is to check whether he adds salt or not on prepared food, the item is not related..."). This sub-theme also identified comments that an item did not clearly achieve its objective, as in this quote: "To check the habit of snacking. It is not necessarily that the snacking term in the question means goodies (cookies, candy, etc.)…he will not understand that it is necessarily goodies." Finally, this sub-theme ranged from incoherence between the item expression and the proposed objective, to a lack of clarity in writing for younger respondents, thus making it difficult for the item to reach its objective.

Clarity of alternatives was discussed in terms of two sub-themes. The sub-theme "Need to include alternatives with a better discrimination" was primarily characterized by suggestions to include response options to better discriminate eating practices ("So, I'm also in doubt regarding whether to put none or one day…you do not know if he never eats (breakfast) or eats at least once a week…you cannot differentiate..."). In contrast, the sub-theme's range encompassed whether to include response options unable to discriminate healthy from unhealthy consumption. This is peripherally exemplified by the quote: "…maybe I have one suggestion: 'yes, but I do not know the kind of preparation'…maybe you would have more mistakes…I believe it is better to show this option…"

The sub-theme "Need to change the text or order of the alternatives" focused on suggestions related to the expression of the response options, as can be seen in the quote: "I think that the option 'No' could be substituted for: I do not usually do breakfast. So, you have to write more clearly." This sub-theme also identified suggestions to change the order of the response options. Finally, the sub-theme's range also included suggestions to use the same response alternatives in similar items ("…because if you follow the logic, you ask about a month or week…I think that this logic is consistent if you use the same response options for all the items.").

This qualitative approach was based on the suggestions of the experts. In summary, the nutritionists highlighted that the items evaluated the quality of diet while considering its sociocultural influences. They also identified items that were not related to quality of diet and should be excluded. In addition to the study of the relevance of the items, the nutritionists underlined the importance of item wording and suggested changes to improve comprehensibility.

The 56 items presented to the nutritionists were changed considering the results from the exploratory content analysis. The principal changes were to the sub-themes "Need to change the text or order of the alternatives" (13.09%), "Need to include alternatives with better discrimination" (24.33%), and "Need to change the item text" (44.3%). In addition to the changes to the text, the nutritionists also suggested excluding nine items because of their irrelevance to the study of eating practices, as in this example: "it is very difficult to collect specific information about culinary ingredients if we do not explore the recipes…people do not know who cooks for them…which ingredients he/she uses." They suggested dividing two items by the food characteristics and including another two items to address the consumption of ultra-processed meals, and the addition of processed culinary ingredients.

The remaining 52 items were organized into thirteen booklets and loaded onto the Survey Monkey platform.

Considering only complete responses, 112 individuals (63%) contributed by assessing the comprehensibility of the items. The characteristics of these individuals are shown in Table 4. Most of them were female (77%) and had no university education (51%). No item's highest frequency of response was within the first three categories of the extra question. In general, the respondents highlighted some errors in the text and suggested using local terms and examples in the items.

TABLE 4: Characteristics of participants in the study of item comprehension, São Paulo, Brazil, 2018 (N = 112).

Age	n	%
≤ 18 years	36	32
> 18 and ≤ 30 years	41	37
> 30 years	35	31
Gender		
Female	86	77
Male	26	23
Education		
Basic	1	0.9
Incomplete Primary	2	1.8
Complete Primary	5	4.5
Incomplete High School	20	17.9
Complete High Scholl	16	14.3
Incomplete University Degree	13	11.6
Complete University Degree	38	33.9
Master	8	7.1
PhD	9	8
Region		
North	1	0.9
Northeast	1	0.9
Midwest and Distrito Federal	1	0.9
South	6	5.4
Southeast	103	91.9

DISCUSSION

One of the steps when developing research questionnaires should be contacting a group of experts on the subject to evaluate to what extent the questionnaire addresses the construct (10). While developing the ESQUADA, nutritionists were invited to discuss the items' relevance to the study of quality of diet and the items' clarity in order to improve the comprehensibility of the items by adolescents and adults.

The invitation to participate in focus groups was extended to nutritionists with professional experience related to public health. They worked in clinics, and universities with or without research projects. The focus groups allowed the participants to exchange their points of view in a conversational atmosphere (17). Moreover, the experience in public health yielded rich interactions regarding which items were relevant or irrelevant for studying quality of diet, and what changes were needed to assess it and to improve the comprehensibility of the ESQUADA. The ideas were coded using exploratory content analysis. The quality of this coding was confirmed by the almost perfect inter-rater reliability.

Consistent with international evidence and the DGBP, the items presented to the experts were developed based on a multidimensional understanding of the quality of diet (6,7). The sub-theme "Relationship between eating behavior and consumption" encompassed the nutritionists' opinions about the relevance of the contextual characteristics of eating and meal regularity because of their relationship with the quality of consumption. This discussion is consistent with the studies that have identified an association between inattentive eating and greater consumption (18).

The experts also highlighted the relevance of investigating companionship while eating and cooking. Although the trend toward not cooking regularly exists, individuals who spend more time cooking the meals at home have a healthier eating and less frequently use fast-food restaurants (19). Besides the association with healthier eating (19), the frequency of consuming home-cooked meals is positively associated with better health (20). Therefore, these points reinforce the relevance of studying the regularity of cooking one's meals.

Furthermore, the sub-theme "Relationship between eating behavior and consumption" highlighted the irrelevance of some items that assessed the use of oils, fats, and instant seasonings. The nutritionists indicated the difficulty of assessing their usual use when preparing foods because of the greater frequency of eating out (21). Therefore, these items were excluded. In contrast, one item was newly added that encompassed the addition of salt, olive oil, or vinegar to the food after it was served.

The nutritionists also suggested excluding the item about the consumption of homemade breads or biscuits (prepared without using ready-made mixes). In addition to the reduction in the customary preparation of foods at home, they indicated the indiscriminate use of the term "homemade" in food labels. The use of the term "homemade," or similar was more frequent in the labels of ultra-processed foods, such as cake mixes and breads (22). Furthermore, consumers related that these terms might mislead them when attempting to select a food (23). Finally, the nutritionists affirmed that the item noted would not discriminate quality of diet because the term "homemade" could refer to foods either prepared at home or commercially. This item was also excluded from the pool of items.

In addition to studying the relevance of the items, the focus groups discussed the clarity of the items. The sub-theme "Need to change the item text" was the most frequent (44.3%) related to improving how the items were expressed. The frequency of this sub-theme indicates the importance of clarity to the quality of the questionnaire. When developing instruments, researchers must consider how best to express items to improve their comprehensibility (24). In the current analysis, the nutritionists also contributed to improving how the items were expressed, in accordance with their professional experience. In this sense, the experts underlined the need to improve the evaluation of fruit intake by splitting the item in two: one item considering only fruit intake and another regarding consumption of natural juices.

Some suggestions concerned the inclusion of self-exclusion response options to better discrimination of eating practices. The experts indicated that the individuals must be able to identify the option that accurately represents their eating practices to provide a correct answer. The response options must range along the construct of interest. Otherwise, misinterpretations based on the data could distort the conclusions and future recommendations (25). Therefore, the response options were changed to better discriminate the variety and frequency of eating practices.

Considering all the suggestions, 52 items remained on the questionnaire. In addition to concerns regarding the length of the questionnaire on the quality of answers, the comprehensibility of the questions was important (24). After considering the suggestions of the nutritionists, the comprehensibility of each item was directly assessed by the naïve population. Because of their good understanding, no items were excluded, highlighting the effectiveness of the focus groups in enhancing the clarity of the items.

The limitations of this study are primarily related to the lowest number of nutritionists in one of the six focus groups. However, the interviewer encouraged discussion while not directly participating in the discussions. Additionally, the study of item comprehensibility did not investigate whether the individuals experienced difficulties in using the online questionnaire. The study also has strengths. Both the interviewer and the observer were trained in the use of focus groups, and the script was pilot tested with nutritionists. The selection of participants with different professional experience in public health yielded rich interactions. The experts were helped to feel more confident with the NOVA food classification by the presentation of some examples of foods. Furthermore, the focus groups provided important discussions regarding quality of diet that improved the pool of items, and the study of the comprehensibility of the items collected the opinions of a naive population with respect to public health.

CONCLUSION

This study reported discussions regarding the items proposed for a new tool to evaluate quality of diet. The focus groups provided important information improving the content of the ESQUADA. A sample of adolescents and adults directly assessed their understanding of the

tool, and the results suggested a clear understanding of the items. These results indicated adequate relevance and comprehensibility of the items for evaluating quality of diet. Therefore, the ESQUADA is ready for further research regarding its accuracy for assessing quality of diet. Finally, this study highlights the advantages of using a qualitative approach to assess experts' suggestions when developing research questionnaires.

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CONFLICT OF INTEREST:

None.

REFERENCES

1. Instituto Brasileiro de Geografia e Estatística - IBGE. Pesquisa de Orçamentos Familiares 2008-2009 - Antropometria e estado nutricional de crianças, adolescentes e adultos no Brasil. Rio de Janeiro. 2010.
2. Ministério da Saúde. Vigitel Brasil 2017 Saúde Suplementar: vigilância de fatores de risco e proteção para doenças crônica por inquérito telefônico. Brasília. 2018.
3. Louzada MLC, Baraldi LG, Steele EM, Martins AP, Canella DS, Moubarac JC, et al. Consumption of ultra-processed foods and obesity in Brazilian adolescents and adults. Prev Med. 2015; 81:9-15.
4. Melo B, Rezende L, Machado P, Gouveia N, Levy R. Associations of ultra-processed food and drink products with asthma and wheezing among Brazilian adolescents. Pediatr Allergy Immunol. 2018;29(5):1-8.
5. Morais DC, Moraes LFS, Silva DCG, Pinto CA, Novaes JF. Methodological aspects of dietary quality assessment in Brazil: systematic review. Cien Saúde Coletiva. 2017;22(8):2671-2680.
6. Alkerwi A. Diet quality concept. Nutrition. 2014;30(6):613-618.
7. Ministério da Saúde. Guia alimentar para a população brasileira. Brasília. 2014.
8. Leech RM, Worsley A, Timperio A, McNaugton SA. Understanding meal patterns: definitions, methodology and impact on nutrient intake and diet quality. Nutr Res Rev. 2015;28(1):1-21.
9. Monteiro CA, Cannon G, Levy R, Moubarac JC, Jaime P, Martins AP, et al. NOVA. A estrela brilha. World Nutrition. 2016;7(1-3):28-40.
10. DeVellis RF. Scale development: theory and applications. Los Angeles: SAGE; 2017.
11. Liamputtong P, Ezzy D. Qualitative research methods. Melbourne: Oxford; 2005.
12. Draper A, Swift JA. Qualitative research in nutrition and dietetics: data collection issues. J Hum Nutr Diet. 2011;24(1):3-12.
13. Bekman RM. Aplicação dos Blocos Incompletos Balanceados na Teoria da Resposta ao Item. Estudos em Avaliação Educacional. 2001; 24:119-138.
14. Conti MA, Scagliusi F, Queiroz GKO, Hearst N, Cordás TA. Avaliação transcultural: tradução e validação de conteúdo para o idioma português do modelo Tripartite Influence Scale de insatisfação corporal. Cad Saúde Pública. 2010;26(3):503-513.
15. Bernard HR, Deslandes SF. Analysing qualitative data: Systematic approaches. Sage; 2010.
16. Landis JR, Koch GG. The measurement of observer agreement for categorical data. Biometrics. 1977;33(1):159–174.
17. Tausch AP, Menold N. Methodological aspects of focus groups in health research: results of qualitative interviews with focus groups moderators. Glob Qual Nurs Res. 2016; 3:1-12.
18. Oliveira JS, Barufaldi LA, Abreu GA, Leal VS, Brunken GS, Vasconcelos SML, et al. Erica: use of screens and consumption of meals and snacks by Brazilian adolescents. Rev Saúde Pública. 2016;50(supl1):7s.
19. Monsivais P, Aggarwal A, Drewnowski A. Time spent on home food preparation and indicators of healthy eating. Am J Prev Med. 2014;47(6):796-802.
20. Mills S, Brown H, Wrieden W, White M, Adams J. Frequency of eating home cooked meals and potential benefits for diet and health: cross-sectional analysis of a population-based cohort study. Int J Behav Nutr Phys Act. 2017;14(1):109.
21. Claro RM, Baraldi LG, Martins APB, Bandoni DH, Levy RB. Trends in spending on eating away from home in Brazil, 2002-2003 to 2008-2009. Cad Saúde Pública. 2014;30(7):1418-1426.
22. Machado PCI, Santos AM, Uggioni PL, Fabri RK, Müller J. Labeling of packaged foods in Brazil: use of terms such as homemade, traditional, and the like. Rev Nutr. 2018;31(1):83-96.
23. Müller J, Uggioni PL. Percepção do consumidor de alimentos em relação às alegações de caseiro, tradicional e outras similares em rótulos de alimentos industrializados. RASBRAN. 2016;7(1):343-344.
24. Coluci MZO, Alexandre NMC, Milani D. Construction of measurement instruments in the area of health. Cien Saúde Coletiva. 2015;20(3):925-936.
25. Beckstead JW. On measurements and their quality. Paper 4: verbal anchors and the number of response options in rating scales. Int J Nurs Stud. 2014;51(5):807-814.

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Evaluación antropométrica y composición corporal por medio de óxido de deuterio en escolares costarricenses

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Resumen: El objetivo del estudio fue determinar elestado nutricional de escolares costarricenses de seis a nueve años. Participaron 103 escolares (54 niños y 49 niñas) con un promedio de edad de 7,8 ± 0,9 años. Se evaluó peso, talla, talla sentado, circunferencia de cintura (CC), índice de masa corporal (IMC), índice córmico (IC) y relación cintura-talla (IC/T). Se utilizó el óxido de deuterio (D2O) para evaluar la composición corporal: % agua corporal total (% ACT), masa libre de grasa (MLG), masa grasa (MG) y % de grasa corporal (% GC). El sobrepeso/obesidad se determinó utilizando el IMC y el método de clasificación de McCarthy para % GC de acuerdo a sexo y edad. Los valores medios para niños y niñas fueron: peso (29,1 ± 7,2 vs 31,0 ± 6,7 kg), talla (124.7 ± 6.7 vs 127.5 ± 7.1 cm), talla sentado (64.4 ± 3.7 vs 65.6 ± 3.5 cm), IMC (18.5 ± 3.11 vs 18.9 ± 2.7 kg/m^2), CC (62.1 ± 8.6 vs 63.8±7.8 cm), IC (51.6 ± 1.6 vs 51.5 ± 1.6), I.C/T (0.52 ± 0.1 vs 0.51 ± 0.1), % ACT (56.5 ± 5.7 vs 51.9 ± 4.5 %), MLG (21.0 ± 3.5 vs 20.5 ± 3.6 kg), MG (8.1 ± 4.2 vs 10.5 ± 3.6 kg), % GC (26.3 ± 7.3 vs 33.2 ± 5.7 %), respectivamente. La edad, talla, MG, % GC y % ACT fueron significativamente mayores ($p<0.05$) en las niñas. Los escolares presentan un crecimiento adecuado junto a una alta prevalencia de sobrepeso/obesidad.

Palabras clave: Antropometría, composición corporal, dilución de óxido de deuterio, escolares, obesidad.

Summary: Anthropometric evaluation and body composition by means of deuterium oxide in Costa Rican schoolchildren. The aim of the study was to determine the nutritional status of Costa Rican schoolchildren from six to nine years old. Participants were 103 schoolchildren (54 boys and 49 girls) with an average age of 7.8 ± 0.9. Each participant was assessed for weight, height, sitting height, waist circumference (WC), body mass index (BMI), cormic index (CI), and waist-height ratio (WHtR). Deuterium oxide dilution (D2O) was used to assess body composition; total body water % (TBW%), fat-free mass (FFM), fat mass (FM), and body fat % (BF %). Overweight/obesity was determined by the use of BMI and McCarthy's classification scheme for BF % in terms of sex and age. Mean values for boys and girls were: age (7.6 ± 0.9 vs 8.0 ± 1.0 years), weight (29.1 ± 7.2 vs 31.0 ± 6.7 kg), height (124.7 ± 6.7 vs 127.5 ± 7.1 cm), sitting height (64.4 ± 3.7 vs 65.6 ± 3.5 cm), BMI (18.5 ± 3.11 vs 18.9 ± 2.7 kg/m^2), WC (62.1 ± 8.6 vs 63.8 ± 7.8 cm), CI (51.6 ± 1.6 vs 51.5 ± 1.6), WHtR (0.52 ± 0.1 vs 0.51 ± 0.1), TBW % (56.5 ± 5.7 vs 51.9 ± 4.5 %), FFM (21.0 ± 3.5 vs 20.5 ± 3.6 kg), FM (8.1 ± 4.2 vs 10.5 ± 3.6 kg), BF% (26.3 ± 7.3 vs 33.2 ± 5.7 %), respectively. Age, height, FM, BF %, and TBW % were significantly higher ($p<0.05$) in girls. Schoolchildren show adequate growth along with high prevalence of overweight/obesity.

