Life Science Journal

Websites:
http://www.lifesciencesite.com
http://www.sciencepub.net

Emails:
editor@sciencepub.net
sciencepub@gmail.com

MARSLAND PRESS
Multidisciplinary Academic Journal Publisher

Estimation of food intake in west Algerian hypertensive adults

Djilali Larbaoui

College of Life Sciences, Ibn-Khaldoun University – Tiaret 14000, Algeria.
E-Mail: djlarbaoui@yahoo.fr.

Abstract: The aim of this study was to estimate food intake in west hypertensive Algerian adults. Mean age and BMI of patients was 53 ± 4 years and 26 ± 2 Kg/m^2, respectively. Patients were divided into eight groups according to hypertension with/ or without other associated pathologic factors (obesity, diabetes and coronary artery disease) and compared with 51 controls (M:W, 25:26) with a mean age of 50 ± 6 years and BMI of 22 ± 1 Kg/m^2. The population studied is characterized by a low socio-economic level found in 40% of cases. The food survey shows that global energy intake is higher than recommended intake, it ranges from 10.35 ± 1.26 to 14.86 ± 2.30 MJ / 24h. Caloric distribution of food ration during different meals is objectionable compared to recommended distribution because the most of ration is consumed during lunch (35 to 40%) and dinner (33 to 45%). Energy intakes of proteins, lipids and carbohydrates are respectively (13 to 15%), (35 to 41%) and (46 to 50%). There is a predominance of animal protein intake (52 to 71%, ie 49.69 ± 10.44 to 80.45 ± 12.96 g / 24h of total protein) in the majority of patient groups. High intakes of saturated fatty acids (58 to 63%, ie 80.19 ± 9.93 to 100.17 ± 11.35 g / 24h) and higher than those of the Mediterranean diet are observed in the majority of patient groups. The proportion of complex carbohydrates is 53 to 75% in GIII, GIV, GVII and GVIII patients compared to 25 to 47% in GI, GII and GVI patients. Dietary cholesterol intake varies between 285.31 ± 11.33 and 822.12 ± 12.17 mg / 24h. These intakes correspond to the Mediterranean diet for patients in GI, GII group and largely exceed it (683.23 ± 10.12 to 822.,12 ± 12,1 mg / 24h) in patients of GV ($P < 0.01$), GIII, GIV, GV, GVI, GVII and GVIII ($P < 0.001$). Dietary fiber intake varies from 20.18 ± 1.23 to 31.12 ± 5.11 g/24h. This intake is lower than that of the Mediterranean diet in all patients. The lowest dietary fiber intakes were observed in GIII, GVII and GVIII patients ($P < 0.001$). In conclusion, it seems that the dietary imbalance observed in most patients of this study contributes with other risk factors (obesity, diabetes, smoking and sedentary lifestyle) in the development of cardiovascular disorders. This study recommends advising theses patients to give a great importance to their food intake and to correct their mode of nutrition to ovoid atherosclerosis risk.
[Djilali Larbaoui. **Estimation of food intake in west Algerian hypertensive adults.** *Life Sci J* 2019;16(10):8-16]. ISSN: 1097-8135 (Print) / ISSN: 2372-613X (Online). http://www.lifesciencesite.com. 2. doi:10.7537/marslsj161019.02.

Key words: Food intake, hypertensive Algerian adults, obesity, diabetes, coronary artery disease, socio-economic level, Mediterranean diet, atherosclerosis risk.

1. Introduction

Epidemiological studies allow us to identify and analyze the nutritional factors involved in the occurrence of cardiovascular diseases. However, only intervention studies can conclude on the responsibility for nutritional factors or a food mode, provided that the methodology is correct (Getz & Reardon, 2007 ; Retelny et al, 2008).

Food survey is the method most used in the assessment of nutritional needs in humans. The large-scale food survey is an indispensable tool for nutrition research, in particular epidemiological surveys. At the scale of the individual, it represents an essential support for the collection of information on the way of life. In this case, it combines research and nutritional education, particularly in the area of promotion and health (Musse & Mejean, 1991; Alix, 2007).

