

ASSOCIATION BETWEEN DIETARY HABITS, EDUCATION, SERUM TRIGLYCERIDES AND BLOOD CHOLESTEROL AMONG WOMEN OF CABILDO, BUENOS AIRES

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Abstract A cross sectional study of 107 women between 20 and 69 years old, living in the town of Cabildo, province of Buenos Aires, Argentina, which describes food intake and analyses its relation to their education, blood cholesterol and serum triglyceride levels. A food frequency questionnaire including questions regarding meal patterns and food use were completed by the participants. Questions regarding educational status were included. A nutritional risk score was created from nine food groups. Total blood cholesterol and serum triglyceride levels were determined. Average total blood cholesterol levels of the women who participated in the present study were higher (209 mg/dl) than those recommended by the National Cholesterol Education Program, while triglyceride values remained within the normal range (124 mg/dl). Total blood cholesterol levels increased with age. Bread, biscuits and cakes were consumed on a daily basis by 98% of the participants and dairy products by 92%, these being mainly full-fat. Meat and fast food intake were very high (96% and 100% respectively). Vegetable and fish intakes were higher among the more educated women. Mayonnaise (58%) and butter (43%) are popular as food dressings and bread spreads respectively, and sunflower oil was the most commonly used for cooking by 94% of the participants. Women with low educational levels (less than 7 years) had higher nutritional risk scores, and thus unhealthier dietary habits than those with more years of formal education. No statistically significant association was found between food groups and cholesterol or triglyceride levels.

Key words: cholesterol, triglycerides, nutrition, food use, Argentina

Resumen *Asociación entre hábitos nutricionales, educación, triglicéridos séricos y colesterol total en mujeres de Cabildo, Buenos Aires.* Se realizó un estudio transversal en 107 mujeres, habitantes del pueblo de Cabildo, provincia de Buenos Aires, Argentina, sobre el consumo de alimentos entre mujeres de 20 a 69 años de edad, analizando su relación con la educación, colesterol total y niveles de triglicéridos. Se encuestó a las participantes sobre el tipo y frecuencia de consumo alimentario y el nivel de educación. Se creó un puntaje de riesgo nutricional a partir de nueve grupos de alimentos. Se midieron los niveles de colesterol total y triglicéridos de las participantes. El nivel promedio de colesterol total de las mujeres participantes fue superior (209 mg/dl) al normal según el recomendado por el *National Cholesterol Education Program*, mientras que el nivel promedio de triglicéridos se mantuvo dentro del rango normal (124 mg/dl). Los niveles de colesterol total aumentaban con la edad. El 98% consumía pan y galletitas regularmente y el 92% productos lácteos, de estos últimos la mayoría eran enteros. El consumo de carnes (96%) y comidas rápidas (100%) era muy alto. Las participantes con más años de educación consumían más pescado y vegetales. Mayonesa (58%) y mantequilla (43%) eran habitualmente utilizadas para acompañar comidas y untar pan. El aceite de girasol era el más utilizado para cocinar (94%). Las mujeres con menos años de educación (< 7 años) presentaban un puntaje de riesgo nutricional más elevado, y por ende hábitos nutricionales menos sanos. No se encontró una relación estadísticamente significativa entre los grupos de alimentos y niveles de colesterol total y triglicéridos.

Palabras claves: colesterol, triglicéridos, nutrición, alimentos, Argentina

Most saturated fats are risk factors of cardiovascular diseases and increase total serum cholesterol as well as

low density lipoprotein cholesterol. Whereas polyunsaturated fatty acids seem to lower serum cholesterol concentrations¹, the scientific evidence regarding a cholesterol lowering effect of monounsaturated fats is scant^{2, 28, 29}. Dietary cholesterol increases serum cholesterol^{1-6, 28, 29}. The American Heart Associations recently revised dietary guidelines limiting the consumption of saturated fat to <10% of energy and cholesterol <300 mg/day to reduce the risk of cardiovascular heart disease³.

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The Seven Countries Study⁴ found a positive association between the percentage of total energy intake from saturated fatty acids and serum cholesterol. A high saturated fat and cholesterol diet increases the risk of coronary heart disease due to their adverse metabolic effects on blood cholesterol concentration⁵. The high consumption of saturated fatty acids and cholesterol is mainly responsible for hypercholesterolemia^{6-11, 30-32}. A reduction in the consumption of saturated fatty acids found in butter, margarines and some types of oils, for instance, decreases total blood cholesterol and triglycerides levels significantly⁷⁻¹¹.