Key words: Anthropometry, body composition, deuterium oxide dilution, schoolchildren, obesity.

INTRODUCCIÓN

El estado nutricional de un individuo es el resultado del balance entre la obtención de la energía por medio de los alimentos y el gasto energético diario. El desequilibrio entre estos dos factores puede causar problemas de malnutrición por deficiencia (desnutrición) o por exceso (obesidad) (1).

Se considera que el estado nutricional no sólo describe la salud de una persona, sino que también es un factor que determina el grado de desarrollo de un país, el bienestar social y el nivel de vida de su población (2). Por lo tanto, para conocer el estado nutricional de las personas es necesario realizar la denominada evaluación nutricional (3).

La evaluación nutricional se ha definido como el mecanismo de valoración que permite identificar diversos factores que determinan el estado de salud de las personas (2) y de intervenir en el momento adecuado a la población que presente algún riesgo nutricional (1).

En las últimas dos décadas, se ha identificado por medio de evaluaciones nutricionales un cambio en el perfil epidemiológico-nutricional en la población infantil latinoamericana. Este cambio ha sido caracterizado por un aumento progresivo de la prevalencia de sobrepeso y obesidad (4). Está comprobado que el sobrepeso y obesidad alteran la calidad de vida de las personas que la padecen (5), promoviendo la incidencia y prevalencia de enfermedades crónicas no transmisibles (6).

En Costa Rica se ha identificado que la prevalencia de sobrepeso y obesidad en escolares es de 34% (7). Aunque en Costa Rica se han realizado estudios enfocados a la evaluación nutricional de la población infantil, éstos siguen siendo escasos y el principal método utilizado ha sido la antropometría (7-10). Sin embargo, no se han utilizado técnicas de referencia como la dilución de óxido de deuterio (D_2O) para la valoración de la composición corporal y el estado nutricional.

Debido a que a nivel pediátrico es importante la rigurosidad y la precisión en el proceso de la evaluación del estado nutricional, ya que, dependiendo del crecimiento y la maduración biológica existe una gran variación en los diferentes componentes del cuerpo; la cual puede afectar significativamente las estimaciones de la masa libre de grasa (MLG) y la masa grasa (MG) (11). El objetivo del presente estudio es realizar la evaluación del estado nutricional de escolares costarricenses por medio del método antropométrico y la composición corporal por medio de la técnica isotópica de D_2O.

MATERIALES Y MÉTODOS

Sujetos:

En el estudio se evaluaron 103 escolares (54 niños y 49 niñas), con edades comprendidas entre los 6 a 9 años (7.7 ± 1.1 años) pertenecientes a tres escuelas del Área Metropolitana de la provincia de San José, Costa Rica. De acuerdo a la información proporcionada por los centros educativos los escolares pertenecen a familias de estratos socioeconómicos medios. Entre los criterios de inclusión para la participación de los escolares en el estudio se estableció que no podían padecer alguna enfermedad aguda o crónica en el momento del estudio. Tampoco podían participar aquellos escolares que en el momento del estudio estuvieran tomando medicamentos que podían afectar los resultados. La muestra seleccionada fue no probabilística, correspondió a todos los escolares cuyos padres o tutores autorizaron la participación firmando el consentimiento informado.

El protocolo de estudio fue redactado siguiendo los postulados de la Declaración de Helsinki (12) y aceptado por el Comité Ético Científico de la Universidad de Costa Rica.

Evaluación Antropométrica:

Se midió el peso, talla, talla sentado, circunferencia de cintura (CC). Las mediciones se realizaron con el mínimo de ropa, siguiendo el mismo protocolo. Para la selección de medidas antropométricas, técnica e instrumental de medición se tuvieron en cuenta las recomendaciones de la Sociedad Internacional para el Avance de la Cineantropometría (ISAK) en su manual, International standards for anthropometric assessment (13).

El peso fue medido con una balanza electrónica portátil SECA (Hamburgo, Alemania) con capacidad de 150 kg y precisión de 0.01 kg. La talla y talla sentado, se midió con un estadiómetro portátil Holtain Ltd. (Dyfed, Reino Unido), con capacidad de 200 cm y precisión de 0.1 cm. La CC fue medida con una cinta antropométrica de metal e inextensible, con capacidad de 200 cm y una precisión de 0.1 cm marca Roffcraft. La medición se realizó en el perímetro del abdomen en su punto más estrecho, entre el borde costal lateral inferior (décima costilla) y la parte superior de la cresta ilíaca.

Las mediciones se realizaron por triplicado y se tomó el promedio de las mediciones como el valor final a considerar. El error de medición para la talla, talla sentada, CC y el peso fueron de 0.2 cm, 0.2 cm, 0.2 cm y 0.01 kg respectivamente.

Con la medición de talla y talla sentado se determinó el índice córmico (IC) o talla sentado relativo el cual corresponde a un índice de proporcionalidad del tronco del sujeto (14).

Composición corporal:

El análisis de la composición corporal se realizó por medio de la técnica isotópica de la dilución de óxido de deuterio (D_2O).

La técnica de D_2O permite calcular el agua corporal total (ACT), dato que permite posteriormente determinar la MLG y la MG. El ACT se midió mediante la determinación de la concentración de D2O, de acuerdo al protocolo de Plateau. Éste protocolo considera dos puntos de medición: una muestra biológica basal previa a la ingestión del isótopo y otra muestra post dosis al final del tiempo de equilibrio (tres horas) del isótopo en los fluidos corporales (15). Para efectos del estudio se utilizó la saliva (2 ml) como muestra biológica.

Para la recolección de la muestra basal y administración de D_2O los escolares estuvieron en ayuno de doce horas, período en el cual no realizaron actividad física vigorosa. Antes de suministrar el D_2O los escolares realizaron una micción.

Después de la recolección de la muestra basal, se administró una dosis de 12 g de D_2O al 99% de átomo. Posteriormente a los recipientes se les agregó 20 ml de agua estéril para que los escolares la bebieran y garantizar la ingesta total del D_2O.

Durante el tiempo de equilibrio (tres horas posteriores a la ingesta del isótopo), los escolares no ingirieron alimentos o bebidas. Tampoco realizaron actividad física o micción. Las muestras de saliva se recogieron utilizando torundas de algodón absorbente estéril que se introdujeron en la boca de los escolares para que se impregnaran de saliva. Posteriormente el algodón se colocó en jeringas de 10 ml y se presionaron con el émbolo para recolectar el fluido en tubos de plástico limpios con tapa de rosca. Las muestras se almacenaron a -70° C para su posterior análisis.

A partir del ACT, se calculó la MLG, asumiendo los coeficientes de hidratación para niños propuestos por Fomon *et al*. (16). La MG fue calculada como la diferencia entre la MLG y el peso corporal.

Las muestras de saliva se analizaron usando un espectrómetro de masas de relación de isótopos HYDRA (Europe Scientific, Crewe, UK) en el Laboratorio de Metabolismo Energético e Isótopos Estables del Instituto de Nutrición y Tecnología de Alimentos (INTA), Universidad de Chile.

Evaluación del estado nutricional por indicadores antropométricos:

Se utilizaron los indicadores talla para la edad (T/E) e IMC (kg/m^2). La categorización del estado nutricional de los escolares se realizó de acuerdo al puntaje Z, según sexo y edad y se clasificó de la siguiente manera: talla baja (T/E < -2 DE), normalidad para la talla (T/E entre -1 y +1 DE), talla alta (T/E > +2 DE), bajo peso (IMC < -1 DE), normalidad para el peso (IMC entre -1 y + 1 DE), sobrepeso (IMC +1 y +2 DE) y obesidad (IMC > +2 DE) (17).

Determinación de Obesidad General:

Se determinó utilizando el IMC y la clasificación de McCarthy *et al.* (18), la cual utiliza percentiles del porcentaje de grasa corporal (%GC) de acuerdo a sexo y edad (5 a 18 años).

Determinación de Obesidad Central:

Se consideró como obesidad central a la medición de CC que se encontraba igual o mayor al percentil 90, para el sexo y la edad, según la referencia de la Tercera Encuesta Nacional de Salud y Nutrición de los Estados Unidos (19).

Determinación del Índice Cintura entre Talla:

El índice cintura entre talla (I.C/T), se determinó por medio de la fórmula: I.C/T = Perímetro de la cintura (cm) / Estatura (cm), con un punto de corte de 0.5 usado para definir riesgo de enfermedades cardio-metabólicas (20).

Análisis estadístico:

Se realizó un análisis descriptivo de las características antropométricas y de composición corporal de los escolares. Se calcularon intervalos de confianza del 95%. Las diferencias entre promedios de las variables medidas de niños y niñas se analizaron mediante la prueba t para muestras independientes. Se consideró significativo un $p<0.05$. Todos los valores están reportados como promedios y desviación estándar. Los análisis de los

datos se realizaron utilizando los softwares estadísticos SPSS for Windows versión 21.0 (IBM Corporation, New York, USA).

RESULTADOS

Las características antropométricas y de composición corporal de los escolares se presentan en la Tabla 1. Al aplicar el análisis estadístico, se determinó que la edad, talla, MG, % GC y % ACT fueron significativamente mayores ($p>0.05$) en las niñas. La Tabla 2 muestra la prevalencia del estado nutricional de los escolares según indicadores antropométricos y de composición corporal. Con respecto al indicador T/E se identificó que tanto niños y niñas presentaron similar prevalencia para baja talla y normalidad de la talla. La talla alta sólo se presentó en 2% de las niñas.

Referente a la talla sentado los niños obtuvieron en promedio 51.6 ± 1.6 cm y las niñas 51.5 ± 1.6 cm, lo que corresponde a 41.4% y 40.4% de la medición en conjunto de cabeza, cuello y tronco; porcentajes obtenidos por los niños y niñas respectivamente.

En cuanto al índice córmico se obtuvo un valor de 51.6 en los niños y 51.5 en las niñas clasificándose de acuerdo a Canda (14), como metriocórmico o tronco medio para ambos grupos de escolares.

Con respecto al indicador IMC el grupo de escolares no registró emaciación, sin embargo; sólo el grupo de niñas presentó prevalencia de bajo peso. El 51.5 % de los escolares estudiados mostró un IMC normal, siendo los niños el grupo con la mayor prevalencia para esta condición. Para el sobrepeso y obesidad se identificó que el total de escolares presentan una prevalencia de un 34.9% y 10.7 % respectivamente; en donde la mayor prevalencia de sobrepeso se presentó en las niñas y la obesidad en los niños.

Al realizar la evaluación nutricional por el método de clasificación de McCarthy (18), se identificó al igual que el IMC, que el grupo de escolares no presentó emaciación, sin embargo; en las demás categorías las prevalencias son diferentes. Aunque el IMC identificó bajo peso, con el método de clasificación de McCarthy (18), no se identifican escolares en esta condición. Con respecto a la normalidad del peso la prevalencia de escolares que se ubica en esta categoría es menor

TABLA 1. Características antropométricas y de composición corporal de escolares costarricenses de 6 a 9 años.

Características Físicas	Niños (n=54)			Niñas (n=49)			p
	x	± DE	Intervalo	x	± DE	Intervalo	
Edad (años)	7.6	0.9	7.4 - 7.9	8.0	1.0	7.7 - 8.3	0.040*
Peso (kg)	29.1	7.2	27.1 - 31.4	31.0	6.7	29.1 - 32.9	0.089
Talla (cm)	124.7	6.7	123.0 - 126.4	127.5	7.1	125.4 - 129.5	0.041*
Talla sentado (cm)	64.4	3.7	63.4- 65.4	65.6	3.5	64.6- 66.6	0.096
IMC (kg/m^2)	18.5	3.11	17.6 - 19.32	18.9	2.7	18.1 – 19.7	0.227
CC (cm)	62.1	8.6	59.7 - 64.4	63.8	7.8	61.5 - 66.0	0.176
IC	51.6	1.6	51.2- 52.1	51.5	1.6	51.0- 51.9	0.884
I.C/T	0.52	0.1	0.50- 0.53	0.51	0.1	0.49- 0.52	0.292
Composición Corporal							
ACT (%)	56.5	5.7	54.9 - 58.0	51.9	4.5	50.7 - 53.3	0.0001*
MLG (kg)	21.0	3.5	20.0 - 22.0	20.5	3.6	19.4 - 21.5	0.526
MG (kg)	8.1	4.2	6.9 - 9.2	10.5	3.6	9.4 - 11.6	0.0004*
GC (%)	26.3	7.3	24.3 - 28.3	33.2	5.7	31.5 - 34.9	0.0001*

IMC: Índice de Masa Corporal, CC: Circunferencia de Cintura, IC: Índice Córmico, I.C/T: Índice cintura-talla, ACT: Agua Corporal Total, MLG: Masa Libre de Grasa, MG: Masa Grasa, GC: Grasa Corporal.

TABLA 2. Prevalencias (%) del estado nutricional de escolares costarricenses de 6 a 9 años según indicadores antropométricos y de composición corporal

Indicador	Niños (n=54) (%)	Niñas (n=49) (%)	Total (n=103) (%)
T/E			
Baja Talla	3.7	2.0	3.0
Normalidad	96.3	96.0	96.0
Talla Alta	0.0	2.0	1.0
IMC			
Bajo Peso	0.0	6.1	2.9
Normalidad	59.3	42.9	51.5
Sobrepeso	25.9	44.9	34.9
Obesidad	14.8	6.1	10.7
McCarthy			
Bajo Peso	0.0	0.0	0.0
Normalidad	22.2	10.2	16.5
Sobrepeso	22.2	8.2	15.6
Obesidad	55.6	81.6	67.9

(16.5%) a la reflejada utilizando el IMC (51.5%). Sin embargo, ambos métodos coinciden que la mayor prevalencia se presenta en el grupo de varones.

Referente al sobrepeso y obesidad, el método de clasificación de McCarthy (18), identifica en general una mayor prevalencia de estas condiciones 83.5%. Lo anterior no se identificó con el IMC, en donde el sobrepeso y obesidad suman un 45.6%.

Tampoco el IMC coincidió con el método de clasificación de McCarthy (18) en donde la mayor prevalencia de sobrepeso lo presentan los niños y la obesidad la presentan las niñas.

La Figura 1 muestra la prevalencia de sobrepeso/obesidad general y obesidad central mostrando que las niñas presentan la mayor prevalencia para estas categorías en comparación a los niños.

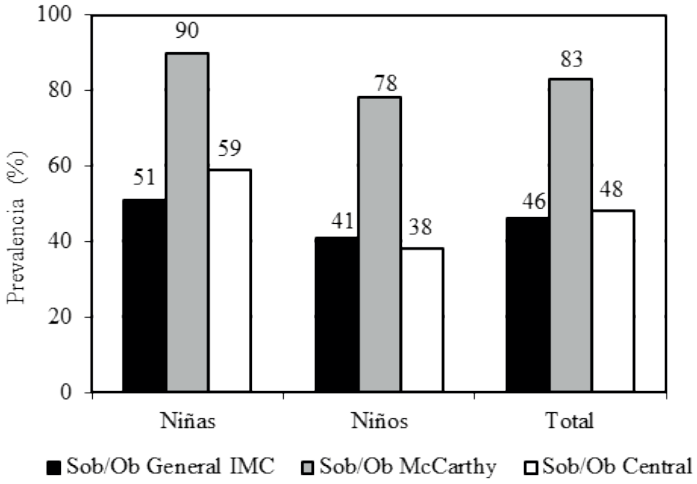
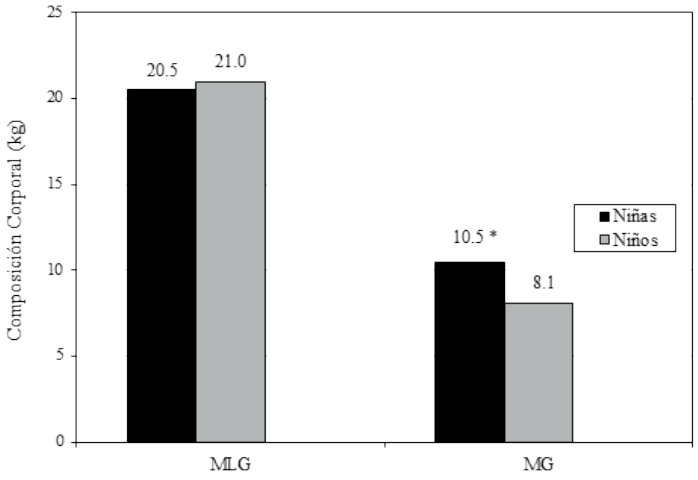


FIGURA 1. Prevalencia de sobrepeso/obesidad general según IMC y clasificación de McCarthy y de sobrepeso/obesidad central según sexo y edad en escolares costarricenses de 6 a 9 años.

