Original Article

Concordance of the Scoring System for Controlling the Serum Levels of Cholesterol and Fat

Marcia de Araujo Leite Nacif, Edeli Simioni de Abreu, Elizabeth Aparecida Ferraz da Silva Torres
São Paulo, SP - Brazil

Objective

To evaluate the comprehension of the scoring system for controlling the serum levels of cholesterol and fat as an instrument of dietary intervention for hypercholesterolemic patients.

Methods

The study comprised 153 individuals of both sexes, with ages ranging from 20 to 65 years, who sought medical care in a hospital or in a basic health unit. They were divided into the following 3 groups: hypercholesterolemic individuals, individuals with no diagnosis of hypercholesterolemia, and health care professionals. A 24-hour recall was used with each individual, who applied the cholesterol/saturated-fat index to their diets, consulting the scoring system. The researcher confirmed the calculation of each participant, considering her calculation as the a reference pattern. Understanding of the system was assessed through comparison between the reference pattern and the data obtained by the interviewees, using the intraclass correlation coefficient.

Results

The patients without a diagnosis of hypercholesterolemia obtained a high correlation in all meals. The morning and afternoon snacks and supper were the meals with the greatest correlation (r=1). In hypercholesterolemic individuals, supper was the meal with the greatest concordance with the reference score (r=1), and the health care professionals obtained a correlation coefficient of 1 in all meals, except lunch (r=0.99).

Conclusion

The scoring system was fast, simple, and easy to be understood and accepted by the population studied.

Key words

cholesterol/saturated-fat index, lipids, score system

Faculdade de Saúde Pública, Faculdade de Ciências Farmacêuticas and Faculdade de Economia e Administração of USP
Mailing address: Faculdade de Saúde Pública da USP - Profa. Assoc. Elizabeth A.F.S. Torres - Av. Dr. Arnaldo, 715 – Cep 01246-904 São Paulo, SP, Brazil.
Received: 2/27/03
Accepted: 7/28/03
English version by Stela Maris C. e Gandour

Data on the mortality profile in Brazil indicate that diseases of the circulatory system are the major cause of death in our country [1-3]. The participation of cardiovascular diseases in mortality has been increasing since the mid 20th century. In 1950, only 14.2% of the deaths occurring in Brazilian capitals were attributed to circulatory diseases [1,4]. In 1999, heart diseases contributed to 32% of all deaths [5].

Several epidemiological studies, from the Framingham study onwards, have provided opinions about the risk factors involved in the etiology of cardiovascular diseases [6,7]. The currently known risk factors may be classified into 2 basic groups: the unmodifiable and the modifiable [4,7-10]. The unmodifiable risk factors are as follows: age, sex, race, and genetic heritage. The modifiable risk factors are as follows: dyslipidemias, dietary habit, arterial hypertension, smoking, alcoholism, sedentary lifestyle, diabetes mellitus, obesity, stress, hyperhomocysteinemia.

The usual diet has been considered a fundamental element of analysis of the determinants of susceptibility for the appearance of nontransmissible chronic diseases. The hyperlipidemic and atherogenic potential of the diet is related to its content of cholesterol and saturated fat, as well as to the total amount of energy in the diet [11-13].

The influence of dietary cholesterol and saturated fat is so important that Connor et al [12] developed a cholesterol/saturated-fat index to assess the effect of the diet on serum cholesterol levels. Based on this index, Torres [14] developed a table containing the caloric value and the cholesterol/saturated-fat index of 187 food items and preparations usually used by the Brazilian population. Based on these data, Abreu et al (unpublished data) developed a scoring system to control the serum levels of cholesterol and fat, aiming at providing an instrument of dietary intervention for hypercholesterolemic patients, and also at preventing the diseases related to the excessive consumption of cholesterol and saturated fat.

This instrument presents a list of food items measured with household utensils with a score based on the cholesterol/saturated-fat index, constituting a scoring system and explanatory material with detailed instructions for individuals to determine their target score, and also recommendations for a healthy diet (fig. 1). It is worth noting that the tools for dietary intervention can be theoretically correct, but, if not understood, they will not fulfill their purpose [15]. Therefore, the present study assessed the understanding of the population about the scoring system for controlling the serum levels of cholesterol and fat.