Argentina has the fourth highest rate of cardiovascular mortality in the Americas¹². It has been shown that one of the main risk factors for atherosclerotic vascular diseases in Argentina is excess consumption of saturated fats^{13, 15, 17}. However, little is known about the impact nutritional habits have on triglyceride and cholesterol levels in the average Argentinean population. Traditionally, the main components of the usual Argentinean diet have been beef, whole fat dairy products and other high lipid containing products¹⁴.

Coniglio¹⁵ compared two population groups, and concluded that those that had a diet rich in monounsaturated and polyunsaturated fatty acids, and low in saturated fatty acids had lower cholesterol levels. In 1999, Parada and Cozza¹⁶ showed an inverse association between the consumption of meat, butter, milk and other dairy products with increments in fibre rich products, oil, low fat meat cuts and skim milk and cholesterol levels, during a 13 year follow-up study in Argentina. A steady decrease in cholesterol levels was recorded, due to changes in nutritional habits. Despite nutritional changes over the last years, cardiovascular diseases are still the number one cause of death in Argentina^{12, 13, 15, 17}.

Little information is available on the cholesterol and triglyceride levels of the Argentinean population^{15, 16}. Furthermore, hardly any of the previous investigations that have taken place in Argentina have focused on the relationship between individual food groups, general dietary habits and cholesterol and triglyceride levels.

The aim of the present study was to describe food use in a representative sample of women living in the town of Cabildo, and to analyse these in relation to total blood cholesterol and triglyceride levels, and the influence that education has over dietary tendencies.

Materials and Methods

A cross sectional population survey was carried out among 20-69 years-old women in Cabildo, Argentina, in 2001. Cabildo is a small town located in mid-eastern Argentina, in the province of Buenos Aires. Interviews with standardized and structured questionnaires were conducted by seven trained members of the research team, each assigned to different parts of town. Prior to the at-home-visits, radio and TV

announcements were made to inform the citizens about the survey and to ask for the female members of the household to be present on the weekend days (Saturday and Sunday) of the survey. All houses in town were included on the survey. Upon the house visits, one eligible female (20 – 69 years of age) per household was invited to participate in the study, choosing the person through a lottery sampling system. Interviews were conducted on the same day, while blood tests were carried out on the following Monday and Tuesday, at the study centre.

Education was measured in years and the participants were classified in two categories according to their education: (i) low (0 to 7 years of education) and (ii) high (more than 7 years of studies). Age was categorised into four groups: (i) 20-39 years; (ii) 40-49 years; (iii) 50-59 years and (iv) 60-69 years.

The assessment of nutritional habits was carried out using a food-frequency questionnaire designed for this study. The participants were asked to report the average dietary intake (per day, week, month or never consumed) of several food items. Dietary intakes were initially divided into 8 categories: (i) never, (ii) once a month, (iii) 2 to 3 times a month, (iv) 1 to 3 times a week, (v) 4 to 6 times a week, (vi) 1 to 2 times a day, (vii) 3 to 4 times a day, (viii) more than 5 times a day. To assess the influence of dietary habits on total cholesterol and triglyceride, two new categories were constructed: (i) irregular intake (1 to 4 times a month or less); (ii) regular intake (2 or more times a week).

To assess the healthfulness of the dietary habits a rating system based upon Argentinean dietary recommendations was used. From the information on dietary habits that was gathered in this study, this rating system focused on nine types of foods: (i) breads, (ii) biscuits and cakes, (iii) vegetables, (iv) milk and yoghurts, (v) cheese, (vi) meats, (vii) fish, (viii) fast foods and (ix) oils and spreads. An indicator describing unhealthy dietary habits was produced from the following food habits: 1) consuming bread other than whole grain bread, 2) eating biscuits and cakes daily or almost so, 3) not eating vegetables daily, 4) drinking mainly fat-containing milk and yoghurts, 5) eating fat-containing cheese daily, 6) eating mostly high fat meat on a daily basis, 7) eating fish less than twice a week, 8) consuming fast foods (hamburgers, pizza, pies) once a week 9) using mainly mayonnaise and butter instead of margarine or oils. The regular consumption of the mentioned items was graded as one point, while the irregular use of the food items was graded as 0 points. This allowed us to grade each diet under study with a value ranging from 0 to 9 possible points, according to the regular or irregular consumption of each of the 9 food groups under study. This type of a rating system has been previously used with adolescents in Haapalahti et al study²⁷.