La Figura 2 muestra la comparación de la MLG y la MG entre niños y niñas, donde se muestra que las niñas presentan una diferencia significativamente mayor de MG que los niños.



*p<0,05 masa grasa de las niñas fue significativamente mayor que en los niños

FIGURA 2. Comparación de la masa libre de grasa y masa grasa de escolares costarricenses de 6 a 9 años.

DISCUSIÓN

Al analizar los resultados del presente estudio referentes a la talla de los escolares, se identifica que coinciden con los reportados en el Censo Escolar Peso y Talla (CEPT) realizado en Costa Rica en el año 2016 (7); se observa que 94.2% de la población escolar de 5 a 12 años presenta una talla normal para la edad, 2% talla alta y 3.6% baja talla.

Aunque en la última Encuesta Nacional de Nutrición en Costa Rica (ENN) realizada entre los años 2008-2009 no se reportan datos para la talla en escolares de 6 a 9 años (10), en la penúltima ENN de 1996 (9), la talla promedio de escolares según sexo y edad fue de 123.5 cm en niños y 123.4 cm en niñas; valores similares a los reportados en el presente estudio para los niños (124.7 cm), pero no para las niñas (127.5 cm).

Al comparar los resultados obtenidos en el presente estudio con los de la ENN de 1996 (9) se puede apreciar que, en un lapso de 20 años, la talla en los niños no cambia, sin embargo; en las niñas se identifica un aumento en promedio de la talla de 4 cm. También al comparar la prevalencia de baja talla obtenida en el presente estudio con los resultados de la ENN de 1996 (9), se identifica que tal prevalencia ha disminuido en la población infantil costarricense.

El haber obtenido una alta prevalencia de talla normal en los escolares es relevante debido a que el indicador talla/edad no sólo es un indicador de referencia para desnutrición crónica, sino también es un indicador que se relaciona con calidad de vida, con el nivel de desarrollo humano y la seguridad alimentaria y nutricional.

Referente a los resultados obtenidos de talla sentado e índice córmico se pudo determinar que tanto los niños como las niñas presentan una adecuada proporcionalidad corporal entre el segmento superior e inferior.

A nivel de salud es importante contar con éste tipo de información ya que permite: 1-evaluar la contribución de la estatura del tronco con respecto a la proporcionalidad corporal y así conocer si la relación entre el segmento superior e inferior no está alterada por algún síndrome, 2- valorar el crecimiento de las extremidades inferiores.

Se ha identificado que el crecimiento de las extremidades inferiores se ve más afectado que el del tronco por condiciones ambientales adversas (21). De hecho, las diferencias en estatura entre sujetos de una misma población, pero de distintas condiciones socioeconómicas son atribuibles fundamentalmente a la diferente longitud de las piernas, es decir; unas piernas proporcionalmente más cortas con respecto a la población a que se pertenece pueden estar informando de un problema crónico de crecimiento (22).

Aunque son escasos los estudios que reportan valores de índice córmico en población infantil de 6 a 9 años, los resultados del presente estudio concuerdan con los reportados por Plata (23) y Prado *et al*. (24), en niños mexicanos y gitanos madrileños respectivamente, donde los escolares también presentaron un tipo de tronco medio.

Hay que destacar que los datos de talla sentado e índice córmico del presente estudio son los primeros reportados en un estudio con niños y niñas costarricenses.

Con respecto al % GC los resultados del presente estudio también concuerdan con los reportados en los estudios de Aguilar *et al*. (25), Fariñas *et al.* (26) y Quintana *et al.* (27), donde las niñas presentan porcentajes de grasa corporal mayores que el de los niños.

Se ha demostrado que los niños con sobrepeso u obesidad presentan una reducción en el ACT como porcentaje del peso corporal comparado a niños eutróficos, justificado por un elevado % GC (28). Se ha identificado que él % ACT en niños de 6 a 9 años con sobrepeso u obesidad es menor al 50 % (29). Aunque en el presente estudio los porcentajes de ACT no fueron menores al 50% (56.5% en niños y 51.9% en niñas); ambos porcentajes no superan el 60% de ACT, lo cual puede justificar que los escolares presenten elevados % GC en especial en las niñas.

Al realizar la evaluación nutricional por el método de clasificación de McCarthy (18), el cual utiliza el % GC para brindar una valoración nutricional, se identificó al igual que el IMC que el grupo de escolares no presentó emaciación, sin embargo; en las demás categorías las prevalencias fueron diferentes.

Con los resultados obtenidos para % GC tanto en niños

como en las niñas se determinó que el estado nutricional va del sobrepeso a la obesidad. Al comparar los resultados obtenidos por el IMC con los obtenidos por el método de clasificación de McCarthy (18), se observa que con el IMC se subestima el sobrepeso y la obesidad en la población infantil estudiada; lo que también se identificó en el estudio de Quintana *et al.* (27) en escolares costarricenses de 6 a 9 años.

Se ha identificado que el peso corporal y la relación peso/estatura no proporcionan información acerca de la composición corporal, siendo lo más importante para los diagnósticos de sobrepeso u obesidad el demostrar el incremento de la grasa corporal (27).

Diversos estudios han demostrado que él % GC aumenta a pesar de que el IMC se mantenga constante. Para un valor de IMC dado se han encontrado aumentos en el contenido graso y aumentos en la distribución central de grasa (20).

Por lo anterior Himes (30), considera que es más recomendado utilizar el método de pliegues cutáneos, ya que generalmente los resultados muestran una mejor correlación con la grasa corporal total para identificar sobrepeso u obesidad que el IMC.

Para efectos del presente estudio es importante mencionar que las curvas de referencia para él % GC propuestas por McCarthy (18), fueron desarrolladas empleando equipos de bioimpedancia Tanita BC-418MA (Segmental Body Composition Analyser) y no D_2O como en el caso del presente estudio.

Debido a las diferencias conocidas entre métodos para estimar la composición corporal se podría considerar que es posible que esto sea una fuente de error que haya influido en los diagnósticos de sobrepeso y obesidad en el grupo estudiado, especialmente en las niñas, siendo esto una limitación.

Sin embargo, McCarthy (18) reporta en su estudio que el equipo Tanita BC-418MA, había sido validado a nivel pediátrico con métodos de referencia en la medición de la composición corporal como el DEXA y la pletismografía de desplazamiento de aire (*BodPod*) (31).

Al igual que el estudio de percentiles de grasa corporal de McCarthy (18), en la actualidad se cuenta con otro importante estudio realizado por Escobar *et al.* (32), con más de 5800 niños y adolescentes colombianos. Para efectos del presente estudio no se utilizó como referencia los percentiles de grasa corporal de Escobar *et al*. (32), debido a que el rango de edad inicia a partir de los nueve años y era necesario para el presente estudio que el rango de edad involucrara edades a partir de los seis años, por lo que se consideró utilizar los percentiles de McCarthy (18), que inicia a partir de los cinco años.

Referente a los valores promedio de I. C/T obtenidos de los niños como de las niñas, los mismos mostraron ser ligeramente más altos que el límite de 0.5 valor que corresponde al umbral para el riesgo de salud cardio-metabólico en individuos de uno u otro sexo a partir de los seis años, según el estudio realizado por McCarthy et al. (20), en el que evaluaron a 8135 niños y adolescentes. Similares resultados fueron reportados en el estudio de Bila *et al*. (29), quien evaluó la composición corporal con D_2O en niños brasileños de 6 a 9 años con sobrepeso y obesidad.

CONCLUSIONES

Los resultados del presente estudio permiten concluir que los escolares estudiados presentan un crecimiento adecuado reflejo de un bienestar general. El IMC consideró a la población estudiada que tenía sobrepeso u obesidad como con normalidad en el peso, situación que debe considerarse ya que pone en evidencia que es más importante determinar el % GC y no tanto el peso ponderal para establecer adecuadamente el estado nutricional de un individuo. Es por esto que se recomienda realizar análisis de la composición corporal o de la MG, especialmente durante la niñez y adolescencia con el fin de poder determinar la prevalencia del sobrepeso y obesidad.

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REFERENCIAS

1. Ros I, Herrero M, Castell M, López E, Galera R, Moráis A, grupo GETNI. Valoración sistematizada del estado nutricional. Acta Pediatr Esp. 2011; 69(4):165-72.
2. Fernández J. Aranda E, Ramos C, de Guía M, Hernández A, Rodríguez J, *et al.* Evaluación del estado nutricional de estudiantes adolescentes de Extremadura basado en medidas antropométricas. Nutr Hosp. 2014; 29 (3), 665-73.
3. Herrero M, Moráis AB, Pérez JD. Valoración Nutricional en Atención Primaria, ¿es posible? Rev Pediatr Aten Primaria. 2011; 13: 255-69
4. Aballay LR, Eynard AR, Díaz MP, Navarro A, Muñoz S. Overweight and obesity: their relationship to metabolic syndrome, cardiovascular disease, and cancer in South America. Nutr Rev. 2013; 71 (3): 168-79
5. Manzur F, Alvear C, Alayón A. El perfil epidemiológico del sobrepeso y la obesidad y sus principales comorbilidades en la Ciudad de Cartagena de Indias. Rev Colomb Cardiol. 2009; 16 (5): 194-200.
6. Tibana AR, Navalta J, Bottaro M, Vieral D, Tajra V, Silva A. *et al.* Effects of eight weeks of resistance training on the risk factors of metabolic síndrome in overweight/obese women - ¿A Pilot Study? Diabetol Metab Syndr. 2013; 5:11
7. Ministerio de Educación Pública, Ministerio de Salud. Informe Ejecutivo Censo Peso/Talla. 2016. Disponible http://www.mep.go.cr/sites/default/files/page/adjuntos/informe-ejecutivo-censo-escolar-peso-cortofinal.pdf.
8. Barrantes A, Calderón A, Fernández X. Prevalencia de sobrepeso, obesidad y factores asociados en preescolares del cantón de Turrialba. Poblac Salud Mesoam. 2017; 15 (1). Disponible https://doi.org/10.15517/psm.v15i1.26278
9. Ministerio de Salud de Costa Rica. Encuesta Nacional de Nutrición: Fascículo 1, Antropometría. San José, Costa Rica; 1996.
10. Ministerio de Salud de Costa Rica. Encuesta Nacional de Nutrición, Costa Rica 2008-2009. INCAP/OPS. San José, Costa Rica; 2009.
11. Silva D, Ribeiroa A, Pavãoa F, Ronquea E, Avelara A, Silvab A. *et al.* Validity of the methods to assess body fat in children and adolescents using multi-compartment models as the reference method: a systematic review. Rev Assoc Med Bras. 2013; 59 (5): 475-86
12. World Medical Assembly, Declaration of Helsinki: Ethical Principles for Medical Research on Human Beings. 64th General Assembly. Fortaleza: Brazil; 2013.
13. Marfell-Jones M, Olds T, Stewart A, Carter L. International standards for anthropometric assessment. Potchefstroom, South Africa, ISAK; 2006.
14. Canda A. Variables antropométricas de la población deportista española. Ministerio de Educación, Cultura y Deporte. Imprenta Nacional del BOE. España; 2012.
15. Salazar G, Infante C, Vio F. Deuterium equilibration time in infant`s body water. Eur J Clin Nutr. 1994;48: 475-81.
16. Fomon S, Haschke F, Ziegler EE, Nelson SE. Body composition of reference children from birth to age 10 years. Am J Clin Nutr. 1998;35: 1169-75.
17. World Health Organization (WHO). The WHO 2007 SAS Macro Package. World Health Organization (WHO): Ginebra, Suiza; 2007.
18. McCarthy HD, Cole TJ, Fry T, Jebb SA, Prentice AM. Body fat reference curves for children. Int J Obes. 2006; 30: 598-602.
19. Fernández J, Redden D, Pietrobelli A, Allison D. Waist circumference percentiles in nationally representative samples of African-American, European-American and Mexican-American children and adolescents. J Pediatr. 2004; 145: 439-44.
20. McCarthy HD, Ashwell M. A study of central fatness using waist-to-height ratios in UK children and adolescents over two decades supports the simple message "keep your waist circumference to less than half your height". Int J Obes. (Lond) 2006; 30: 988- 92.
21. Ferro-Luzzi A. Environment and physical growth. In: Genetic and Environmental Factors during the Growth Period. NATO ASI Series. Plenum Press. New York, London; 1984.
22. Sandín M, Fraile R, Perez M, Gonzalez A, López P, García L, *et al*. Curvas de crecimiento de niños de la Comunidad de Madrid. Eds. de la Universidad Autónoma de Madrid; 1993.
23. Plata JP. Índices ponderales de futbolistas amateurs en la ciudad de Colima, Colima. Tesis de Maestría. Sin Publicar. Universidad de Colima; 2003.
24. Prado C, Marrodán M, Sebastián J, Carmenate M, Nielsen A. Crecimiento y nutrición en los niños gitanos de los Realojos. Rev Cubana Salud Pública 2005; 31 (4): 285-90.
25. Aguilar M, González E, García C, García P, Álvarez J, Padilla C, *et al*. Estudio comparativo de la eficacia del índice de masa corporal y el porcentaje de grasa corporal como métodos para el diagnóstico de sobrepeso y obesidad en población pediátrica. Nutr Hosp. 2012; 27 (1):185-91.
26. Fariñas L, Vásquez V, Martínez A, Carmenate M, Marrodán M. Evaluación del estado nutricional de escolares cubanos y españoles: índice de masa corporal frente a porcentaje grasa. Nutr Clin Diet Hosp. 2012; 32:58-64.
27. Quintana-Guzmán E, Salas-Chaves MP, Cartín-Brenes M. Índice de masa corporal y composición corporal con deuterio en niños costarricenses. Acta Pediátr Mex. 2014; 35: 179-189.
28. Kliegman R, Behrman RE, Jenson HB, Stanton BF. Nelson, Tratado de pediatría. 18th ed. Rio de Janeiro, RJ: Elsevier; 2009.
29. Bila WC, de Freitas AE, Galdino AS, Ferriolli E, Pfrimer K, Lamounier JA. Deuterium oxide dilution and body composition in overweight and obese schoolchildren aged 6-9 years. J Pediatr. (Rio J) 2016; 92 (1): 46-52.
30. Himes JH. Challenges of accurately measuring and using BMI and other indicators of obesity in children. Pediatrics 2009; 124: S3-22.
31. Pietrobelli A, Rubiano F, St-Onge MP, Heymsfield SB. New bioimpedance analysis system: improved phenotyping with whole-body analysis. Eur J Clin Nutr. 2004; 58: 1479-84.
32. Escobar-Cardozo G, Correa-Bautista J, González-Jiménez E, Schmidt Rio Valle J, Ramírez-Vélez R. Percentiles de grasa corporal por bioimpedancia eléctrica en niños y adolescentes de Bogotá, Colombia: estudio FUPRECOL. Arch Argent Pediatr. 2016; 114 (2):135-142.

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Asociación de sobrepeso u obesidad con trastornos del estado de ánimo en adolescentes

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Resumen: Objetivo: Determinar la asociación entre sobrepeso-obesidad y trastornos del estado de ánimo en adolescentes, específicamente depresión, ansiedad, baja autoestima y dismorfia corporal. Metodología: Diseño transversal comparativo en adolescentes de 12 a 14 años, se integraron dos grupos el primero con sobrepeso-obesidad y el segundo con normopeso. Los trastornos del estado de ánimo fueron evaluados con Inventario de Depresión de Beck-II, Escala de ansiedad de Hamilton, Escala de autoestima de Rosenberg y Cuestionario de forma corporal de Cooper. El análisis estadístico incluyó chi cuadrada y razón de momios. Resultados: Se encontró asociación de sobrepeso-obesidad con depresión RM 17,94 (IC 95%; 8,17-39,38), ansiedad RM 11,11 (IC 95%; 4,75-25,97), autoestima RM 8,40 (IC 95%; 4,08-17,24) y dismorfia corporal RM 9,64 (IC 95%; 2,14-43,17). Conclusión: Existe asociación entre sobrepeso-obesidad y trastornos del estado de ánimo en adolescentes.

Palabras clave: Depresión, ansiedad, autoestima, dismorfia corporal, sobrepeso, obesidad, adolescentes.