Methods

We carried out a methodological study assessing 153 individuals of both sexes, with ages ranging from 20 to 65 years,

2 points

Food item	Portion	CSI per portion
Popcorn	01 teacup	2
Light fresh cheese	01 large slice	2
Parmesan cheese	01 soupspoon	2
Fried snacks	01 medium-sized unit	2
Sausage	01 thin slice	2
Creamy soups	01 ladle	2
Dried tomato	01 soupspoon	2

3 points

Food	Portion	CSI per portion
Meatball (bovine)	01 unit	3
Oven-cooked codfish	01 saucer	3
Sautéed minced meat	01 soupspoon	3
Milk custard	01 soupspoon	3
Arabian meat snack	01 unit	3
Quail egg	01 unit	3
Mozzarella cheese	01 small slice	3
Light cheese spread	01 soupspoon	3
Sardine	01 unit	3
Vegetable soup with meat	01 ladle	3
Sashimi	01 portion	3
Milk-containing ice cream	01 scoop	3
Fruit and milk drink	01 cup	3

Fig. 1 – Example of the scoring system for controlling the serum levels of cholesterol and fat.

residents in the municipality of Ourinhos in 2002, who sought medical care at the hospital or in basic health care units. They were divided into the following 3 groups: hypercholesterolemic patients; patients without a diagnosis of hypercholesterolemia; and health care professionals (physicians, nutritionists, nurses, nurse's aides, and technicians). All participants signed a written informed consent. The following individuals were excluded from the study: illiterate individuals or those unable to write, because the scoring system required reading and understanding skills, in addition to taking note of the food score; individuals who could not calculate, because the method required addition and multiplication for composing the cholesterol/saturated-fat index; individuals who could not answer the interview and calculate their score due to visual, auditory, or neurological problems.

The methodology of this study was adapted from research carried out at Washington University[16]. To assess whether the instrument in question was understood by the target population, the researcher used the 24-hour recall, which consisted of recording the dietary ingestion of the interviewees in the preceding 24 hours. For each type of food item mentioned by the individuals, further information was asked about its type, size of the portion, the amount consumed, and the utensils used. To help the interviewees in estimating the amount of food ingested, a kit of household utensils and measuring spoons was shown to the individuals in case of doubt.

After applying the 24-hour recall, the researcher showed the scoring system for controlling serum levels of cholesterol and fat to the interviewees, and asked them to calculate their cholesterol/saturated-fat index based on the food list. The time required for each participant to calculate the dietary score (the scoring time) was recorded. Then, the researcher also calculated the cholesterol/saturated-fat index of the 24-hour recall for each participant. The researcher values were considered as reference points.

Understanding of the population about the scoring system was assessed by comparing the reference values with the values obtained by the interviewees.

This system comprises a list with 240 food items measured with household utensils, which were scored for cholesterol/saturated-fat index (CSI), calculated according to the methodology cited in the study by Connor et al[12] with the formula: CSI = (1.01 x g of saturated fat) + (0.05 x mg of cholesterol). A low index means a high capacity to reduce hyperlipidemias. The list has a brochure-like format with 22 pages and is accompanied by explanatory material with detailed instructions about how to choose food and how to determine the score of daily cholesterol/saturated-fat index with simplified easy-to-use tables and no food restrictions. In addition, it contains clear and objective messages in regard to the need for maintaining a healthy weight and steps to be followed to obtain a balanced diet.

Statistical analysis was performed with the aid of the Statistical Package for the Social Sciences (SPSS), version 10.0 for Windows[17]. Aiming at comparing the score of the cholesterol/saturated-fat index in the 6 different meals (breakfast, morning snack, lunch, afternoon snack, dinner, and supper) and also the overall score, obtained by the interviewee and by the interviewer, the intraclass correlation coefficient was estimated[18]. These coefficients were estimated for each study group and in different educational levels. The comparison of the mean scoring time for the cholesterol/saturated-fat index in the different educational levels was initially performed by calculating the means and standard deviations, and later with analysis of variance [19]. For comparing the means of the scoring time for the cholesterol/saturated-fat index according to educational level, the Bonferroni test was used.

Results

Figures 2 and 3 show the score distribution provided by the individuals and by the researcher, according to the groups studied and educational level, respectively.

Tables I and II compare the score for the cholesterol/saturated-fat index in 6 different meals and also the overall score provided by the interviewee and the interviewer for each group studied in different educational levels.