Numerous epidemiological studies have shown that populations with cardiovascular disease are characterized by high intakes of fats, in particular saturated fats, and a high intake of cholesterol (Tanasescu et al, 2004 ; Siri-Tarino et al, 2010).

In current clinical practice, the main objective of nutritional interview is to know patient's eating habits as well as average consumption of various nutrients. It allows to evaluate relationship between food consumption and pathologies and to propose beneficial modifications. For example, for an obese population, food interview allows them to propose an

effective diet to lower their body weight. For patients with hypertriglyceridemia, dietary survey can specify feeding conditions that can cause this hypertriglyceridemia and modifications that may possibly aggravate or reduce it (Hata & Nakajima, 2000; Schlienger et al, 2003).

Moreover, atherosclerosis and clinical manifestations of coronary heart disease are closely related to dietary habits of the populations. Thus, the important role of an appropriate diet for coronary patients has been shown (Lichtenstein et al, 2006 ; Lange et al, 2011).

Many authors have published dietary guides for the prevention of these cardiovascular diseases; it is certain that diets that appear to have similar levels of nutrients are ultimately composed of completely different nutrient sources (Yoo et al, 2004; Fogli-Cawley et al, 2007; Martinez-Gonzalez & Martin-Calvo, 2013; Jun *et al, 2018*; Li et al, 2019).

The aim of this study is to estimate dietary intake in hypertensive adult patients in the west of Algeria and to try to see if there is a relationship between food consumption, socio-economic level, lifestyle and the high risk of atherosclerosis in these patients.

2. Material and Methods

1. Subjects

Fifty one control subjects were recruited among apparently healthy, normolipidemic Algerian peoples, of them 25 men and 26 women with a mean age of 50 ± 6 years and 22 ± 1 Kg/m^{2}body mass index (BMI). Four hundred and forty eight hypertensive patients with or without other pathological disorders e.g diabetes, obesity and coronary artery disease (previous myocardial infarction or angina pectoris) were recruited at the general medicine service of the Tiaret hospital (west of Algeria). Blood pressure levels were retrieved from medical records of participating patients. Hypertensive people are those who had blood pressure levels > 140/90 mmHg or used antihypertensive medications. There were 223 men (M) and 225 women (W) with a mean age of 53 ± 4 years. All men were current smokers but not women. No physical activity was practiced by all patients (men and women). Patients were divided into eight groups: Group I (GI), (n=54, Men/Women 27/27) with hypertension alone (mean age 52 ± 6 years, BMI 23 ± 1 Kg/m^2); GII (n=57, M/W, 28/29) with hypertension and diabetes (mean age 49 ± 4 years and BMI 23 ± 1Kg/m^2); Group III (GIII), (n=54, M/W,26/28) with hypertension and obesity (mean age 54 ± 4 years and BMI 28 ± 1Kg/m^2); GIV (n=57, 28/29) with hypertension, diabetes and obesity (mean age 51 ± 6 and BMI 29 ± 2Kg/m^2); Group V (GV), (n=57, M/W, 28/29) with hypertension and coronary artery disease (mean age 50 ± 7 years and BMI 22 ± 2Kg/m^2); group VI (GVI), (n=57, M/W, 30/27) with hypertension, diabetes and coronary artery disease (mean age 54 ± 5 years and BMI 23 ± 1Kg/m^2); group VII (GVII), (n=55, 27/28) with hypertension, obesity and coronary artery disease (mean age 55 ± 5 years and BMI 29 ± 2) and Group VIII (GVIII), (n=57, 29/28) with hypertension, coronary artery disease and obesity (mean age 56 ± 3 years and BMI 32 ± 4). The purpose of this study was explained to the subjects and the investigation was carried out with their consent. The experimental protocol was approved by the West Hospital Committee of Tiaret on Human Subjects.