Summary: Association of overweight or obesity with mood disorders in adolescents. Objective: To determine the association between overweight-obesity and mood disorders in adolescents, specifically depression, anxiety, low self-esteem and body dysmorphism. Methodology: Comparative cross-sectional design in adolescents aged 12 to 14 years, two groups were integrated the first with overweight-obesity and the second with normal weight. Mood disorders were evaluated with Beck-II Depression Inventory, Hamilton Anxiety Scale, Rosenberg Self-Esteem Scale and Cooper Body Form Questionnaire. The statistical analysis included chi square and odds ratio. Results: Overweight-obesity association with depression was found in OR 17,94 (IC 95% 8,17-39,38), OR 11,11 anxiety (IC 95% 4,75-25,97), OR self-esteem 8,40 (IC 95% 4.08-17.24) and body dysmorphism OR 9.64 (IC 95% 2.14-43.17). Conclusion: There is an association between overweight-obesity and mood disorders in adolescents.

Key words: Depression, anxiety, self-esteem, body dysmorphism, overweight, obesity, adolescents.

INTRODUCCIÓN

El sobrepeso y la obesidad pueden definirse como un exceso de grasa corporal o tejido adiposo producido como consecuencia de un desequilibrio positivo y prolongado entre la ingesta y el gasto energético. Este trastorno se ha convertido hoy en día en uno de los principales problemas de salud a nivel mundial. El rápido aumento en su prevalencia, ha hecho que la Organización Mundial de la Salud, la haya declarado "la epidemia del siglo XXI" por las dimensiones que ha adquirido a lo largo de las últimas décadas y por su impacto sobre la morbimortalidad, la calidad de vida y el gasto sanitario (1,2).

En todos los grupos de edad se ha reportado un aumento importante en el número de pacientes con sobrepeso-obesidad, siendo uno de los grupos más vulnerables a esta condición clínica, los niños y adolescentes. El número de niños y adolescentes de

edades comprendidas entre los cinco y los 19 años que presentan sobrepeso-obesidad se ha multiplicado por 10 a nivel mundial en los cuatro últimos decenios (3,4).

En la actualidad más de una tercera parte de los adolescentes presentan exceso de peso, lo que indica que uno de cada cinco adolescentes tiene sobrepeso y uno de cada diez presenta obesidad. De acuerdo con los resultados de la Encuesta Nacional de Salud y Nutrición del 2016, 36,3% de los adolescentes tiene sobrepeso u obesidad (5).

La adolescencia es una etapa entre la niñez y la edad adulta en donde se producen cambios físicos, psicológicos y emocionales además se acentúa el desarrollo del autoconcepto, las competencias, habilidades sociales, la autoestima y valorización de la imagen corporal siendo todo lo anteriormente descrito crucial para la vida adulta. (6,7).

Al generar un malestar anímico y emocional en esta edad, se podría considerar como un predictor de la aparición de problemas psicológicos durante la adolescencia como depresión, ansiedad, baja autoestima, dismorfia corporal, los cuales pueden postergarse en la vida adulta y llegar fácilmente a niveles de mayor severidad requiriendo tratamientos más intensivos y costosos y como con cualquier otra patología aumentar la comorbilidad de los pacientes que los padecen (8,9).

Si bien no se ha demostrado que exista un trastorno específico en la personalidad del paciente con sobrepeso y obesidad, los estudios publicados al respecto sobre la asociación de sobrepeso-obesidad con trastornos del estado de ánimo no son concluyentes; el exceso de peso no sólo expone a quien lo padece a una larga lista de enfermedades, como cardiopatías, hipertensión arterial y diabetes, sino presumiblemente también a trastornos psicológicos (10-12).

En este contexto el objetivo del artículo es determinar la asociación entre sobrepeso obesidad y trastornos del estado de ánimo en adolescentes, específicamente depresión, ansiedad, baja autoestima y dismorfia corporal.

MATERIALES Y MÉTODOS

Se realizó un diseño transversal comparativo en adolescentes de 12 a 14 años de edad, en la ciudad de Querétaro, México de septiembre del 2017 a octubre del 2018. Se incluyeron adolescentes que sabían leer y escribir, que aceptaron participar en el estudio previo consentimiento informado y con autorización de los padres; fueron excluidos aquellos en los que ya se conocía el diagnóstico de algún trastorno del estado de ánimo y estuvieran en tratamiento médico, los que presentaron alguna enfermedad crónica o discapacidad anatómica; y se eliminaron los que entregaron cuestionarios incompletos.

Se integraron 2 grupos el primer grupo se definió como adolescentes con sobrepeso-obesidad y el segundo grupo como adolescentes con normopeso; para ello se utilizaron los patrones de crecimiento de la Organización Mundial de la Salud. Se consideró normopeso entre el percentil 5 y el 85, y sobrepeso obesidad del percentil 86 en adelante.

El tamaño de la muestra se calculó con la fórmula para dos proporciones con nivel de confianza del 95% (Z_{alfa} =1,64) para una zona de rechazo de la hipótesis nula, poder de la prueba del 80% (Z_{beta} = 0,84), asumiendo que en los adolescentes con sobrepeso obesidad 35% referían trastorno del estado de ánimo (p1= 0,35) y que en adolescentes con normopeso 15% presentaban trastorno del estado de ánimo (p2 = 0,15). El total de muestra fue de 55 por grupo, no obstante, lo anterior se trabajó con un grupo de 78 adolescentes con normopeso y 84 con sobrepeso obesidad. La técnica muestral fue no probabilística por cuota empleando como marco muestral el listado de adolescentes inscritos en la unidad médica donde reciben atención.

Las variables estudiadas incluyeron características de la población (edad y sexo) y trastornos del estado de ánimo que son ciertas alteraciones del estado del ánimo el cual se define como una relación entre dos variables: energía y tensión, por lo que fluctuaría entre estado energético y un estado referido al grado de nerviosismo, considerándose el mejor un estado calmado-energético y el peor un estado tenso-cansado. Las variaciones del estado de ánimo, patológicos en calidad y en intensidad, pueden ser desde depresión severa hasta ilación maníaca. El rasgo esencial de los trastornos de esta categoría es que todos ellos reflejan un desequilibrio en la reacción emocional o del estado de ánimo que no se debe a ningún otro trastorno físico o mental. Se incluyeron depresión,

ansiedad, autoestima y trastorno dismórfico corporal (13).

La depresión se determinó utilizando el inventario de Depresión de Beck-II (alfa de Cronbach 0.78-0.92), autoinforme de 21 ítems con respuestas en escala de 0 a 3, de 7 categorías y puntuación mínima de 0 y máxima de 63. Puntuación de 0 a 13, sin depresión; de 14 a 19, depresión leve, de 20 a 28, depresión moderada; y de 29 a 63 depresión grave. Para el análisis bivariado se integró el grupo sin depresión y el grupo con depresión, en este se incluyó depresión leve, moderada y grave (14).

La escala de Hamilton (alfa de Cronbach 0.79-0.86) se empleó para identificar ansiedad; se incluyeron 14 ítems, cada uno se valoró en escala de 0 a 4 puntos, valor mínimo posible de 0 y máximo de 56 puntos. Entre 0 y 5 puntos se definió como no ansiedad, entre 6 y 14 puntos ansiedad menor, y 15 o más puntos ansiedad mayor. Para el análisis bivariado se formó el grupo de no ansiedad y el grupo de ansiedad, en éste se incluyó la ansiedad menor y la ansiedad mayor (15).

La autoestima se determinó con la escala de Rosenberg (alfa de Cronbach 0.89), en ella se incluyeron 10 ítems en escala tipo Likert con puntuación final entre 10 y 40. De 30 a 40 puntos se consideró autoestima elevada o normal, de 26 a 29 puntos autoestima media, y menos de 25 puntos autoestima baja. Para el análisis bivariado se recodificó en 2 categorías, autoestima alta o normal fue el primer grupo, y el segundo grupo incluyó autoestima baja y autoestima media (16).

Para evaluar la existencia de trastorno dismórfico corporal se aplicó El Body Shape Questionnaire o cuestionario de la forma corporal de Cooper (alfa de Cronbach 0.93-0.97), en este cuestionario se incluyeron 34 ítems evaluados en escala Likert de 6 niveles de respuesta. Se consideró insatisfacción corporal y preocupación excesiva de la imagen corporal cuando la puntuación total fue mayor a 81, puntuación menor o igual a 80 se clasificó como satisfacción corporal (17).

Previa autorización del Comité Local de Investigación se identificaron los pacientes que cumplieran con los criterios de selección de la población estudio, y se procedió a la obtención de datos mediante la aplicación del instrumento de recolección hasta completar la muestra.

El plan de análisis estadístico incluyó promedios, desviación estándar, porcentajes, prueba de t para poblaciones independientes, prueba de Mann-Whitney, chi cuadrada y razón de momios.

RESULTADOS

En el grupo de sobrepeso obesidad predominan los hombres con 59,5% y en el grupo de normopeso la prevalencia de hombres es 47,4% (chi^2 = 2,37, p=0,12). El promedio de edad en el grupo de sobrepeso obesidad es 12,77 ±0,75 años y en el grupo de normopeso es 12,68±0,69 años (MW=0,74, p=0,45).

En el grupo de sobrepeso obesidad el 83,3% de los adolescentes presentan depresión y en el grupo de normopeso el 21,8% refiere esta condición, estadísticamente estas diferencias son significativas (p=0,000). Tabla 1

Por cada 11.11 (IC 95%; 4,75-25,97) adolescentes que tienen sobrepeso-obesidad y presentan ansiedad, existe 1 adolescente con normopeso que también presenta ansiedad, esta diferencia es estadísticamente significativa. Tabla 2.

TABLA 1. Asociación de sobrepeso-obesidad con depresión en adolescentes.

Depresión	Porcentaje		Chi^2	p	RM	IC 95%	
	Sobrepeso obesidad	Normopeso				Inferior	Superior
Presente	83,3	21,8	61,60	0,000	17,94	8,17	39,38
Ausente	16,7	78,2					

TABLA 2. Asociación de sobrepeso-obesidad con ansiedad en adolescentes.

Ansiedad	Porcentaje		Chi²	p	RM	IC 95%	
	Sobrepeso obesidad	Normopeso				Inferior	Superior
Presente	56,0	10,3	37,6	0,000	11,11	4,75	25,97
Ausente	44,0	89,7					

TABLA 3. Asociación de sobrepeso-obesidad con baja o media autoestima en adolescentes

Autoestima baja o media	Porcentaje		Chi²	p	RM	IC 95%	
	Sobrepeso obesidad	Normopeso				Inferior	Superior
Presente	66,7	19,2	36,96	0,000	8,40	4,08	17,24
Ausente	33,3	80,8					

En el grupo con sobrepeso obesidad predomina la autoestima baja o media, en este grupo se refiere en 66,7% y en el grupo de normopeso la prevalencia es 19,2%, estadísticamente estas diferencias son significativas (p=0,000). Tabla 3.

Por cada 9,64 (IC 95%; 2,14-43,27) adolescentes que tienen sobrepeso obesidad y refieren insatisfacción corporal, existe 1 adolescente que tiene normopeso y también refiere insatisfacción corporal, esta relación es estadísticamente significativa. Tabla 4

El promedio de trastornos del estado de ánimo en el grupo sobrepeso obesidad es 2,14 y en el grupo de normopeso es 1,33 (t=7,59, p=0,000).

Cuando el análisis se hace en relación a la prevalencia del número de trastornos se identifica que en la población estudiada todos los adolescentes refieren al menos 1 trastorno del estado de ánimo, en el grupo de sobrepeso obesidad el 20,2% refiere 1 trastorno y en el grupo de normopeso 71,8% también refiere 1 trastorno. En el grupo de sobrepeso obesidad la prevalencia de 2, 3 o 4 factores es mayor que en el grupo de peso normal (p=0,000). Tabla 5

TABLA 4. Asociación de sobrepeso-obesidad con dismorfia corporal.

Dismorfia corporal	Porcentaje		Chi²	p	RM	IC 95%	
	Sobrepeso obesidad	Normopeso				Inferior	Superior
Presente	20,2	2,6	12,2	0,000	9,64	2,14	43,27
Ausente	79,8	97,4					

TABLA 5. Asociación de sobrepeso-obesidad con la prevalencia del número de trastornos.

Número de trastornos	Porcentaje		Chi^2	p
	Sobrepeso-obesidad	Normopeso		
1	20,2	71,8	46,22	0,000
2	47,6	23,1		
3	29,8	5,1		
4	2,4	0,0		

DISCUSIÓN

La prevalencia de sobrepeso y obesidad se ha incrementado en todos los grupos de edad, incrementado de igual manera las consecuentes comorbilidades de dicha condición. Se han propuesto y llevado a cabo numerosas estrategias para la reducción y control del peso no obstante lo anterior, la evidencia muestra que sólo un mínimo porcentaje de pacientes logra dicho objetivo. Como búsqueda de una respuesta al constante enigma de la etiología, abordaje y tratamiento del exceso de peso, se ha investigado la existencia de una personalidad que predisponga, favorezca o determine esta enfermedad, se han realizado estudios previos buscando asociar sobrepeso obesidad con diversos trastornos del estado de ánimo en los adolescentes, la mayoría de dichas investigaciones muestran resultados que no han sido concluyentes o son contradictorios; en esto radica la importancia del artículo que aquí se presenta, él aporta al debate del tema (18).

Se debe reconocer que es una fortaleza del trabajo la clasificación empleada para establecer normopeso, sobrepeso u obesidad; en este mismo sentido se deben considerar los instrumentos empleados para diagnosticar depresión, ansiedad, autoestima e insatisfacción corporal. (14-17,19).

Sin duda una de las características de la adolescencia es el proceso de transformación y búsqueda de la identidad, escenario del que no se puede excluir la aceptación de la imagen corporal; evidentemente se trata de una etapa complicada que debe ser estudiada para aportar información en torno al tema, el artículo abona al debate.

Lo que los resultados de este trabajo evidencian es que en los adolescentes, independientemente de la presencia o ausencia de sobrepeso obesidad se presenta al menos un trastorno del estado de ánimo, se podría pensar que por la etapa de desarrollo que cursan los adolescentes esto fuera lo esperado, sin embargo debe de reconocerse que desde el punto de vista médico hablar del 30% de adolescentes con 2 o más trastornos del ánimo es una llamada de atención que debe ser atendida por el sistema de salud; porque lo que se demostró en este estudio es que la presencia de sobrepeso obesidad aumenta la probabilidad de tener un número mayor de trastornos del ánimo.

Es evidente que de los trastornos del ánimo estudiados la depresión es la que llama más la atención, la evidencia demostró que por cada 17,94 adolescentes con sobrepeso obesidad que presentaron depresión existe 1 adolescente con normopeso que también presentó depresión, estos datos son importantes puesto que la prevalencia es muy elevada, por lo que debería convertirse en un foco de intervención de primer orden y de evaluación de resultados y pronósticos al tratar con pacientes con obesidad o con depresión, debido a las consecuencias fatales que generan estados depresivos crónicos como la ideación suicida (20).

Si se compara el peso de cada uno de los factores se puede afirmar que la depresión es más común que la ansiedad, y esta es más común que la baja autoestima.

Puesto que la ansiedad es una respuesta de anticipación voluntaria que advierte sobre un peligro inminente, se convierte en un área de oportunidad para adoptar medidas para afrontar una amenaza, no obstante, cuando sobrepasa el equilibrio de respuesta normal o supera la capacidad adaptativa se convierte en patológica.

La baja autoestima se produce por un cúmulo de situaciones, pero también van de la mano con las relaciones familiares y sociales, por lo que adecuadas redes de apoyo podrían estar contribuyendo a que el peso de la baja autoestima sea menor que el de la depresión (21,22).

Cuando se analiza la asociación de dismorfia corporal con sobrepeso obesidad se tendría que estar consciente que se habla de la autosatisfacción que el adolescente tiene con su cuerpo y la presencia de juicios valorativos, escenario que puede conducir a la aparición de conductas de riesgo, entre ellas atracones, dietas restrictivas, abuso de laxantes, vómito autoinducido, y aunado a ello llevar a trastornos alimentarios entre ellos bulimia y anorexia (23).

Se estima que más del 80% de los adolescentes con sobrepeso obesidad continuarán siendo obesos en la vida adulta, escenario ante el cual se asume que las conductas sociales en el adolescente se extienden a la vida adulta, entre ellas exclusión social y discriminación, las cuales afectan las competencias sociales, la autodisciplina, la motivación, y la adquisición de habilidades duras y blandas.

Se conceptualiza al obeso como carente de voluntad y compromiso, este puede ser un argumento para rechazarlo en ofertas laborales y condicionando menor nivel socioeconómico a futuro. Los adultos obesos que presentaron trastornos del estado de ánimo en la adolescencia presentan mayor riesgo de desarrollar trastornos específicos de personalidad, entre ellos trastorno antisocial compulsivo, por evitación, esquizoide, paranoico y obsesivo (24-26).