According to table I, the patients without a diagnosis of hypercholesterolemia obtained a high correlation, ie, the number of right answers in relation to the score for the cholesterol/saturated-fat index calculated by the interviewees and by the researcher was very high in all meals. The morning snack, afternoon snack, and supper were the meals with the greatest correlation (r=1), although the others were also adequate. The hypercholesterolemic patients also obtained a high correlation. Supper was the meal with the greatest concordance with the reference score (r=1), although the other meals had a high concordance. The health care professionals obtained an intraclass correlation coefficient of 1 in all meals, except for lunch, showing that most participants in this group agreed with the reference score.

Table II shows the correlation coefficient according to edu-

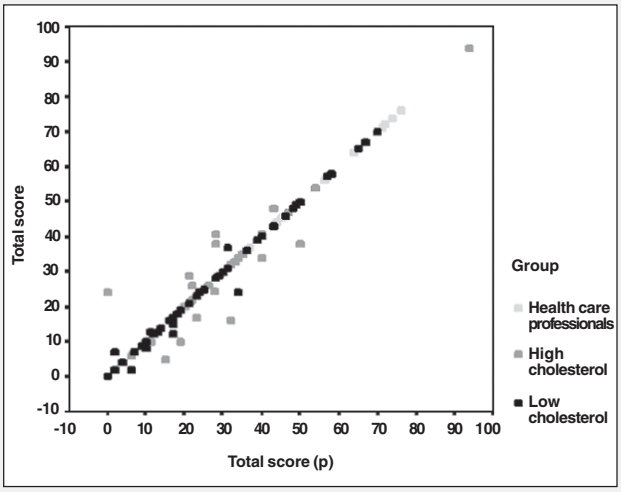

Fig. 2 – Score distribution of the individuals and researcher (p) according to the groups studied.

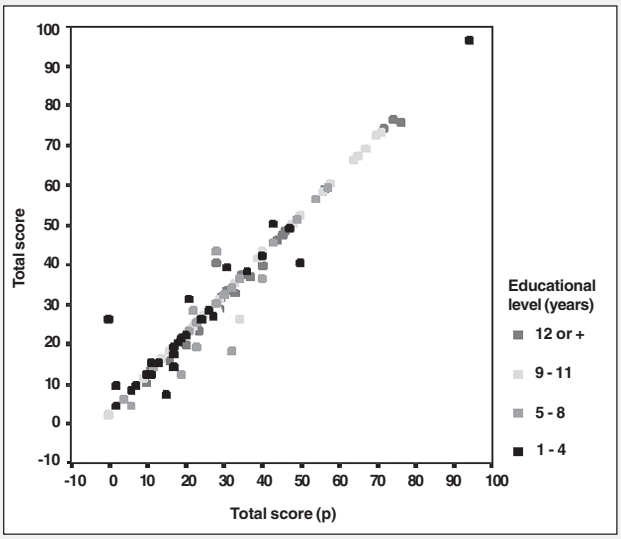

Fig. 3 – Score distribution of the individuals and researcher (p) according to educational level.

Table I - Estimates of the intraclass correlation coefficient in the groups studied according to the type of meal

Type of meal	Correlation coefficient		
	Low cholesterol	High cholesterol	Health care professional
Breakfast	0.9676	0.8171	1
Morning snack	1	0.7595	1
Lunch	0.9980	0.9592	0.9915
Afternoon snack	1	0.9582	1
Dinner	0.9945	0.9660	1
Supper	1	1	1
Total	0.9935	0.9295	1

Table II - Estimates of intraclass correlation coefficient according to the type of meal and educational level (years of study)

Type of meal	Correlation coefficient			
	1 - 4	5 - 8	9 - 11	12 or +
Breakfast	0.6644	0.6809	0.9993	1
Morning snack	1	1	1	0.8537
Lunch	0.9673	0.9724	0.9946	0.9864
Afternoon snack	0.9622	1	1	1
Dinner	0.9608	0.9972	1	0.9999
Super	1	1	1	1
Total	0.9502	0.9449	0.9972	0.9960

Table III - Scoring time for the cholesterol/saturated-fat index according to educational level (years of study)

Educational level (years studied)	Scoring time (minutes)				
	N*	Mean	Minimum	Maximum	Standard deviation
1 – 4	29	5.86	3.00	10.00	2.42
5 – 8	26	5.77	2.00	10.00	2.70
9 – 11	54	4.52	2.00	10.00	1.78
12 ou +	44	4.27	2.00	10.00	1.70