2. Food Consumption

Subjects were interviewed by trained interviewers using an adapted and structured questionnaire. The questionnaire reported by Mares-Perlman et al. 1992 queried the dietary intake and was composed of two parts: a food frequency questionnaire and additional food intake questions. Subjects were also asked to list names and frequency of consumption of food not listed in the questionnaire. For type of food, the respondent was asked how frequently it was eaten and whether the usual portion was small, medium or large (graduated measure, soup and coffee spoon, dinner and soup plate...) (Cubeau & Pequignot, 1991**)**. For food not part of the food list but reported to be consumed by patients, exact portion size data were elicited. Additional food intake questions were included to determine the following dietary habits: frequency of eating the skin of chicken or fat of meat, frequency and type of fat added in cooking, type of fat added to potatoes and vegetables, brand name of the most frequently consumed cold cereals and the total daily quantity of fruits and vegetables eaten. Food intake was converted into nutrients and energy via the consumption food table using the method of Souci et al 2000.

3. Statistical Analysis

Values are given as means ± SD. Statistically significant differences in the values between different groups was evaluated by Student's t test for parametric data and by the Mann-Whitney U test for non-parametric data, and were initially analyzed by ANOVA. The statistical significance level was set at $p < 0.05$. Energy and nutrient intakes were compared to the Mediterranean diet (Keys, 1995; Renaud et al, 1995; Luc et al, 2006).

3. Results

1. Socio-economic survey

Socio-economic survey of patients compared to controls (Table 1) found that patients in GIII, GIV, GVII and GVIII are employed, while for controls and other groups, the percentage working people varies from 35 to 70%. The illiteracy rate is null among patients of GVII and GVIII, from 3 to 5% for GIII and

GIV and varies between 10 and 50% for the rest of patients and controls. The highest levels of education (higher school level) are observed in patients of GIII, GIV, GVII and GVIII. Most of patients and controls live in semi-collective habitat, 10-24% of patients live in villas. Sanitary facilities are favorable for 73-80% of patients, unfavorable for 20-27% of patients and controls. The number of people in the family is less than 3 in 26 to 78% of patients and controls and especially in patients of GIII, GIV, GVII and GVIII (60 to 78%), greater than 4 in 22 to 74% of patients and controls. The highest numbers of people in the household are seen in controls (58%) and patients of GI (74%) and VI (73%).

In total, 48% of surveyed population are unemployed, 30% have low level of education (illiteracy or primary level), 40% live in buildings and 45% of patients belong to large families. All these parameters define a low socio-economic level found in 40% of cases.

Table 1: Socio-economic level of patients and controls

	Control	GI	GII	GIII	GIV	GV	GVI	GVII	GVIII
Employment									
- With	70	67	35	100	100	56	52	100	100
- Without	30	33	65	0	0	44	48	0	0
School level									
- Illiterate	12	28	24	3	5	50	10	0	0
- Primary	58	35	59	25	21	32	36	25	19
- Secondary	28	37	17	29	35	16	46	35	39
- Superior	2	0	0	43	39	2	8	40	42
Habitat									
- Semi-collective	30	41	24	70	80	55	25	65	60
- Building	69	59	76	20	8	45	75	18	16
- Villa	1	0	0	10	12	0	0	17	24
Sanitary equipment									
- Favorable	80	79	80	100	100	73	79	100	100
- unfavorable	20	21	20	0	0	27	21	0	0
Household size									
<3 people	42	26	44	65	60	70	27	72	78
> 4 people	58	74	56	35	40	30	73	28	22

[a]: Values are expressed as % of patients and controls

2. Food survey

Estimated food intake for men does not present any significant difference compared with that of women: for that, results are treated together.

a. Daily caloric intake of food ration

Global calorie intake (Table 2 & 3) varies from 10.35 ± 1.26 to 14.86 ± 2.30 MJ/24h and is higher than that of recommended intakes (8.36 to 10 MJ/24h). Highest values, compared to controls, were observed in patients of GIII, GIV ($P < 0.01$), GVII and GVIII ($P < 0.001$), patients presenting the highest number of atherosclerosis risk factors. The breakfast represents from 9 to 18% of the energetic contributions. Most of the ration is consumed during lunch (35 to 40%) and dinner (33 to 45%). Caloric distribution of the food ration during various meals is criticizable compared to the distribution recommended by Trémolière et al, 1984 (Table 4).