The blood extractions were performed by biochemists from the Argentinean Biochemist Association. The blood samples were taken starting the Monday, after the questionnaires were performed. A sample of five to ten ml of blood was extracted from each of the participants with a syringe and hypodermic needle, previous hygiene with alcohol 70%. The samples were taken during the morning after the 12 hour fasting period required. The blood samples were gathered in conic tubes. The tubes were submerged in water at 37 °C for 30 minutes. After that, the samples were centrifuged for 5 minutes at 2000 RPM. Plasma was separated in two Eppendorff tubes. One was used to determine total cholesterol and triglycerides and the other was deposited in liquid nitrogen and sent to the city of La Plata to be analyzed by gas chromatography. In La Plata the sample were kept in a freezer at -70 degrees until used to determine then fatty acid composition of each sample. To determine the total cholesterol values Colestat enzymatic

method AA (*Weiner Lab.*) were used. To determine triglyceride values, we used *TG Colour GPO/PAP AA* from the same laboratory. The analyses were performed in a *Technicon RA 1000* auto-analyzer. Total blood cholesterol levels are divided in 3 categories according to the guidelines by National Cholesterol Education Program (NCEP)¹⁸: <200 mg/dl (desirable), 200-239 mg/dl (borderline high) and >240 mg/dl (high). Triglycerides levels were divided into 4 categories: < 150 mg/dl, 150-199 mg/dl (borderline high), 200- 499 mg/dl (high), >500 mg/dl (very high triglycerides).

Associations between variables, mainly prevalence proportions, were tested by t-tests and ANOVA using LSD tests for multiple comparisons. Categorical data was tested with chi-square and Mann-Whitney tests. The level of significance was set at $p < 0.05$. The results are expressed with numbers and relative frequencies (%). Ninety-five percent confidence intervals are reported for all results. Data analyses were carried out with help of *SPSS* version 11.0 for *Windows*.

Results

The final study sample consisted of 107 women with a response rate of 87%. Agriculture and farming are the activities which most of the population is involved in. More than half of the women work at home. They cook their own food at home for themselves and their families, and none of the women surveyed eat in restaurants on a regular basis. There were no statistically significant differences between the women included in the study and those 13% which were excluded due to the missing laboratory data. Both groups showed similar characteristics in regard to their age, education and diet.

TABLE 1.— *Baseline characteristics of the study participants of Cabildo, 2001*

Characteristics	n (%)
Age groups	
20-39	27 (25)
40-49	25 (23)
50-59	32 (30)
60-69	23 (21)
Education (years)	
0-6	60 (56)
7-12	32 (30)
>12	15 (14)
Activity	
Employed	34 (31.8)
House wife	60 (56.1)
Unemployed/ retired	9 (8.4)
Student	4 (3.7)
Blood lipids	
Average total blood cholesterol value	209 mg/dl (119-379)*
Average serum triglyceride value	124 mg/dl (21-833)*

*CI= confidence interval

Table 1 shows the baseline characteristics of the study sample and the consumption of the nine food groups assessed in the survey.

The study sample was distributed evenly within the age groups, presenting between 20 and 30% of participants in each of the four categories (20 to 39, 40-49, 50-59 and 60- 69 year olds). Thirty two percent of the women surveyed worked outside their home.

We found that more than half (56%) of the women in Cabildo had 6 years or less of education, and only 14% had started or completed a college or university degree.

The mean total blood cholesterol value for all the women under study was 209 mg/dl. The mean triglyceride value for this study was 124 mg/dl.