La intervención médica en los adolescentes se encamina de manera rutinaria a disminuir las complicaciones, sin embargo, se obtiene aún más cuando las intervenciones se hacen de manera preventiva y multidisciplinarias; al no conocer la relación causal sobrepeso obesidad y trastornos del estado de ánimo se dificulta el manejo del paciente, pero al asegurar una asociación entre las mismas sin importar la dirección causal permite abordar de manera integral e incidir sobre todos los factores que pudieran estar predisponiendo a perpetuar dichas patologías (27).

CONCLUSIÓN

En conclusión, existe asociación entre sobrepeso obesidad y los trastornos del estado de ánimo en adolescentes.

REFERENCIAS

1. Miguel M, Gárces-Rimón M. La obesidad juvenil y sus consecuencias. Revista de Estudios de Juventud. 2016; 112: 85-94. http://www.injuve.es/sites/default/files/revista112_6.pdf
2. González M, Lugli Z, Vivas E, Guzmán R. Insatisfacción con la imagen corporal y control personal de la conducta en obesos que asisten a tratamiento. Gen. 2015; 69(2), 28-38. http://revistagen.org/index.php/GEN/article/download/11/3
3. Dávila-Torres J, González-Izquierdo JJ, Barrera-Cruz A. Obesity in México. Rev Med Inst Mex Seguro Soc 2015; 53 (2): 240-249. http://www.medigraphic.com/cgi-bin/new/resumenI.cgi?IDARTICULO=56578
4. Acuerdo nacional para la salud alimentaria, estrategia contra el sobrepeso y la obesidad en México.
5. Shamah-Levy TT, Cuevas-Nasu L, Gaona-Pineda EB, Gómez-Acosta LM, Morales-Ruán MC, Hernández-Ávila M, et al. Sobrepeso y obesidad en niños y adolescentes en México, actualización de la Encuesta Nacional de Salud y Nutrición de Medio Camino 2016, Salud Publica Mex 2018; 60 (3): 244-253. http://saludpublica.mx/index.php/spm/article/viewFile/8815/11493.https://doi.org/10.21149/8815
6. Gaete V. Desarrollo psicosocial del adolescente. Rev Chil Pediatr. 2015; 86 (6): 436-443. https://scielo.conicyt.cl/scielo.php?script=sci_arttext&pid=S0370-41062015000600010. http://dx.doi.org/10.1016/j.rchipe.2015.07.005
7. Krauskopf D. El desarrollo en la adolescencia: las transformaciones psicosociales y los derechos en una época de cambios. Psicología.com. 2011. 1-12. https://psiquiatria.com/bibliopsiquis/el-desarrollo-en-la-adolescencia-las-transformaciones-psicosociales-y-los-derechos-en-una-epoca-de-cambios/
8. Vázquez M, Muñoz M, Fierro A, Alfaro M, Rodríguez L, Bustamante P. Estado de ánimo de los adolescentes y su relación con conductas de riesgo y otras variables. Rev Pediatr Aten Primaria. 2013; 15 (59): 75-84. http://dx.doi.org/10.4321/S1139-76322013000400003
9. Pintado Y, Jiménez Y, Padilla M, Guerra JM, Antelo ME. Trastornos psicológicos en los adolescentes. Una visión general. Rev Psicol. Psiquiatr Nino Adolesc., 2010; 9(1): 11-27. http://www.psiquiatriainfantil.org/trastornos-psicologicos-en-los-adolescentes-una-vision-general/
10. Rodríguez LM. Psicología del desarrollo moral en la adolescencia: un modelo integrativo. (Tesis previa a la obtención del título de Doctorado en Psicología). Argentina 2016. [citado 17 diciembre 2018]. Disponible en: http://bibliotecadigital.uca.edu.ar/repositorio/tesis/psicologia-desarrollo-moral-adolescencia.pdf

11. Baile J, González M. Comorbilidad Psicopatológica en obesidad. An. Sist. Sanit. Navar., 2011; 34 (2):253–261. http://dx.doi.org/10.4321/S1137-66272011000200011
12. Galeano M. Indicadores depresivos en una muestra de pacientes con obesidad. Eureka., 2011; 8(2): 254-266. http://pepsic.bvsalud.org/scielo.php?script=sci_arttext&pid=S2220-90262011000200010
13. Baena A, Sandoval M, Urbina C, Juárez N, Villaseñor S. Los trastornos del estado de ánimo. Revista digital Universitaria., 2005; 6 (11): 1-14. http://www.revista.unam.mx/vol.6/num11/art110/art110.html
14. Muñiz J, Fernández J. La opinión de los psicólogos españoles sobre el uso de los test. Papeles del Psicólogo., 2010; 31: 108-121. http://psycnet.apa.org/record/2010-04075-010
15. Hamilton, M. The Assessment of Anxiety States by Rating. British Journal of Medical Psychology., 1959: 32, 50-55. http://dx.doi.org/10.1111/j.2044-8341.1959.tb00467.x
16. Jurado D, Jurado S, López K, Querevalú B. Validez de la escala de autoestima de Rosenberg en universitarios de la ciudad de México. Revista Latinoamericana de Medicina Conductual., 2015;(5)1: 18-22.
17. González-Carrascosa R, García-Segovia P, Martínez-Monzó J. Valoración de la imagen corporal y de los comportamientos alimentarios en universitarios. Revista de psicopatología y psicología clínica., 2013; 18 (1):45-59. www.aepcp.net issn 1136-5420/13
18. Yesta D, Carrasco A. El manejo de la obesidad en la infancia y adolescencia: de la dieta a la cirugía. An pediatr. 2012; 77(2):71-4. Doi: 10.1016/j.endonu.2012.03.013
19. González-Rivera JA, Pagán-Torres OM. Escala de Autoestima de Rosenberg, ¿unifactorial o bifactorial? Apuntes de Psicología.,2017; 35 (3): 169-177. http://www.apuntesdepsicologia.es/index.php/revista/article/view/688
20. Pérez-Padilla E, Cervantes-Ramírez V, Hijuelos-García N, Pineda-Cortés JC, Salgado-Burgos H. Prevalencia, causas y tratamiento de la depresión Mayor. Rev Biomed., 2017; 28 (2) :89-115.
21. Secretaría de Salud. Guía de Práctica Clínica Diagnóstico y Tratamiento de los Trastornos de Ansiedad en el Adulto; 2010. [consultado 04 diciembre 2018]. Disponible en: http://www.cenetec difusion.com/CMGPC/IMSS-392-10/ER.pdf
22. Silva-Escorcia I, Mejía-Pérez O. Autoestima, adolescencia y pedagogía. Revista Electrónica Educare., 2015; 19(1): 241-256. doi: http://dx.doi.org/10.15359/ree.19-1.13
23. Behar R, Arancibia M, Heitzer C, Meza N. Trastorno dismórfico corporal: aspectos clínicos, dimensiones nosológicas y controversias con la anorexia nerviosa. Rev Med Chile., 2016; 144: 626-633.
24. Calvo C. Obesidad infanto-juvenil. Anales de la Real Academia Nacional de Farmacia., 2014; 84 (1): 15-28. DOI: http://dx.doi.org/ES/monoranf.v0i0.1499
25. Zurita-Cruz JN, Wakida-Kusunoki GH, Domínguez-Camacho A, Padilla-Rojas M, Maldonado-Rivera C, Peña-Pelayo M. Alteraciones psicoemocionales en adolescentes con obesidad. Rev Mex Pediatr. 2017; 84 (5): 176-181. http://www.medigraphic.com/cgi-bin/new/resumen.cgi?IDARTICULO=76135
26. Quintero J, Félix M, Banzo-Arguis C, Martínez de Velasco R, Barbudo E, Silveria J et al. Psicopatología en el paciente con obesidad. Salud Mental.,2016;39(3):123-130 DOI: 10.17711/SM.0185-3325.2016.010
27. Urióstegui-Flores A, García-Bravo M, Pérez-Pinto A, Orea-Lara A. Medición de parámetros asociados al síndrome metabólico en alumnos de enfermería en Taxco, México. Rev. Salud Pública., 2018; 20 (3): 334-339. http://www.scielo.org.co/pdf/rsap/v20n3/0124-0064-rsap-20-03-334.pdf

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Body image dissatisfaction and its association with antropometrics parameters, weight status and self-esteem in Chilean schoolchildren.

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Summary: Although an increasing number of children are becoming obese, the psychological comorbidities associated with obesity are not well established. This research was aimed at determining if there is association between body image dissatisfaction with anthropometrics parameters, weight status and self-esteem in children from public schools. The sample comprised 712 schoolchildren age 11.94 ± 1.16 years (351 girls and 361 boys). Self-esteem, body image dissatisfaction, body fat (BF), body mass index (BMI), Waist circumference (WC) and waist to height ratio (WHtR) were evaluated. 372 children (52.2%) presented normal weight, 201 (28.2%) children presented overweight and 139 children (19.5%) presented obesity. There were no differences in proportions between boys and girls ($p = 0.778$). Girls presented a higher proportion of body image dissatisfaction ($p = 0.0045$). The children with obesity presented the highest proportion with low or very low self-esteem ($p < 0.001$) and presented a higher proportion of body image dissatisfaction ($p<0.001$). The body image dissatisfaction was associated with overweight/obesity status (OR = 4.12, $p < 0.001$), WtHR (OR = 3.53, $p < 0.001$) and self-esteem (OR = 2.91, $p = 0.03$). In conclusion the body image dissatisfaction in the sample of study was associated with antropometric parameters and self-esteem.

Key words: Body image, self-esteem, obesity, schoolchildren.

Resumen: Insatisfacción con la imagen corporal y su asociación con parámetros antropométricos, estatus corporal y la autoestima en escolares chilenos. A pesar de que un número creciente de niños se está volviendo obeso, las comorbilidades psicológicas asociadas con la obesidad no están bien establecidas. Esta investigación tuvo como objetivo determinar si existe asociación entre la insatisfacción con la imagen corporal con parámetros antropométricos, el estatus corporal y la autoestima en niños de escuelas públicas. La muestra comprendía a 712 niños en edad escolar 11,94 ± 1,16 años (351 niñas y 361 niños). Se evaluaron la autoestima, la insatisfacción con la imagen corporal, la grasa corporal (GC), el índice de masa corporal (IMC), la circunferencia de la cintura (CC) y la relación cintura estatura (RCE). 372 niños (52,2%) presentaron peso normal, 201 (28,2%) sobrepeso y 139 niños (19,5%) presentaron obesidad. No hubo diferencias en las proporciones entre niños y niñas ($p = 0.778$). Las niñas presentaron una mayor proporción de insatisfacción con la imagen corporal ($p = 0,0045$). El grupo obeso presentó la proporción más alta con baja o muy baja autoestima ($p <0.001$) y presentó una mayor proporción de insatisfacción con la imagen corporal ($p <0.001$). La insatisfacción con la imagen corporal se asoció con el estado de sobrepeso/obesidad (OR = 4.12, $p <0.001$), RCE (OR = 3.53, $p <0.001$) y autoestima (OR = 2.91, $p = 0.03$). En conclusión, la insatisfacción con la imagen corporal en la muestra de estudio se asoció con parámetros antropométricos y la autoestima.

Palabras clave: Imagen corporal, autoestima, obesidad, escolares.

INTRODUCTION

School-age obesity is associated with psychosocial problems such as deficiencies in social co-existence and quality of life. It has been observed that obese children tend to have affective problems, mainly low self-esteem, body dissatisfaction and depression (1), affecting their academic performance, as well as social and family interaction. In addition, obese children with declining levels of self-esteem present significantly higher rates of sadness, loneliness, and anxiety, and they are more likely to engage in high-risk behaviors such as smoking

or alcohol consumption (2). Therefore, there is growing interest in the psychosocial aspects of obesity, especially as they affect children and adolescents.

Children with emotional and behavioral problems have a high risk of academic failure (3), which is evident in primary school. With the added problems of body image dissatisfaction and self-esteem produced by childhood obesity (4), the situation becomes more complex due to the high percentages of obese schoolchildren globally. A negative perception of one's body image and low self-esteem increases psychological distress (5).

Body image refers to a person's sense of their physical appearance and body function. A negative body-image self-evaluation may result in psychosocial dysfunction (6) in both genders and has become an important public health issue (7). Body image dissatisfaction is a good predictor of several mental health risks (8), including eating disorders and depression (9). Likewise, the self-esteem refers to a person's self-assessment and may be different in diverse contexts such as family, school and society. Low self-esteem is one of the main psychosocial factors related to childhood overweight and is significantly related to the bullying (10).

Although an increasing number of children are becoming obese, the psychological comorbidities associated with obesity are not well established. Therefore,this research was aimed at determining if there is association between body image dissatisfaction with anthropometrics parameters, weight status and self-esteem in children from public schools.

MATERIALS AND METHODS

Participants: A cross-sectional study involved 712 schoolchildren (351 girls and 361 boys), 11.94 ± 1.16 years of age from four public schools of the Araucanía region, Chile. The sample was selected for convenience purposes, and assessments were made regarding age, sex, anthropometric aspects, body image dissatisfaction and self-esteem. The research was carried out in public schools. The study design is described in Figure 1.

Inclusion criteria required participants to present informed consent by their parents and themselves, to

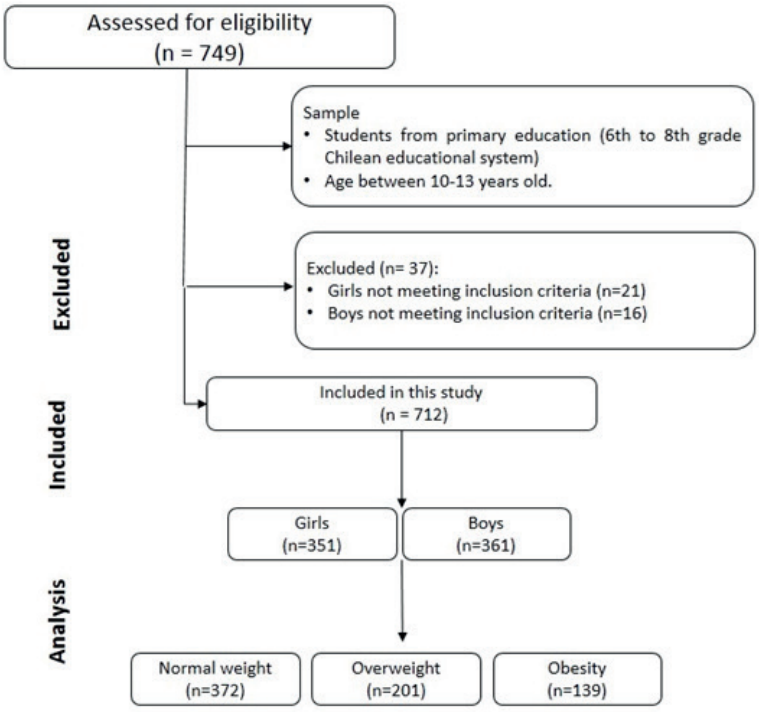

FIGURE 1. Study design

be enrolled in the school being studied and to be 10–13 years of age. The exclusion criteria were the presence of musculoskeletal disturbances; physical, sensory or intellectual disabilities; and non-compliance with the inclusion criteria.

All procedures performed in studies involving human participants were in accordance with the ethical standards of the University de La Frontera committee and have been performed in accordance with the ethical standards as laid down in the 1964 Declaration of Helsinki and its later amendments or comparable ethical standards.

Instruments: Students were evaluated with bare feet and wearing the least amount of clothing possible. Size (m) was estimated with a Seca® model 214 height rod (Hamburg, Germany), graduated in mm. Body mass (kg) were evaluated using a TANITA scale, Scale Plus model UM - 028 (Tokyo, Japan). Body mass index (BMI) was obtained by dividing body weight by height in meters squared (kg/m2) and was used to estimate the degree of obesity according to the international rating criteria given by the Centers for Disease Control and Prevention (CDC) according to corresponding ages and percentiles related to sex. Childhood obesity is defined as having a BMI equal to or greater than the 95th percentile for children of the same age and sex; being overweight is defined as having a BMI between the 85th percentile and the 95th percentile (11).

Waist circumference (WC) was measured using a Seca® model 201 (Hamburg, Germany) tape measure at the umbilical scar level. The waist to height ratio (WHtR) was obtained by dividing the WC by the child's height and was used to estimate fat accumulation in the central area of the body. A ratio greater than 0.5 is generally accepted as a universal cutoff for central obesity (12).