b. Daily intake of protein, lipids and carbohydrates

Energy intakes of proteins, lipids and carbohydrates are respectively (13 to 15%), (35 to 41%) and (46 to 50%) (Table 5). There is a predominance of animal protein intake (52 to 71%, ie 49.69 ± 10.44 to 80.45 ± 12.96 g/24h of total protein) in patients of GII, GIII, GIV, GV, GVII and GVIII and a predominance of plant vegetable proteins in patients of GI (55%, ie 54.35 ± 8.32 g/24h) and GVI (54%, ie 59.89 ± 15.04 g/24h) (Table 2 & 6). We note a predominance of polyunsaturated fatty acids in GII and GV patients (35 to 44%, ie 1.35 ± 1.02 to 1.42 ±0.02 g/24h) of total fatty acids. This distribution is comparable to that of Mediterranean diet for monounsaturated and polyunsaturated fatty acids in some patients but it is no longer for saturated fatty acids which are in quantities greater than that of the Mediterranean diet for GII, GIV, GVII and GVIII patients. The proportion of complex carbohydrates is 53 to 75% in GIII, GIV, GVII and GVIII patients compared to 25 to 47% in GI, GII and GVI patients. Distribution between simple and complex carbohydrates is comparable to that of Mediterranean diet for controls and for GI, GII and GVI patients. It is characterized by a decrease in the proportion of

complex carbohydrates and an increase of simple carbohydrates in patients compared to the Mediterranean diet which is 75% of complex carbohydrates against 25% of simple carbohydrates (Table 2 & 6).

c. Daily intake of dietary cholesterol

Dietary cholesterol intake ranged from 285.31 ± 11.33 to 822.12 ± 12.17 mg/24h in patients of this study. These intakes correspond to Mediterranean diet for patients in GI and GII and largely exceed it (683,23 ± 10,12 to 822,12 ± 12,1 mg/24h) in GV (P <0.01), GIII, GIV, GV, GVI, GVII and GVIII (P <0.001) (Table 2).

d. Daily intake of dietary fiber

Dietary fiber intake in patients ranges from 20.18 ± 1.23 to 31.12 ± 5.11 g/24h. This intake is lower than that of Mediterranean diet in all patients in this study. The lowest intakes of dietary fiber were observed in GIII, GVII and GVIII patients (P <0.001) (Table 2).

e. Quantitative distribution of some food groups

The most consumed foods in this population (Table 7) are red meat, poultry, and eggs in patients of GIII, GIV, GVII, and GVIII. The least consumed foods in these patients are fish, bread, fruits and vegetables, milk and dairy products. The consumption of margarine and oils is comparable in all patients. The consumption of olive oil in this population is null.

Table 2: Daily consumption of energy, food proteins, lipids, carbohydrates, cholesterol and fibers in patients and controls