* Number of individuals

cational levels. The individuals who studied up to 4 years had adequate correlation coefficients in all meals. The breakfast showed the lowest concordance. In regard to individuals whose educational level was up to 8 years, their breakfast was also the meal with the lowest correlation. When the correlation between the score for the cholesterol/saturated-fat index and individuals whose educational level was up to 11 years, a strong correlation was observed in all meals. The coefficient obtained for the morning snack, afternoon snack, dinner, and supper was r=1, which shows a perfect correlation. The analyses revealed that individuals whose educational level exceeded 11 years also had a very high correlation, mainly for breakfast, afternoon snack, and supper as the meals with the highest level of correct answers (r=1). The morning snack was the meal with the lowest correlation (r=0.8537).

Table III shows the scoring time for the cholesterol/saturated-fat index, considering the educational level of the individuals. The result of the analysis of variance revealed that the mean scoring times for the cholesterol/saturated-fat index are not statistically equal in several educational levels (P=0.003).

The multiple comparisons of the means showed that individuals with up to 4 years of education had a scoring time for the cholesterol/saturated-fat index similar to those with up to 8 years of education ($P < 0.99$). In regard to the other educational levels, the scoring time for the cholesterol/saturated-fat index was longer for individuals with up to 4 years of education than for individuals with 11 years or more ($P < 0.05$). However, the scoring time for the cholesterol/saturated-fat index for individuals with up to 8 years of education and for those with up to 11 years or more did not differ statistically ($P = 0.06$).

Discussion

In the present study, the concordance of the scoring system for controlling the serum levels of cholesterol and fat was assessed by comparing the score for the cholesterol/saturated-fat index of the 24-hour recall obtained by the interviewee and that obtained by the interviewer. The intraclass correlation coefficient was calculated for statistical analysis [18]. Although the distribution of the variables studied is not normal, the statistical technique used was adequate for fulfilling the objectives of the study.

Differences were observed in the values of correlation between the meals (breakfast, morning snack, lunch, afternoon snack, dinner, and supper) for each group studied (high cholesterol, low choles-

terol, and health care professionals) in the different educational levels (tab. I and II). The health care professionals had greater correlation coefficients than the individuals in the other 2 groups. The hypercholesterolemic individuals also had lower correlation coefficients in some meals and in the overall score as compared with individuals without a diagnosis of hypercholesterolemia.

Individuals who studied up to 4 years had lower correlation coefficients as compared with those in other groups. Individuals who studied up to 8 years had lower correlations than those who studied 11 years or more, and, in these 2 groups the correlation coefficients were similar.

In regard to the different meals, some obtained a higher score than others did. Breakfast was the meal with the lowest correlation coefficient in the population studied, which may be explained by the presence of foods, such as butter, margarine, jam, cheese, and ham. In the scoring system, these food items are expressed in units of household utensil measurements, such as 1 soupspoon or a knife tip, and some mathematical operations have to be performed to find the cholesterol/saturated-fat index of the food item ingested.

In regard to lunch and dinner, the correlation coefficients were greater than that for breakfast, because most individuals ingest only 1 portion of some protein food items, such as 1 piece of beef or 1 egg, and these were the amounts of food expressed in household measurements in the scoring system, which facilitated scoring the cholesterol/saturated fat index. We also observed that in these meals many individuals ingested vegetables and fruits, which, according to what is written in the scoring system, have a cholesterol/saturated fat index = 0, which also facilitated scoring.

In regard to morning and afternoon snacks and supper, the very high correlation coefficients are due to the fact that most of the population does not usually have these meals, and, when they do, few are the food items ingested, such as 1 serving of yogurt and a glass of milk, which facilitates the scoring of the cholesterol/saturated-fat index.

The mean scoring time of the individuals was approximately 5 minutes. The statistical analyses revealed that the higher the educational level of the individuals, the shorter the scoring time for the cholesterol/saturated-fat index. Mitchell et al[16] found a mean of 10 minutes (range = 3 to 25 minutes). These data, in addition to the high correlation coefficients found in this study, indicate that the scoring system is a fast instrument of dietary orientation easily understood by the population.

Acknowledgments

We thank Drs Sonia Tucunduva Philippi and Betsabeth Slater Villar, Silvia M. F. Cozzolino, and biologist Geni Rodrigues Sampaio for their support.

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