The Body Shape Questionnaire (BSQ)(13) was used to identify body image dissatisfaction. The questionnaire was composed of 34 items scored on a 6-point Likert scale (1 = never, 2 = rarely, 3 = sometimes, 4 = often, 5 = very often and 6 = always). Scores can range from 34 to 204 points and are divided as follows: a) less than 81 = no dissatisfaction with body image; b) 81–110 = mild dissatisfaction; c) 111–140 = moderate dissatisfaction and d) greater than 140 = extreme dissatisfaction. In this study the questionnaire obtained an internal consistency of Cronbach's alpha = 0.80. The BSQ has been used in Chilean children population with overweith and obesity (14).

To measure schoolchildren's self-esteem, we used the TAE-Student: Self-Esteem Test (15), via a general self-report. A point is added for each positive answer and 0 points for negative answers. The sum of the gross score is transformed to a T score according to norms by age. The students are identified according to the following categories: normal self-esteem (score greater or equal to 40 points), low self-esteem (score 30–39 points) and very low self-esteem (scores equal to or less than 29 points). The level of internal consistency reached in this questionnaire presented an Cronbach's alpha = 0.83.

Procedure: Previously trained research assistants visited selected schools during the 2017 Chilean school year and carried out the assessments on those children who presented parental consent and their own assent. Anthropometric assessments were conducted in a favorable space facilitated by the school, with optimum temperature and reliable privacy. Surveys were completed in classrooms on different days than the anthropometric evaluations. One survey was conducted per day. The evaluations took place during physical education classes and in the morning.

Statistical Analysis

Statistical analysis was performed using STATA v11.1 software. The continuous variables were expressed as mean and standard deviation. Differences between groups were determined using an analysis of variance (ANOVA) test. Qualitative variables were expressed in proportions and compared between groups with the chi-squared test. To establish the association among body image dissatisfaction with self-esteem and anthropometric variables, we calculated the odds ratio (OR) and confidence interval (95% CI). Values of $p < 0.05$ were considered statistically significant.

TABLE 1. Anthropometric and psychosocial characteristics in schoolchildren.

Variable	Total (n=712)	Girls (n=351)	Boys (n=361)	p-value
Age (years)	11.94±1.16	11.88±1.13	11.99±1.18	0.215
BMI (kg/m^2)	21.65±3.98	21.90±3.80	21.45±4.16	0.156
WC (cm)	73.79±10.74	73.00±9.80	74.44±11.4	0.106
WHtR (WC/ size)	0.48±0.07	0.48±0.06	0.48±0.7	0.497
BID (score)	54.60±26.96	55.69±26.3	53.69±27.7	0.090
Self-esteem (score)	51.65±13.37	53.30±14.38	50.29±12.4	0.202

Data shown represent median (mean ± standard deviation), p values <0.05, statistically significant Mann-Whitney U-test. BMI: Body mass index. WC: Waist circumference. WHtR: Waist to height ratio. BID: Body image dissatisfaction.

RESULTS

Regarding weight status, 372 children (52.2%) presented normal weight, 201 (28.2%) children were overweight and 139 children (19.5%) were obese. There were no differences in proportions between boys and girls (p = 0.778). In comparisons by sex, the anthropometric and psychosocial variables did not present significant differences (p > 0.05) (Table 1).

Boys and girls presented a similar distribution according nutritional status (p = 0.778). Girls presented a higher proportion of body image distasfaction (p = 0.0045) but in self-steem did not present significant differences (Table 2).

TABLE 2. Proportion of schoolchildren according to psychosocial variables, weight status and adominal obesity

Variable	Total (n=712)	Girls (n=351)	Boys (n=361)	p-value
Body image dissatisfaction			0.045	
No	618 (86.8)	300 (85.5)	318 (88.1)	
Mild	52 (7.3)	25 (7.1)	27 (7.5)	
Moderate	26 (3.7)	16 (4.6)	10 (2.8)	
Extreme	16 (2.2)	10 (2.8)	6 (1.7)	
Self-esteem				0.362
Normal	550 (77.2)	272 (77.5)	278 (77.0)	
Low	131(18.4)	64 (18.2)	67 (18.6)	
Very low	31(4.4)	15 (4.3)	16 (4.4)	
Nutritional status				0.778
Normal (≥ p5)	372 (52.2)	184 (53.0)	188 (52.0)	
Overweight (≥ p85)	201(28.2)	98 (27.6)	103 (28.7)	
Obese (≥ p95)	139(19.5)	69 (19.4)	70 (19.3)	
WtHR				0.396
No risk (<0.5)	499 (70.1)	244 (69.5)	255 (70.6)	
Risk (≥ 0.5)	213 (29.9)	107 (30.5)	106(29.4)	

The data shown represent n (proportions), p value determined by Chi2 test represent differences of proportion between sex. p <0.05 considered statistically significant.

TABLE 3. Proportion of schoolchildren according to psychosocial variables and weight status.

Girls	**Normal** (n=184)	**Overweight** (n=98)	**Obese** (n=69)	p-value
Self-esteem				<0.001
Normal (%)	150 (81.5)	74 (75.5)	48 (69.6)	
Low (%)	29 (15.8)	19 (19.4)	16 (23.2)	
Very low (%)	5 (2.7)	5 (5.1)	5 (7.2)	
Body image dissatisfaction				
No (%)	173 (94.0)	81 (82.7)	46 (66.7)	<0.001
Mild (%)	9 (4.9)	8 (8.2)	8 (11.6)	
Moderate (%)	2 (1.1)	5 (5.1)	9 (13.0)	
Extreme (%)	0 (0.0)	4 (4.1)	6 (8.7)	

Boys	**Normal** (n=188)	**Overweight** (n=103)	**Obese** (n=70)	p-value
Self-esteem				
Normal (%)	155 (82.4)	76 (73.8)	48 (68.6)	<0.001
Low (%)	28(14.9)	22(21.4)	16 (22.9)	
Very low (%)	5 (2.7)	5 (4.9)	6 (8.57)	
Body image dissatisfaction				
No (%)	176 (93.6)	88 (85.4)	50 (71.4)	<0.001
Mild (%)	10 (5.3)	10 (9.7)	10(14.3)	
Moderate (%)	2 (1.1)	3 (2.9)	6 (8.6)	
Extreme (%)	0 (0.0)	2 (1.9)	4 (5.7)	

The data shown represent n (proportions), p value determined by Chi^2 test, $p < 0.05$ considered statistically significant.

The obese group presented the highest proportion with low or very low self-esteem ($p < 0.001$). Therefore, the obese group presented a higher proportion of body image dissatisfaction ($p < 0.001$) (Table 3).

Table 4 shows that body image dissatisfaction was associated with overweight/obesity status (OR = 4.12, $p < 0.001$), WtHR (OR = 3.53, $p < 0.001$) and self-esteem (OR = 2.91, p = 0.03).

TABLE 4. Association between body image dissatisfaction with anthropometric parameters and self-esteem according to gender in Chilean children-adolescents.

Variables	Body image dissatisfaction		
	Total (n=712)	Girls (n=351)	Boys (n=361)
Variable	OR (IC 95%), p-value	OR (IC 95%), p-value	OR (IC 95%), p-value
Overweight/obesity	4.12 (2.45-7.21), <0.001	3.49 (1.63-7.45), 0.001	5.28 (2.42-11.50), <0.001
WtHR (%)≥ 0.5	3.53 (2.01-6.18), <0.001	4.0 (1.75-9.11), 0.001	3.37 (1.62-7.85), 0.001
Self-esteem	2.91 (1.24-1.84), 0.03	2.67 (0.24-1.84), 0.02	3.22 (0.49-1.84), 0.03

The data shown represent the Odds Ratio (OR) IC95%, 95% Confidence Intervals and the p-value. $p < 0.05$ are considered statistically significant. BMI; Body mass index, WtHR; Waist to height ratio.

DISCUSSION

This research was aimed at determining if there is association between body image dissatisfaction with anthropometrics parameters, weight status and self-esteem in children from public schools.

Body image dissatisfaction was predominant in children with obesity, central obesity (WtHR ≥0.5) and girls, principally. Likewise, higher anthropometric parameters such as BMI were significantly associated with body image dissatisfaction, as found in a study with British schoolchildren in which those with higher adiposity had lower body estimates in boys and girls from different ethnic groups (16). A study carried out in Chile, which related anthropometric parameters with body image dissatisfaction in schoolchildren of different urban and rural ethnic groups, reported similar results, with higher BMIs, WCs and levels of body image dissatisfaction. These parameters were associated with increased risks of eating disorders (17).

In this study, the overweight and obesity conditions were associated with body image dissatisfaction, with results similar to those in a study in which girls from primary schools in the United States were evaluated, in this study BMI was shown to be a significant indicator of body image dissatisfaction because greater body mass implied exposing themselves to mockery (18). A recent study in Chile reported similar results in which obesity was associated with higher levels of body image dissatisfaction and other negative physical and anthropometric factors for children's health (14). Another study, reported that obese youth, regardless of gender, reported a poorer quality of life and higher rates of body image dissatisfaction compared with their normal-weight counterparts (19). A study in Portugal showed a significant association between obesity and body dissatisfaction as subjects with overweight and obesity were more dissatisfied with their body image and wished to be thinner (20).

In this study, a high percentage of students had low or very low self-esteem; this was associated with overweight and obesity conditions. Results similar to those were found in a meta-analysis which reported an association between obesity and self-esteem (21). Australian students of a similar age to those in the present investigation reported that obesity affects the self-perception of children who enter adolescence, especially for girls (22). It is important to consider, however, that children with obesity are more likely to be victimized by their peers in general and have family problems and less perceived social support; obesity is even considered a predictor of higher suicide rates (23). For this reason, the results are alarming and indicate the need to include the topic of body image in the school curriculum.

Body image dissatisfaction in this study was associated with obesity and abdominal obesity (i.e. abdominal obesity WtHR ≥0.5) and self-esteem, similarly an investigation was conducted to investigated prospective risk factors for increases in body dissatisfaction in adolescents. It was reported that BMI was a predictor of increases in body dissatisfaction, and low self-esteem may contribute to an increase in negative self-evaluation generally and in negative evaluation of the body particularly (24). A recent study in China reported that the majority of the female participants indicated a preference to be more slender. Body image dissatisfaction was negatively correlated with self-esteem and subjective well-being and was positively correlated with negative emotions (25). A study carried out in Brazil concluded that self-esteem influenced body dissatisfaction in adolescent girls (26).

Of the psychological components, body dissatisfaction is the component most strongly related to childhood obesity (4), and low self-esteem may be due in part to dissatisfaction with body size or concerns about being overweight that negatively affect the social and attitudinal perception that the children have on their own body (27). In a study in which Korean schoolchildren were evaluated, obese children showed greater body dissatisfaction and lower self-esteem than those of normal weight and those who were overweight but without higher levels of depression. In addition, obese children with body dissatisfaction had significantly lower self-esteem and higher levels of depressive symptoms than normal weight children or obese children without body dissatisfaction (4).

Limitations: The study has some limitations: i) age was not considered as an adjustment variable for the body image dissatisfaction, ii) the sample was study was intentional and iii) we did not compare schoolchildren with different physical activity patterns. Beside, the students evaluated were from low socio-economic status and presented high levels of segregation which affects psychosocial and emotional variables for their development (28). These factors, together with educational segregation, can increase mental health problems in vulnerable children.

CONCLUSION

This study showed the body image dissatisfaction of schoolchildren was associated with CMR, overweight/obesity status and self-esteem. It is important to consider that all of these variables affect the integral development and mental health of children and are associated with factors of greater complexity that alter their social behavior and academic performance, especially in a society in which the body is considered a reference of personal identity, overwhelmed by social pressure. These results suggest the need to carry out new research on different factors that may be affecting children in the educational system.

REFERENCES

1. Wardle J, Cooke L. The impact of obesity on psychological well-being. Best Pract Res Clin Endocrinol Metab. 2005;19 (3):421-40.
2. Strauss RS. Childhood obesity and self-esteem. Pediatrics. 2000;105(1):e15.
3. Mundy LK, Canterford L, Tucker D, Bayer J, Romaniuk H, Sawyer S, *et al.* Academic Performance in Primary School Children With Common Emotional and Behavioral Problems. J Sch Heatlh. 2017;87(8):593-601.
4. Shin NY, Shin MS. Body dissatisfaction, self-esteem, and depression in obese Korean children. Journal Pediatr. 2008;152(4):502-6.
5. Duchesne A-P, Dion J, Lalande D, Bégin C, Émond C, Lalande G, *et al*. Body dissatisfaction and psychological distress in adolescents: Is self-esteem a mediator? J. Health Psychol. 2017;22(12):1563-9.
6. McDermott E, Mullen G, Moloney J, Keegan D, Byrne K, Doherty GA, *et al*. Body image dissatisfaction: clinical features, and psychosocial disability in inflammatory bowel disease. Inflamm Bowel Dis. 2015;21(2):353-60.
7. Gestsdottir S, Svansdottir E, Sigurdsson H, Arnarsson A, Ommundsen Y, Arngrimsson S, *et al*. Different factors associate with body image in adolescence than in emerging adulthood: A gender comparison in a follow-up study. Health Psychol Rep. 2018; 6(1):81-93.
8. Joseph C, LoBue V, Rivera LM, Irving J, Savoy S, Shiffrar M. An attentional bias for thin bodies and its relation to body dissatisfaction. Body Image. 2016;19:216-223.
9. Bhatt-Poulose K, James K, Reid M, Harrison A, Asnani M. Increased rates of body dissatisfaction, depressive symptoms, and suicide attempts in Jamaican teens with sickle cell disease. Pediatr Blood Cancer. 2016;63(12):2159-2166.
10. Danielsen YS, Stormark KM, Nordhus IH, Maehle M, Sand L, Ekornas B, *et al*. Factors associated with low self-esteem in children with overweight. Obes Facts. 2012;5(5):722-33.
11. Centers for Disease Control and Prevention, Overweight and obesity; Defining overweight and obesity. 2010.
12. Chung IH, Park S, Park MJ, Yoo EG. Waist-to-Height Ratio as an Index for Cardiometabolic Risk in Adolescents: Results from the 1998-2008 KNHANES. Yonsei Med J. 2016;57(3):658-63.
13. Cooper PJ, Taylor MJ, Cooper Z, Fairbum CG. The development and validation of the Body Shape Questionnaire. Int. J. Eat. Disord. 1987;6 (4): 485-494.
14. Delgado P, Martínez C, Caamaño F, Jerez D, Osorio A, García F, *et al*. Insatisfacción con la imagen corporal y su relación con el estado nutricional, riesgo cardiometabólico y capacidad cardiorrespiratoria en niños pertenecientes a centros educativos públicos. Nutr Hosp. 2017;34(5):1044-9.
15. Marchant T, Haeussler I, Torretti A. TAE: Battery to evaluate school self-esteem. Santiago: Ediciones Universidad Católica de Chile. 2002.
16. Duncan MJ, Al-Nakeeb Y, Nevill AM. Body esteem and body fat in British school children from different ethnic groups. Body Image. 2004;1(3):311-5.
17. Rosas Muñoz M, Delgado Floody P, Cea Leiva F, Alarcón Hormazábal M, Alvarez San Martín R, Quezada Gallego K. Comparison of the risks in eating disorders and body image among mapuches and not mapuches students. Nutr Hosp. 2015;32(6):2926-2931.
18. Vander Wal JS, Thelen MH. Predictors of body image dissatisfaction in elementary-age school girls. Eat Behav. 2000;1(2):105-22.
19. Gouveia MJ, Frontini R, Canavarro MC, Moreira H. Quality of life and psychological functioning in pediatric obesity: the role of body image dissatisfaction between girls and boys of different ages. Qual life Res. 2014;23(9):2629-38.
20. Coelho EM, Fonseca SC, Pinto GS, Mourão-Carvalhal MI. Factors associated with body image dissatisfaction in Portuguese adolescents: obesity, sports activity and TV watching. Motricidade. 2016;12(2).
21. Griffiths LJ, Parsons TJ, Hill AJ. Self-esteem and quality of life in obese children and adolescents: a systematic review. Int J Pediatr Obes. 2010;5(4):282-304.

22. Franklin J, Denyer G, Steinbeck KS, Caterson ID, Hill AJ. Obesity and risk of low self-esteem: a statewide survey of Australian children. Pediatrics. 2006;118(6):2481-7.
23. Brausch AM, Decker KM. Self-esteem and social support as moderators of depression, body image, and disordered eating for suicidal ideation in adolescents. JJ Abnorm Child Psychol. 2014;42(5):779-89.
24. Paxton SJ, Eisenberg ME, Neumark-Sztainer D. Prospective predictors of body dissatisfaction in adolescent girls and boys: a five-year longitudinal study. Dev Psychol. 2006;42(5):888-99.
25. Wang K, Liang R, Ma ZL, Chen J, Cheung EF, Roalf DR, *et al*. Body image attitude among Chinese college students. PsyCh journal. 2018;7(1):31-40.
26. Fortes LS, Cipriani FM, Coelho FD, Paes ST, Ferreira MEC. Does self-esteem affect body dissatisfaction levels in female adolescents? Revista Paulista de Pediatria. 2014;32(3):236-40.
27. Erickson SJ, Robinson TN, Haydel KF, Killen JD. Are overweight children unhappy?: Body mass index, depressive symptoms, and overweight concerns in elementary school children. Arch Pediatr Adolesc Med. 2000;154(9):931-5.
28. Contreras D, Sepúlveda P, Bustos S. When schools are the ones that choose: The effects of screening in Chile. Social Science Quarterly. 2010;91(5):1349-68.