Table 2 shows food consumption patterns among the women surveyed. Ninety eight percent of the women surveyed reported daily or almost daily consumption of bread. Whereas 83% reported consuming white bread, only 17%

TABLE 2.— *Food consumption patterns among the study participants in Cabildo, 2001*

Food groups	n	(%)
Bread consumption		
Irregular intake ¹	2	(2)
Regular intake ²	105	(98)
Biscuits and cake consumption		
Irregular intake	2	(2)
Regular intake	105	(98)
Vegetable consumption		
Irregular intake	25	(23)
Regular intake	82	(77)
Milk and yoghurt consumption		
Irregular intake	9	(8)
Regular intake	98	(92)
Cheese consumption		
Irregular intake	8	(7)
Regular intake	99	(93)
Meat consumption		
Irregular intake	4	(4)
Regular intake	103	(96)
Fish consumption		
Irregular intake	107	(100)
Regular intake	0	(0)
Fast food consumption		
Irregular intake	0	(0)
Regular intake	107	(100)
Butter, margarine and oil consumption		
Irregular intake	1	(1)
Regular intake	106	(99)
Total	107	(100)

¹ Irregular intake = eating the food item once or less than once a week

² Regular intake = eating the food item 2 or more times a week on a monthly basis

reported eating whole grain bread regularly. The same consumption pattern was seen for the "biscuits and cakes" category. Seventy-seven percent of the women reported daily vegetables intake, and 23% ate vegetables less than three times a week.

Milk and cheese was consumed daily by 92% and 93% of the subjects respectively. Forty six percent of the women reported a daily intake of whole fat milk, and 12% reported a whole fat yoghurt everyday. "Hard" cheeses (gruyere, parmesan and others) were consumed by 50% of the participants daily.

Ninety six percent of the subjects reported daily meat consumption. The type of meats most commonly consumed was poultry (70%) followed by beef with high fat content (48%). Regular pork consumption was found in 35% of the participants.

Twenty two percent of the women reported eating canned fish (tuna, anchovies) once a week, and fresh sea fish was reportedly consumed once a week by 34% of the study population.

All of the interviewed women reported frequent consumption of some form of fast food. The most popular

among the fast foods was pizza, which was consumed more than twice a week by 62% of the women. Hamburgers and pies were both consumed at least twice a week by 32% of the interviewed.

With regards to the group denominated as "oils and spreads" 58% of the women reported using mayonnaise daily, mainly in the form of salad dressing and other food dressings. Twenty-eight percent of the study population used butter regularly, and only 16% used margarine. Forty-three percent of the women reported not using any kind of spreads on their bread or biscuits. Twenty-nine percent reported daily use of spreads, from these 43% said they used butter, and 12% used margarine. Sunflower oil was the type of oil most frequently used (94%), followed by olive oil, 13%. Seventy-eight percent of the women reported eating fried foods more than once a week. Sunflower oil was the oil most frequently used to do the frying (49%), followed by mixed oils (sunflower and maize oil mix) used by 33%. Forty-nine percent said they used the oil once for frying, 13% used the same frying oil three or more times.

We found a statistically significant difference ($p < 0.001$) between age and total blood cholesterol level (Table 3).

TABLE 3.- Mean total blood cholesterol and serum triglyceride values according to age-groups in women of Cabildo, 2001

Age	n (%)	Mean total cholesterol values (mg/dl; 95% CI)	p-value*	Mean triglyceride values (mg/dl; 95% CI)	p-value*
20-44 years	44	185 (168.6- 201.3)	0.000	132 (90.5 – 173.4)	0.525
45-69 years	63	223 (211.0 – 234.9)		119 (101.9 – 137.5)	

*p-value of overall T-test model

TABLE 4.- Cholesterol and triglyceride categories according to educational groups among Argentinean women in Cabildo, 2001

	Range	Education n (%)		p-value
		< 7 years	> 7 years	
Cholesterol	<200 mg/dl	24 (39)	20 (50)	0.458
	200-240 mg/dl ²	22 (36)	10 (25)	
	>240 mg/dl ³	15 (25)	10 (25)	
Triglycerides	<150 mg/dl ⁴	48 (80)	28 (70)	0.146
	150-199 mg/dl ⁵	4 (6)	2 (5)	
	200-499 mg/dl ⁶	8 (14)	10 (25)	

¹ Normal \leq 200 mg/dl

² Borderline high = 200-240 mg/dl

³ High \geq 240 mg/dl

⁴ Normal \leq 150 mg/dl

⁵ Borderline high = 150-199 mg/dl

⁶ High = 200- 499 mg/dl

As the women get older their total blood cholesterol values increased. No trends between age and mean serum triglyceride values were found.

Table 4 shows total blood cholesterol and serum triglycerides ranges based on the recommendations of the Third report of the NCEP¹⁸ according to the educational levels of the participants. Among the low educated women 39% had normal total blood cholesterol levels and 61% presented either borderline high or high levels. Eighty percent of these women had normal serum triglyceride levels. Among the high educated women (more than 7 years); 50% had normal blood cholesterol levels, and 70% had normal triglyceride values. There were no statistically significant differences between these groups ($p=0.458$ for total blood cholesterol and $p=0.146$ for serum triglycerides).