Nutrients	Controls	GI	GII	GIII	GIV	GV	GVI	GVII	GVIII	MD
Total energy (MJ/24h)	10,30 ± 1,23	10,35 ± 1,26	10,70 ± 1,62	12,39 ± 1,92**	12,92 ± 2,00**	11,95 ± 1,85*	12,05 ± 1,61*	13,39 ± 2,09***	14,86 ± 2,30***	8
Total protein (g/24h)	95,69 ± 11,40	95,14 ± 12,94	90,94 ± 15,32	94,05 ± 16,04	99,40 ± 16,79	95,73 ± 16,13	110,40 ± 17,50*	102,16 ± 17,28	114,01 ± 19,16***	
- Animal	41,34 ± 6,19	42,97 ± 7,31	56,70 ± 9,92***	61,40 ± 10,84***	64,91 ± 11,35***	49,69 ± 10,44*	50,52 ± 8,98*	71,70 ± 11,68***	80,45 ± 12,96***	72
- Vegetable	54,35 ± 8,32	52,17 ± 11,14	34,23 ± 5,41***	32,65 ± 5,20***	34,48 ± 5,45***	46,04 ± 5,69***	59,89 ± 15,04***	30,46 ± 5,61*	33,56 ± 6,22***	
Total lipids (g/24h)	91,67 ± 20,47	94,80 ± 10,60	105,74 ± 24,99	135,87 ± 32,05**	141,01 ± 33,32**	129,67 ± 30,64*	110,66 ± 24,47	146,72 ± 34,73***	162,39 ± 38,17***	
Fatty acids (g/24h)	17,12 ± 2,56	19,27 ± 3,84	35,53 ± 6,32***	82,89 ± 9,50***	80,19 ± 9,93***	38,92 ± 8,99***	24,88 ± 10,47*	70,05 ± 10,28***	100,17 ± 11,35***	
- Saturated	44,35 ± 7,20	46,42 ± 8,56	29,25 ± 3,45***	32,34 ± 3,84***	41,02 ± 4,01	30,79 ± 3,63***	53,64 ± 11,05*	50,14 ± 4,16*	39,09 ± 4,59	83
- Monounsaturated	20,75 ± 4,39	23,73 ± 4,77*	34,62 ± 1,72***	19,48 ± 2,31	17,01 ± 2,00	55,39 ± 4,81***	27,40 ± 6,08**	22,57 ± 2,08	19,54 ± 2,29	
- Polyunsaturated	1,25 ± 0,43	1,31 ± 0,55	1,35 ± 1,02	0,23 ± 0,01***	0,21 ± 0,03***	1,42 ± 0,2	1,30 ± 0,55	0,32 ± 0,10***	0,19 ± 0,04***	
- Polyunsaturated /saturated										
Total carbohydrates (g/24h)	314,62 ± 43,1	310,61 ± 51,52	311,13 ± 52,20	341,30 ± 57,24***	356,16 ± 59,75***	327,50 ± 54,94*	361,64 ± 63,33***	368,72 ± 62,31***	409,48 ± 68,46***	
- Simple	76,31 ± 13,5	78,29 ± 14,17	89,89 ± 18,99	158,63 ± 21,11***	155,90 ± 21,74***	104,62 ± 19,96**	92,22 ± 17,29*	168,56 ± 22,86***	190,32 ± 24,98***	220
- Complex	238,11 ± 38,4	232,32 ± 48,40	221,23 ± 43,93	182,67 ± 48,35*	200,25 ± 50,29	222,88 ± 46,20	269,42 ± 59,40	200,16 ± 52,45	219,16 ± 57,61	
Cholesterol (mg/24h)	283,12 ± 16,20	285,31 ± 11,33	297,27 ± 10,12*	683,23 ± 10,12***	658,13 ± 15,60***	309,22 ± 15,30**	386,16 ± 17,20***	576,25 ± 10,13***	822,12 ± 12,17***	300
Dietary fiber (g/24h)	33,21 ± 4,13	31,12 ± 5,11	29,15 ± 6,30	20,18 ± 1,23***	21,62 ± 2,11***	29,30 ± 4,13*	26,73 ± 7,13*	19,75 ± 4,17***	18,83 ± 2,93***	> 50

Values are means ± SD. ; MD: Mediterranean diet (Keys, 1995; Renaud et al, 1995; Luc et al, 2006). ; *: Patients versus controls; * P<0.05; ** P<0.01; *** P<0.001

Table 3: Total energy intake and its distribution between different nutrients in patients and controls