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Biochemical and microbiological changes during fermentation and storage of a fermented milk product prepared with Tibetan Kefir Starter.

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Summary: The aim of this study was to determine the optimal temperature ranges of milk fermentation by the microbial association Tibetan Kefir Grains and to set changes during the storage of the fermented milk product. The optimum technological parameters of milk fermentation by Tibetan Kefir Grains compliance are set. Compliance of these parameters ensures the desired metabolic processes and obtaining a dairy product with good organoleptic properties: fermentation temperature is 28±1 °C for 24 hours, acidity of the product is from 80 to 120 % lactic acid, the amount of lactic acid bacteria – (2.9±0.22) × 108 CFU/cm^3, fungi – (3.7±0.27) × 104 CFU/cm^3. It was found that during the storage of the fermented milk drink produced on the leaven Tibetan Kefir Grains at the temperature of 4 ± 1 °C for 10 days titratable acidity of the product increased by 1.2 times to 108.4 ± 8.3 °T, the population of lactic acid bacteria (*Lactobacillus fermentum* and some other) and yeast (*Saccharomyces spp* and some other) remained at the initial level. This indicates that the finished fermented milk product can be stored without losing functional probiotic properties for at least 10 days and meets the requirements of the standard (ISO 4471). At the same time, at a temperature of +8 ± 1°C the expiration date of the fermented milk drink is decreases to 7 days.

Key words: Tibetan Kefir Starter, fermented milk drink, lactic acid microorganisms.

Resumen: Parámetros tecnológicos y cambios microbiológicos durante la fermentación y el almacenamiento de un producto lácteo fermentado preparado con iniciador de kéfir tibetano. El objetivo de este estudio fue determinar los rangos de temperatura óptimos de la fermentación de la leche mediante la asociación microbiana de granos de Kéfir Tibetanos y estudiar los cambios durante el almacenamiento del producto lácteo fermentado. Se establecieron los parámetros tecnológicos óptimos de fermentación de la leche utilizando los granos de Kéfir Tibetano. El cumplimiento de estos parámetros garantiza los procesos metabólicos deseados y la obtención de un producto lácteo con buenas propiedades organolépticas: la temperatura de fermentación es de 28 ± 1° C durante 24 horas, la acidez del producto es de 80 a 120% de ácido láctico, la cantidad de bacterias del ácido láctico - (2.9 ± 0.22) × 108 UFC /cm^3, hongos - (3.7 ± 0.27) × 104 UFC /cm^3. Se encontró que durante el almacenamiento de la bebida láctea fermentada producida con los granos de Kéfir Tibetanos de levadura a una temperatura de 4 ± 1° C durante 10 días, la acidez titulable del producto aumentó 1.2 veces a 108.4 ± 8.3 ° T, la población de las bacterias del ácido láctico (*Lactobacillus fermentum* y algunas otras) y la levadura (*Saccharomyces spp* y otras) se mantuvieron en el nivel inicial. Esto indica que el producto lácteo fermentado terminado se puede almacenar sin perder propiedades probióticas funcionales durante al menos 10 días y cumple con los requisitos de la norma ISO 4417. Al mismo tiempo, a una temperatura de + 8 ± 1 ° C, la fecha de vencimiento de la bebida de leche fermentada se reduce a 7 días.

Palabras clave: Iniciador de Kéfir Tibetano, bebida de leche fermentada, microorganismos de ácido láctico.

INTRODUCTION

Fermented milk products are a palatable and economical source of a wide range of nutrients: protein, vitamins and minerals. The nutrient composition is similar to the one that milk has, but concentrations of vitamins are in general a little lower. However, in addition to these purely nutritional properties, there is increasing support for a number of other health advantages (1).

Among the large range of the fermented milk products, products that are based on the use of physiologically active natural symbiotic microbiota, deserve special attention. Production of these products is based on improving processes. It includes two points: first one is using traditional dairy strains of lactic acid bacteria, the second one is developing new fermented milk products with new types of microorganisms that show a probiotic properties (2-3).

Kefir is a specific dairy product from the group of fermented milks where lactose hydrolysis occurs during fermentation with the simultaneous action of bacteria (*Lactobacillus acidophilus, Bifidobacterium bifidum, Streptococcus thermophilus, Lactobacillus delbrueckii subsp. bulgaricus, Lactobacillus helveticus, Lactobacillus kefiranofaciens, Lactococcus lactis, and Leuconostoc species*) and yeasts (*Kluyveromyces marxianus, Kluyveromyces lactis, Saccharomyces fragilis, Saccharomyces cerevisiae, Torulaspora delbrueckii, and Kazachstania unispora*) contained in kefir grains (4-5). Kefir is traditional fermented milk product which has been produced and consumed for thousand years in the areas from Eastern Europe to Mongolia. It is believed that the name kefir derives from the mountain areas of Caucasus. Kefir grains represent a unique ecosystem in nature, formed by a symbiotic relation between bacteria and yeasts. A complex microbial community of kefir grains contains more than 50 various species of bacteria and yeasts and, depending on their origin, several species of filamentous moulds (6-7).

The microbial community of Tibetan kefir grains depends primarily on their source. It has been reported that Tibetan kefir grains contain Lactobacilli, Lactococci and yeast, and sometimes acetic acid bacteria, depending on the source of origin. As a naturally-existing yogurt starter, Tibetan kefir grains have some unique benefits and have attracted increasing attentions (8-12).

In recent years worldwide interest in the study of natural microbial associations such as "Tibetan or Indian fungi", "Indian rice", "Sea rice" is increased (13-15). Due to the wide range of biological active substances that are part of beverages, the relative simplicity of cultivation and the possibility of keeping culture for a long time in an active state these natural associations gained widespread in everyday life. Thus, in Belarus, polyculture of the microorganisms – the rice fungi *Oryzamyces indici* was intensively studied. Also biotechnology for the production of fermentation of soft drinks using fungi was offered (16-17). Natural association of microorganisms "Tibetan Kefir Grains" (local Ukrainian name Tibetan fungi) is widely used in home conditions to prepare fermented milk drink that from the perspective of traditional medicine is one of the leading places in activity effects on the human body (13-15).

Our research has found that the fermented milk drink made on the basis of the starter "Tibetan Kefir Grains" has a high antagonistic activity over the fungi of the genus *Aspergillus* and bacteria of the species *Proteus vulgaris,* sensitive to the *Bacillus cereus, Mycobacterium luteum* i *Staphylococcus aureus*.

Also, the microorganism of fermented product had resistance to the bad conditions of gastrointestinal tract, those were- the content of sodium chloride up to 4.0%, the content of bile – up to 20%, the concentration of phenol – up to 0.5% in favorable environment. The obtained data indicate that the fermented milk product belongs to the functional purpose.

The expiration date of the finished product without significant changes in organoleptic, microbiological and physic-chemical properties is important for the industrial use of the microbial association "Tibetan Kefir Grains". Therefore, one of the main technological aspects that often limit the possibility of introducing a new product into production is a short expiration date. Given the above, the study of the influence of different temperatures on the microbiological and physico-chemical parameters of the finished fermented milk drink during its storage will allow to substantiate the expiration date of the product under production conditions.

The acceptable shelf life of a product is determined by the time it starts to loose its basic sensorial qualities. During storage, a product may become unpalatable in sense of toxicity by contamination with harmful microorganisms. It has been shown that the presence of pathogenic microorganisms in dairy foods is not correlated with microbial spoilage causing sensorial changes in products (18).

Thus, the industrial use of starter "Tibetan Kefir Grains" will expand the range of fermented milk products with a number of useful properties. Motivated by the strong progress in technology of the probiotic fermented milk product (19-21) in this work we determined the optimal temperature regimes for milk fermentation by the microbial association "Tibetan Kefir Grains" and set changes in the process of storing the fermented milk product.

MATERIALS AND METHODS

The following mediums were used to isolate axenic cultures of microorganisms that are part of the microbial association "Tibetan Kefir Grains". The medium of MRS-agar was used for isolation of axenic culture of lactic acid bacteria at 37±1 °C during 24-48 hours. The Sabouraud medium and beer wort medium were used for isolation of yeast at 25±1 °C during 3-5 days. Also beer wort with the addition of 3% ethanol and 0.5% CaCO3 was used for the selection of acetic acid bacteria at 37±1 °C during 24-48 hours. For determination of genus of selected strains bacteria and yeast were described using morphological and biochemical analysis. Morphology of isolated cultures of microorganisms was studied using a light microscope Trinocular MBL2100 ("Krus", Germany) at eyepiece 20 and lens 100. The final identification of strains of lactic acid bacteria to specie was carried out by a range of carbohydrates fermentation tests (API 50SN - Bio Merieux, Inc, France) used according to the manufacturer's recommendations. Also species belonging of isolated cultures of lactic acid microorganisms was studied using PCR (polymerase chain reaction). PCR was also used to identify lactic acid microflora, PCR protocols were carried out according to previous works (22-23). As primer was used 16S rDNA sequence (24).

RESULTS AND DISCUSSION

Previous studies (13-15) found that the "Tibetan Kefir Grains" is a white lump, without a specific odor, size from 3-6 mm (young fungus) to 3-5 cm in diameter (fungus before separation) (Figure 1a,b).

The morphology of the microorganisms present in the starter "Tibetan Kefir Grains" found (Figure 1b) existence of oval and long-form yeast cells which are surrounded by cocci and single and chain rod-shaped bacteria. Microbiological studies using classical methods and PCR-identification methods (Figure 2) found that the association studied consists of two types of yeast and four types of bacterial cells.

Lactobacillus fermentum are much dominated among all microorganisms, accounting for 88.99% of the total number of the cells of a lump fungus weighing 1 g.

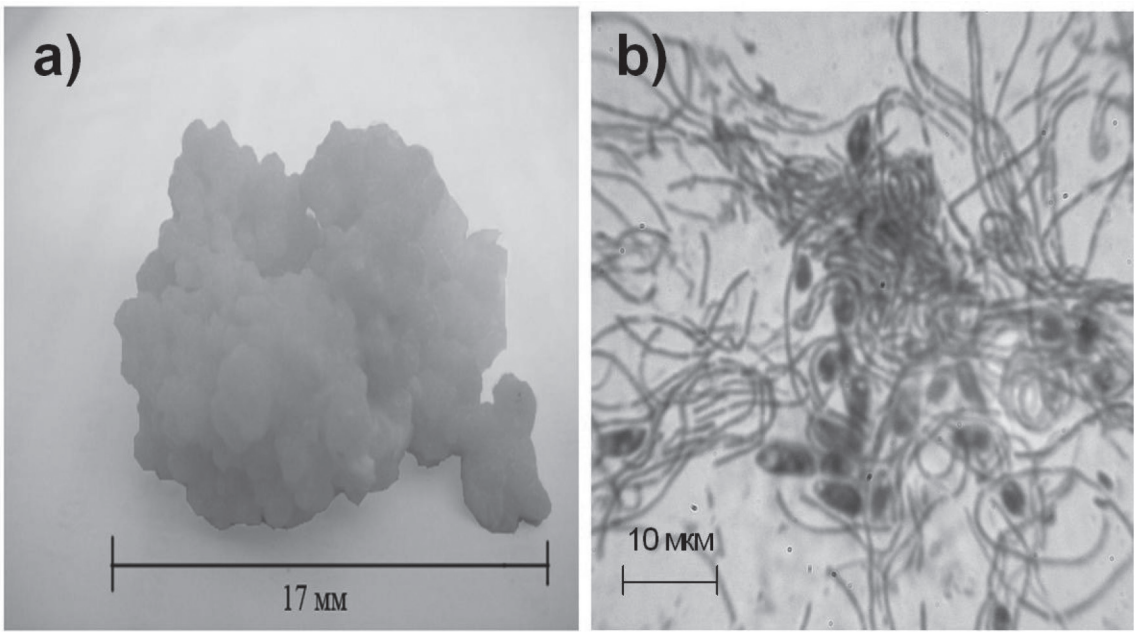

FIGURE 1. The photo of the lump natural association "Tibetan Kefir Grains" (magnification in 5.9 times) (a) and the microscopic picture of the natural association "Tibetan Kefir Grains" (Light microscope, magnification in 1500 times) (b).

The bacterial cells of the genus *Lactobacillus spp.* are found on the second place, their account for an average of 9%. Still about 1.12% in the starter accounts for bacteria genus *Gluconobacter oxydans* and 0.68% for *Leuconostoc lactis*. The total amount of the fungi was nearly 0.1%.

The correlation of yeast and lactobacillus in the culture liquid of the fermented milk product is important for the probiotic properties of the beverage. In order to receive the fermented milk product, we need to add 2.5-5% of the seed material from the association of microorganisms "Tibetan Kefir Grains", it will make the cow's milk sterile which contains a mass fraction of fat 2.5% and cultivation to the value of the acidity of the medium 85 – 120 °T.

It is known that functional properties of finished product depend on quantitative correlation of probiotic microorganisms in it. In most cases lactobacilli have a positive impact on human health because of their increased level may indicate the potential probiotic properties of the beverage. We observed intensive multiplication of yeast cells, whose number was $(5.9\pm0.42)\times10^5$, and complete inhibition of lactobacilli at the fermentation temperature of 22 °C during 48 hours. Fermentation of milk at a temperature of 28 °C caused the multiplication of all associated microbial of "Tibetan Kefir Grains". As a result, the number of yeast cells was $(3.7\pm0.27)\times10^4$ and lactobacilli cells − $(2.9\pm0.22)\times10^8$ after 24 hours of cultivation. This proportion of these groups of microorganisms in the fermented milk product − such as kefir meets the requirements of the normative document ISO 4417:2005. Kefir. Specifications (25). However, the maximum number of lactobacilli cells (5.7 ± 0.30) ×108 was achieved at the fermentation temperature of milk 35 °C for 5 hours. At the same time the number of yeast cells in such fermented milk drink was $(5.2\pm0.31)\times10^2$ that does not comply with the standard.

Consequently, the results indicate that for optimal quantitative accumulation of yeasts and lactobacilli in the fermented milk product, produced with using the leaven "Tibetan Kefir Grains" favorable temperature for fermentation of milk was 28 ± 1°C.

The study of the effect of the expiration date of the fermented milk product at different temperatures for 10 days is given in Figure 3.