There were no statistically significant differences in cholesterol levels between groups of women with regular and irregular intake of any food group when analysed individually.

Table 5 presents the nutritional habits between the less and more educated women. The more educated

women consumed less bread, biscuits and cakes than did women with fewer years of education. More educated women also reported a lower regular intake of dairy products, meats, butter, margarine, mayonnaise and oils and a higher regular consumption of vegetables than did the less educated participants. Although none of these differences were statistically significant, the mean nutritional risk score based upon a combination of these food choices did differ between the groups. There were no statistically significant differences when age, education and cholesterol levels were tested in combination.

The range of the nutritional risk score was 6 to 9 points. Mean nutritional risk score for those with less than 7 years of education was statistically significantly ($p=0.046$) higher (8.14) than the total score for those with more than 7 years of education (7.87) (Table 6). There was no statistically significant differences between the nutritional risk score and the age groups.

Table 7 presents the mean total blood cholesterol and triglyceride levels according to nutritional risk score (NRS). There were no statistically significant differences between the groups.

TABLE 5.— Comparison between regular and irregular food intake by groups according to high and low educational levels

Intake of nutritional items		Education categories		Significance (χ^2)
		Low education ¹ n (%)	High education ² n (%)	
Breads	Regular ³	60 (100)	45 (96)	0.191
	Irregular ⁴	0 (0)	2 (4)	
Biscuits and cakes	Regular	60 (100)	45 (96)	0.191
	Irregular	0 (0)	2 (4)	
Vegetables	Regular	44 (73)	38 (81)	0.249
	Irregular	16 (27)	9 (19)	
Milk and yoghurts	Regular	56 (93)	42 (89)	0.348
	Irregular	4 (7)	5 (11)	
Cheese	Regular	57 (95)	42 (89)	0.348
	Irregular	3 (5)	5 (11)	
Meats	Regular	58 (97)	45 (96)	0.232
	Irregular	2 (3)	2 (4)	
Fish	Regular	0 (0)	0 (0)	-
	Irregular	60 (100)	47 (100)	
Fast foods	Regular	60 (100)	47 (100)	-
	Irregular	0 (0)	0 (0)	
Butter, margarine and oils	Regular	60 (100)	46 (100)	0.439
	Irregular	0 (0)	1 (0.9)	

¹ Low education = 7 years or less

² High education = more than 7 years

³ Regular intake = eating the food item 2 or more times a week on a monthly basis

⁴ Irregular intake = eating the food item 1 to 3 times a month

TABLE 6.– Mean nutritional risk score according to educational levels among 20-69 year old women in Cabildo

Education	n (%)	Mean nutritional risk score	95% CI*	p-value
Less than 7 years	60 (56.1)	8.14	0.005 to 0.522	0.046
More than 7 years	47 (43.9)	7.87		

*CI= Confidence interval of the difference of the mean nutritional risk score

TABLE 7.– Mean total blood cholesterol and triglyceride levels according to nutritional risk score (NRS) among women of Cabildo, 2001

NRS	n (%)	Mean cholesterol mg/dl (95% CI*)	Mean triglyceride mg/dl (95% CI)
6	4 (3.7)	212 (195 - 229)	181 (164 - 198)
7	14 (13.2)	208 (185 - 231)	114 (74 - 154)
8	67 (63.2)	209 (197 - 221)	124 (99 - 149)
9	22 (20.8)	204 (176 - 232)	122 (79 - 166)

*CI= Confidence interval

Discussion

Based on the results of previous studies^{19,20} approximately 20 food products form the basic conventional Argentinean diet: bread, spaghetti and flour derivatives, beef, sugar, milk, cheese, sunflower oil, potatoes, green leaf vegetables, rice, oranges, apples, peaches and tomatoes. During the last 20 years, some of these foods, especially those containing meats and saturated fats in various forms have become less important in the everyday diet¹²⁻¹⁵. In the present study we confirmed that the diet of the participants tended to follow the basic conventional and unhealthy Argentinean diet.

The higher the educational level the better food choices made, and thus a lower risk score, this could be due to the fact that the more educated women have better general knowledge regarding which foods are healthier, and tend to choose these over the others. Another fact that could influence the food choices among these two groups is that the less educated women and their families have a lower income level, thus food prices could be the other important factor influencing the dietary habits of these women. Parada et al.¹⁶ already showed this relationship between income and dietary choices when they discovered that lower income populations in Argentina had a diet based on rice and other cereals, with high intakes of meats and low intakes of low-fat milks, while those with

more education had higher incomes and their dietary choices were healthier, with a higher consumption of vegetables, low-fat milk and less red meats. These results concur with ours. We think that the socioeconomic factors should be studied in more depth in future investigations.

Most of the bread and biscuits consumed are made with refined flour, which loses many of the vitamins and fibres found on the whole wheat grains. Whole grain bread products are not commonly consumed. Most of the breads and biscuits made in Argentina contain high amounts of trans-fatty acids, butter, and sugar, and few useful minerals and vitamins¹⁹, which has been shown to cause adverse effects on the plasma lipoprotein profile^{2-10, 21}. Dairy products are widely consumed in the diet of the women in Cabildo. Almost half of the women in this study reported consumption of whole fat milk and yoghurt. There is lack of information regarding consumption of dairy products for the average Argentinean population. Although low-fat milks and yoghurts are available on the markets they are not widely consumed. We believe that this is due to the fact that they are more expensive than the whole fat dairy products, and so people tend to buy cheaper products. Cheese formed an important part of the average diet. Dairy products are a major source of calcium. In Argentina calcium needs are met mainly through dairy products (68%), followed by cereals in the

form of seed and nuts, fruits and different types of vegetables²⁰.

Meat has always been a major part of the Argentinean diet. In this study 96% of the participants reported high consumption of meat, these being mainly poultry and beef. According to research done by the Argentinean National Institute of Technical Nutrition, it has been shown that the intramuscular fat found on beef in the average meat available on the market (1.0 to 1.9g/100g) is equal or has even less than some parts of chicken meat (without skin: 1 to 3.6g/100g). Furthermore it was found that the cholesterol content of the beef produced on the Argentinean Pampas is moderately low (45 to 51mg/100g) mainly due to the way the cattle is bred and it feeds on natural pastures. These values do not differ significantly from those found in chicken (42 to 64 mg/100g)^{22, 23}. The fact that meats in the Argentinean Pampas seem to have lower levels of cholesterol than other meats produced elsewhere could in part explain the non-significant results we found when comparing regular meat intake and total blood cholesterol levels. The meat, especially beef, is usually cooked by oven or barbecued. Cholesterol in the diet comes from beef (55%), eggs (19%) and the rest from chicken, pork, cheese, milk and butter. Iron is provided through meat and eggs, cereals, legumes, roots and fruits²⁰.

Fish is rarely consumed in the average Argentinean diet. This has been an interesting finding since fish is the most important source of eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA) in a staple diet, which has been shown to decrease cardiovascular heart disease²⁴⁻²⁶. The addition or complementation of n-3 fatty acids to the Argentinean diet could be an interesting field for future investigation. It was surprising to find that all women under study consumed fast foods regularly. The participants reported preparing and eating fast foods mainly at home, since most women cook at home. Hamburgers and hotdogs are not as popular as pizzas, especially among the older women. However these items are consumed by one-third of the women living in Cabildo on a weekly basis, and pizzas are also prepared mainly at home and during weekends. Mayonnaise is very popular as dressing for several foods and widely consumed. Butter is more popular as bread spread than margarine. The consumption of butter and margarine on the same amounts have shown that butter produces higher blood lipid values (LDL and total cholesterol) over margarine in the review done by Judd, Baer and Clevidence⁷ on several studies. The oil most commonly used for cooking was sunflower oil. Frying foods is popular and 78% of the participants consume fried foods at least twice a week. Olive oil was used by only 13% of the participants. This is probably due to the high price of this type of oil, and not because of taste.

Although no statistically significant results were obtained when comparing total blood cholesterol and triglyceride values with the nine food groups created, we saw that some trends seem to prevail. It is interesting to note that the mean total blood cholesterol values for the high intake group are all above the internationally recommended values. According to previous studies we know that the high intake of foods such as bread, biscuits, dairy products, meats, fast foods and oils are associated with higher total blood cholesterol values⁵⁻¹⁰. In our study this trend was not observed among the nutritional groups and serum lipid values. The lack of independent significance between the dietary variables and serum lipids under study does not necessarily mean that the dietary habits of the women of Cabildo contribute nothing to the total blood cholesterol and triglycerides values; it may be that the interactions between the variables and other factors not studied produce a greater effect than the individual variables alone.