Revealed, that storage of the resulting fermented milk product at a temperature of +4±1 °C for 10 days detected a slight increase its total acidity. So, acidity increased in

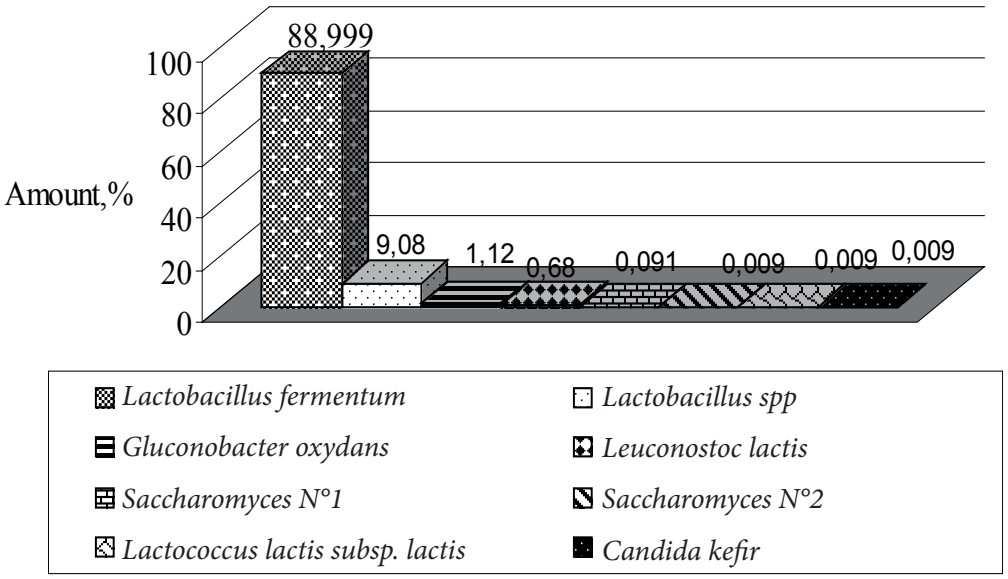

FIGURE 2: Composition of microflora of the "Tibetan Kefir Grains", %

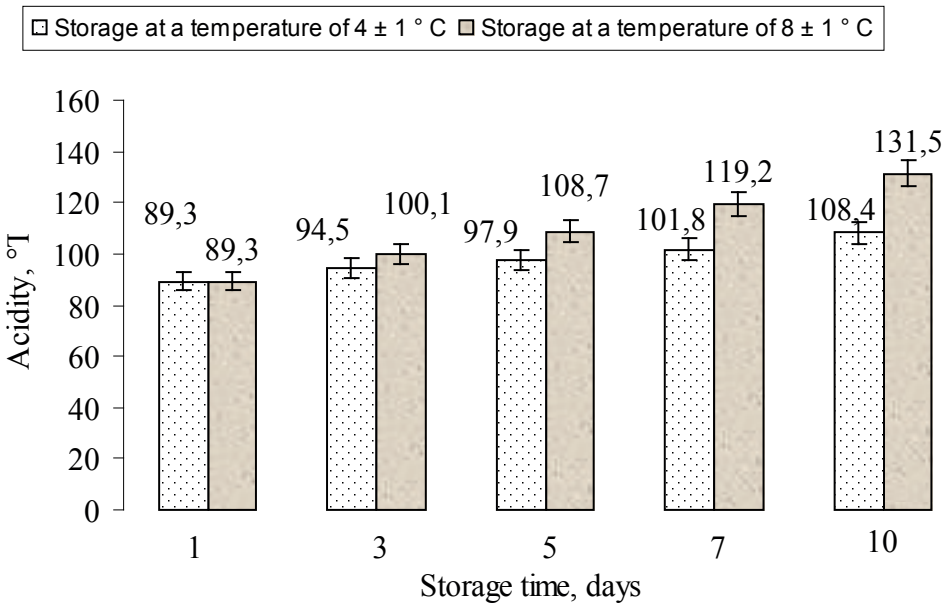

FIGURE 3. Changing of titratable acidity during storage the fermented milk drink at different temperatures

1.09 times (from 89.3±7.7 °T to 97.9±7.4 °T) during five days of storage, after 10 days the acidity increased in 1.2 times to 108.4±8.3 °T. There is a more intense increase in acidity in the fermented milk drink during storage at +8±1 °C. The titrated acidity increased in 1.3 times for five days, and after 10 days from the beginning of the experiment, it exceeded the permissible quantity, which is normalized with ISO 4417: 2005 (25).

Thus, the fermented sour-milk product at the microbial association "Tibetan Kefir Grains", at a temperature of +4 ± 1°C, can be stored without changes of organoleptic and physical-chemical properties for at least 10 days, at the same time at a temperature of +8 ± 1ºC the expiration date is reduced to 7 days.

In Figure 4 and Figure 5 the results of investigations of changes in the population of lactic bacteria and yeast in the sour-milk drinks fermented on the starter "Tibetan Kefir Grains" at different storage temperatures are given.

Revealed, that ten-day holding of the fermented milk product at a temperature of +4 ± 1°C didn't significantly affect on the number of lactic acid bacteria. The amount of lactobacilli practically remained on the original content, this indicates that the finished fermented milk product, which is made on the leaven "Tibetan Kefir Grains" can be stored without losing functional probiotic properties, not less than 10 days and meets the requirements of the ISO. Storage at a temperature of +8 ± 1°C contributed to the development of lactic microbiota, which gradually increased, especially the microbiological process intensified after 7 days of storage.

In the study of the content of yeast in the fermented milk drinks at different storage temperatures, practically similar regularities of development, as well as lactic acid bacteria were found. The amount of yeast increased insignificantly at +4 ± 1°C for 10 days, and intensively increased at +8 ± 1°C from the fifth day of storage. The rapid development of yeast in the fermented milk product produces off flavours its organoleptic properties.

In conducting the organoleptic assessment of the quality of the resulting product, the following indices were investigated: consistency and appearance, taste and smell, color.

Revealed, that the resulting drink based on the leaven "Tibetan Kefir Grains", which was stored at +4±1 °C for 10 days, according to the organoleptic properties meets the requirements for fermented milk drinks:

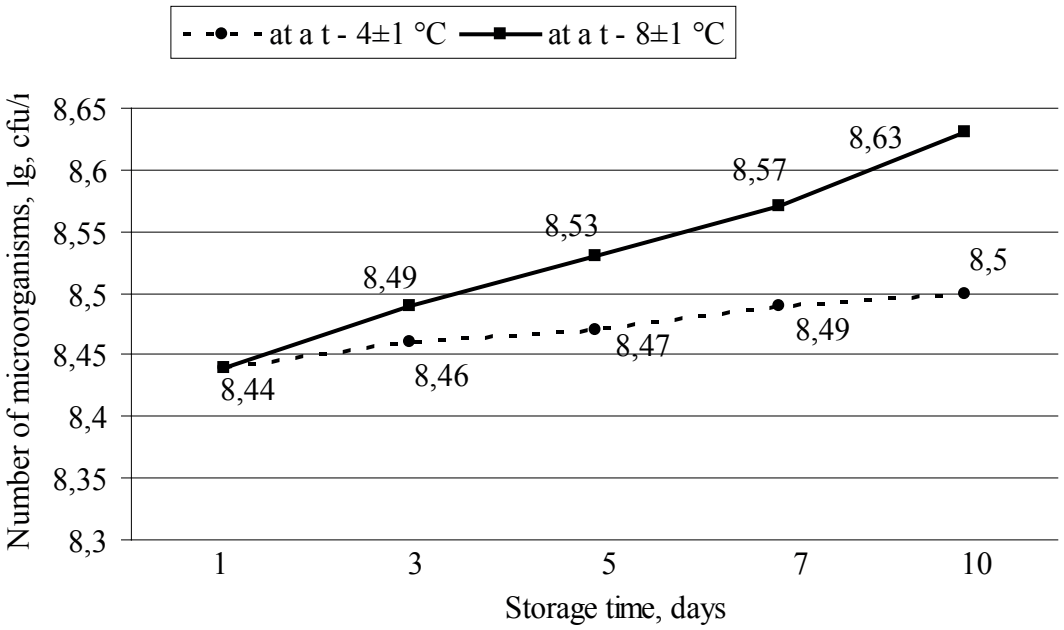

FIGURE 4: Changes in the lactic microbiota population at different temperatures of storage of sour-milk drinks fermented on the microbial association "Tibetan Kefir Grains

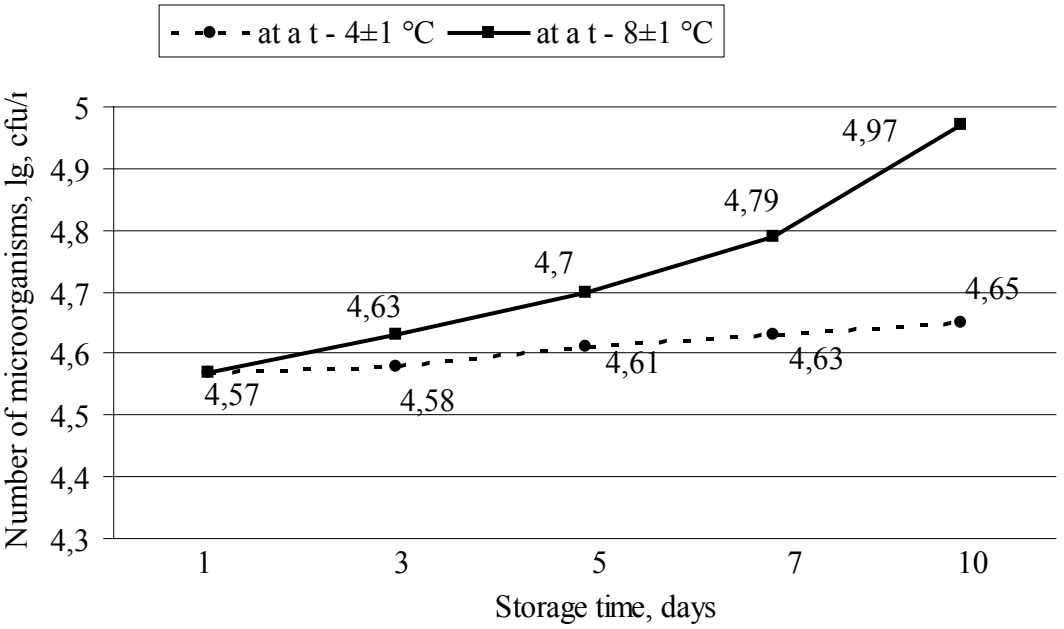

FIGURE 5: Change the yeast population at different temperatures of storage of sour-milk drinks fermented on the microbial association "Tibetan Kefir Grains"

– consistency and appearance – homogeneous, resembling liquid sour cream, with disturbed clot, with insignificant gas formation in the form of individual points, caused by normal lactic acid microbiota;

– taste and smell – pure, sour milk, refreshing, slightly sharp, without foreign, unpleasant benign product of flavours and odors;

– colour – milky white.

At the same time, the drink which was keeping at a temperature of +8±1 °C since the fifth day had a sharp taste and significant gas formation.

Therefore, using the microbial association "Tibetan Kefir Grains" can be the basis for obtaining the fermented milk drink, which should be stored at a temperature above +4± 1 °C and not longer than 10 days.

CONCLUSIONS

The optimum technological parameters of milk fermentation by "Tibetan Kefir Grains" were successfully determined. Compliance of these parameters ensures the desired metabolic processes and obtaining the fermented milk product with good organoleptic properties: fermentation temperature is 28±1 °C for 24 hours, acidity of the product is from 80 to 120 °T, the amount of lactic acid bacteria – (2.9±0.22) × 108 CFU/cm^3, fungi – (3.7±0.27) × 104 CFU/cm^3.

During the storage of the fermented milk product produced on the leaven "Tibetan Kefir Grains" at 4±1 °C for 10 days titrated acidity of the product increased in 1.2 times to 108.4±8.3 °T, the content of lactic acid microorganisms (lactobacilli and yeast) remained at the initial level. This indicates that the finished fermented milk product can be stored without losing functional probiotic properties for at least 10 days and meets the requirements of the standard.

CONFLICTS OF INTEREST

There are no conflicts to declare.

REFERENCES

1. Buttriss J, Nutritional properties of fermented milk products. Int J Dairy Technol. 2007;50(1):21-27.
2. Rosa D, Dias M, Grześkowiak Ł, Reis S, Conceição L, Maria do Carmo G, Milk kefir: nutritional, microbiological and health benefits. Nutr Res Rev. 2017;30(1):82-96.
3. Lourens-Hattingh A, Viljoen B, Yogurt as probiotic carrier food. Int Dairy J. 2001;11(1-2):1-17.
4. Farnworth ER, Kefir – a complex probiotic. Food Sci Technol Bull: Funct Foods. 2006;2(1): 1-17.
5. Prado MR, Blandón LM, Vandenberghe LP, Rodrigues C, Castro GR, Thomaz-Soccol V, Soccol CR. Milk kefir: composition, microbial cultures, biological activities, and related products. Front. Microbiol. 2015; 6:1177.
6. Pogačić T, Šinko S, Zamberlin Š, Samaržija D. Microbiota of kefir grains. Mljekarstvo. 2013;63(1):3-14.
7. Guzel-Seydim Z, Kok-Tas T, Ertekin-Filiz B, Seydim AC. Effect of different growth conditions on biomass increase in kefir grains. J Dairy Sci. 2011;94(3):1239-1242.
8. Yang XJ, Fan MT, Shi JL, Dang B. Isolation and identification of preponderant flora in Tibetan kefir. China Brewing. 2007;171:52–55.
9. Zhou J, Liu X, Jiang H, Dong M. Analysis of the microflora in Tibetan kefir grains using denaturing gradient gel electrophoresis. Food Microbiol. 2009;26(8):770-775.
10. Zhou J, Dong M, Jiang H. Study on fermentation properties of Tibetan kefir grains. Food Sci. (China). 2006;27:29–33.
11. Gao J, Gu F, Abdella NH, Ruan H, He G. Investigation on culturable microflora in Tibetan kefir grains from different areas of China. J Food Sci. 2012;77(8):425-433.
12. Gao J, Gu F, Ruan H, Chen Q, He J, He G. Culture conditions optimization of tibetan kefir grains by response surface methodology. Procedia Eng. 2012;37:132-136.
13. Vichko O, Chervetsova V, Novikov V. Microbiological characteristics of sour-milk feed supplements and their influence on intestinal micro-biocenosis of piglets. Res J Pharm Biol Chem Sci. 2013; 4:1404–1410.
14. Kukhtyn M, Vichko O, Berhilevych O, Horyuk Y, Horyuk V. Main microbiological and biological properties of microbial associations of Lactomyces tibeticus. Res J Pharm Biol Chem Sci. 2016;6:1266–1272.
15. Kukhtyn M, Vichko O, Horyuk Y, Shved O, Novikov V. Some probiotic characteristics of a fermented milk product based on microbiota of "Tibetan kefir grains" cultivated in Ukrainian household. J Food Sci Technol. 2018;55(1):252–257.
16. Ghosh K, Ray M, Adak A, Dey P, Halder SK, Das A, et al. Microbial, saccharifying and antioxidant properties of an Indian rice based fermented beverage. Food Chem. 2015;168: 196-202.

17. Tsed E, Basilenko Z, Koroleva L, Lebedok E, Ivanova I. New fermentation source in the technology of fermented non-alcoholic beverages. Ann. Warsaw. Univ. of Life Sci. –SGGW, Agriculture. 2008;52:103-106.
18. Shobharani P, Agrawal R. Interception of quorum sensing signal molecule by furanone to enhance shelf life of fermented milk. Food Control. 2010;21(1):61-69.
19. Shah N. Isolation and enumeration of bifidobacteria in fermented milk products: A review. Milchwissenschaft. 1997;52(2):72-76.
20. Rodrigues KL, Caputo LR, Carvalho JC, Evangelista J, Schneedorf JM. Antimicrobial and healing activity of kefir and kefiran extract. Int J Antimicrob Agents. 2005;25(5):404-408.
21. Lee MY, Ahn KS, Kwon OK, Kim MJ, Kim MK, Lee IY, et all. Anti-inflammatory and anti-allergic effects of kefir in a mouse asthma model. Immunobiology. 2007;212(8):647-654.
22. Byun R, Nadkarni M A, Chhour KL, Martin FE, Jacques NA, Hunter N. Quantitative analysis of diverse Lactobacillus species present in advanced dental caries. J Clin Microbiol. 2004;42(7):3128-3136.
23. Zentek J, Ferrara F, Pieper R, Tedin L, Meyer W, Vahjen W. Effects of dietary combinations of organic acids and medium chain fatty acids on the gastrointestinal microbial ecology and bacterial metabolites in the digestive tract of weaning piglets. J Anim Sci. 2013;91(7):3200-3210.
24. Tilsala-Timisjarvi A, Alatossava T. Development of oligonucleotide primers from the 16S-23S rRNA intergenic sequences for the identifying different dairy and probiotic lactic acid bacteria by PCR. Int J Food Microbiol. 1997; 35:49-56.
25. National Standard of Ukraine Kefir ISO 4417:2005 (2005), National Consumer Standard of Ukraine, Kyiv, from DNAOP Website: https://dnaop.com/html/34061/doc-%D0%94%D0%A1%D0%A2%D0%A3_4417_2005

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MATERIALES Y MÉTODOS

Identifique los métodos, los aparatos y equipos (nombre y dirección del fabricante) y los procedimientos realizados. Identifique los reactivos y productos químicos utilizados.

Describa los métodos estadísticos con detalles e indique el método y modelo estadístico.

RESULTADOS

Limite las Tablas y las Figuras al número necesario para explicar el argumento y resultados de la investigación y evaluar los datos en que se apoya. Se sugiere un máximo de 5 Tablas y 3 Figuras.

DISCUSIÓN

Breve y concisa, contrastada con observaciones realizadas en otros estudios. Proponga nuevas hipótesis cuando haya justificación para ello, pero identificándolas claramente como tales.

CONCLUSIONES

Refiérase a las más relevantes y oriente sobre posibles vías para continuar la investigación o el estudio emprendido.
No cite referencias bibliográficas en esta sección.

AGRADECIMIENTOS

Mencione la procedencia del apoyo recibido en forma de subvenciones (equipos, reactivos, medicamentos) y a las instituciones financiadoras del estudio, dependencia e instituciones que apoyaron su ejecución, así como a personas y colaboradores.

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ÍNDICE POR MATERIAS DEL VOLUMEN 68, 2018

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