Only half of the participants had the recommended total blood cholesterol levels, and more than 50% were on the borderline or high range. Triglyceride values on average were within the normal range (124 mg/dl), according to NCEP¹⁸.

As age increases so do total blood cholesterol levels, this result corroborates the results of previous studies done in Argentina^{15,16}. We observed a difference, although not statistically significant between the total blood cholesterol levels, the mean being slightly higher for less educated women (216 vs. 200 mg/dl). When we examined the total blood cholesterol values, education and age of the participants we found no statistically significant results. The younger sample was not the one with more years of education and thus total blood cholesterol or triglyceride levels were not influenced by this factor in this study.

The present study has several limitations. Only nutritional habits, education and blood lipids in the form of cholesterol and triglycerides were studied. Important confounders such as smoking status, physical exercise and body mass index which have been shown to have a strong influence on cholesterol and triglyceride values were not included. The only factor measuring socio-economical status was education. It would have been interesting to have data regarding income. We found that higher educational status influenced positively on the nutritional risk score, however the 95% CI values were broad which made the significant p-value loose specificity. It would have been interesting to see if women with higher income had the same impact. The lack of direct statistically significant association could be partly explained by the fact that it has been demonstrated that cross sectional studies, on their own, are not the best method for detecting relationship between diet and blood lipid values^{32, 33}.

No information regarding cholesterol lowering drug intake was recorded. It is possible that the higher educational groups may be able to afford cholesterol lowering drugs and that they may be better informed on the benefits that this therapy provides. This could be a factor that could have had influenced the overall cholesterol levels within the study sample.

In this study no information was provided regarding the genetic factors which could influence the lipid values of this study. A number of different genes associated with the lipoproteins have been identified as involved in genetic predisposition to increased lipid values and produce coronary artery disease; however, the vast majority are not due to genetic conditions such as familial hypercholesterolaemia or other rare disorders of fat metabolism.

In conclusion, this study found no statistically significant associations between consumption of different foods and serum triglyceride and blood cholesterol. The risk score was high, especially among the less educated group of women. This reflects that the overall dietary habits of the women of Cabildo are associated with unhealthy food choices. However nutrition is not the only factor that influences the levels of total blood cholesterol and triglycerides. Factors such as body mass index, physical exercise, smoking status and blood pressure were not studied. Total cholesterol values were higher than those recommended by the NCEP. High fat dairy products, meat, and fast foods are widely consumed, while vegetable consumption is relatively low. More educated women have a lower nutritional risk score. Further studies should be conducted to study whether this is because of higher income or because they have better knowledge regarding nutrition. Educational campaigns regarding healthier food choices could make a positive impact on the health of the population. The benefits of omega 3 fatty acids shown worldwide could improve the diet of this population. Increasing fish intake or adding omega 3 fatty acids to other widely consumed food sources such as bread or eggs could improve the blood lipid profile of these women and have a protective effect on coronary heart diseases. The availability of skimmed milks and yoghurts, as well as a wider selection of low fat cheeses should be ensured. Although all of these food items are available they are significantly more expensive than their whole fat counterparts.

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En una de sus epístolas Séneca escribe a Lucilio: Ya sabes que Haspasté, la bufona de mi mujer, ha quedado en mi casa en virtud de carga hereditaria, ya que por mi parte soy enemigo de esos monstruos. En efecto, si he de reír de un loco o bufón, cerca me tengo a mí, para mis burlas. Es el caso que esa mujer ha perdido la vista de repente, mas por raro que te parezca, no se cree ciega y constantemente pide que la saquemos de aquí, pensando que mi casa está a oscuras. Créeme que eso nos produce risa, porque nadie sabe que es avaro o codicioso. Los ciegos, al fin, buscan un lazarillo, pero nosotros nos manejamos solos. [...]

Michel Eyquem de Montaigne (1533-1592)

Ensayos completos (1580-1588). Libro segundo. XXV Sobre los que fingen enfermedad.

Traducción de Juan G. de Lauces. Notas prologales de Emiliano M. Aguilera.

Buenos Aires: Orbis, 1984, p 315-6.