Nutrients	Controls	GI	GII	GIII	GIV	GV	GVI	GVII	GVIII
Total energy (MJ/24h)	10,30 ± 1,23	10,35 ± 1,26	10,70 ± 1,62	12,39 ± 1,92**	12,92 ± 2,00**	11,95 ± 1,85*	12,05 ± 1,61*	13,39 ± 2,09***	14,86 ± 2,30***
Total protein (MJ/24h)	1,60 ± 0,21	1,59 ± 0,21	1,52 ± 0,26	1,57 ± 0,27	1,66 ± 0,28	1,60 ± 0,27	1,85 ± 0,29	1,71 ± 0,29	1,90 ± 0,32
- Animal	0,69 ± 0,10	0,72 ± 0,12	0,95 ± 0,17***	1,03 ± 0,18***	0,91 ± 0,19	0,83 ± 0,17*	0,84 ± 0,15*	1,20 ± 0,20***	1,34 ± 0,22***
- Vegetable	0,91 ± 0,14	0,87 ± 0,19	0,57 ± 0,09***	0,55 ± 0,09***	0,74 ± 0,09	0,77 ± 0,09***	1,00 ± 0,25***	0,51 ± 0,09*	0,56 ± 0,10***
Total lipids (MJ/24h)	3,45 ± 0,77	3,57 ± 0,78	3,98 ± 0,94*	5,11 ± 1,21*	5,30 ± 1,25**	4,87 ± 1,15*	4,16 ± 0,92	5,52 ± 1,31***	6,10 ± 1,44***
Fatty acids (MJ/24h)	0,64 ± 0,09	0,73 ± 0,14	1,33 ± 0,24***	3,12 ± 0,36***	3,02 ± 0,37***	1,46 ± 0,34***	0,94 ± 0,39*	2,64 ± 0,39***	3,77 ± 0,43***
- saturated	1,67 ± 0,27	1,75 ± 0,32	1,10 ± 0,13***	1,22 ± 0,14***	1,54 ± 0,15	1,16 ± 0,14***	2,02 ± 0,42*	1,89 ± 0,16*	1,47 ± 0,17
- monounsaturated	0,78 ± 0,17	0,89 ± 0,18*	1,30 ± 0,06***	0,73 ± 0,09	0,64 ± 0,08	2,08 ± 0,07***	1,03 ± 0,23**	0,85 ± 0,08	0,74 ± 0,09
- polyunsaturated									
Total carbohydrates (MJ/24h)	5,25 ± 0,72	5,19 ± 0,86	5,20 ± 0,87	5,71 ± 0,96***	5,96 ± 1,00***	5,48 ± 0,92*	6,04 ± 1,06***	6,16 ± 1,04***	6,85 ± 1,14***
- Simple	1,27 ± 0,23	1,31 ± 0,25	1,50 ± 0,32	2,65 ± 0,35***	2,61 ± 0,36***	1,75 ± 0,33**	1,54 ± 0,29*	2,82 ± 0,38***	3,18 ± 0,42***
- Complex	3,98 ± 0,64	3,88 ± 0,81	3,70 ± 0,73	3,05 ± 0,81*	3,35 ± 0,84	3,72 ± 0,77	4,50 ± 0,99	3,35 ± 0,88	3,66 ± 0,96

Values are means ± SD. ; *: Patients versus controls.; * P<0.05; ** P<0.01; *** P<0.001.

Table 4: Energy distribution of food intake[a] during different meals of the day in patients and controls

Meal	Controls	GI	GII	GIII	GIV	GV	GVI	GVII	GVIII	Distribution according to (Trémolière et al, 1984)			
										Ideal	Good	Critical	Bad
Breakfast	15	10	9	17	16	18	12	20	18	20	25	10	-
Lunch	35	40	42	35	36	37	39	40	37	25	30	40 - 50	40 - 50
Taste	10	5	9	8	8	10	10	8	7	15	15	-	-
Dinner	33	45	38	38	35	35	37	30	33	25	30	40 - 50	40 - 50
snacks	7	-	2	2	5	-	2	2	5	15	-	-	-

[a]: Values are expressed as percentage of total energy intake.

Table 4: Energy distribution of food intake[a] during different meals of the day in patients and controls

Meal	Controls	GI	GII	GIII	GIV	GV	GVI	GVII	GVIII	Distribution according to (Trémolière et al, 1984)			
										Ideal	Good	Critical	Bad
Breakfast	15	10	9	17	16	18	12	20	18	20	25	10	-
Lunch	35	40	42	35	36	37	39	40	37	25	30	40 - 50	40 - 50
Taste	10	5	9	8	8	10	10	8	7	15	15	-	-
Dinner	33	45	38	38	35	35	37	30	33	25	30	40 - 50	40 - 50
snacks	7	-	2	2	5	-	2	2	5	15	-	-	-

[a]: Values are expressed as percentage of total energy intake.

Table 5: Distribution of different nutrients[a] related to total energy in patients and controls

Nutrients	Controls	GI	GII	GIII	GIV	GV	GVI	GVII	GVIII	MD
Total protein (MJ/24h) - animal - vegetable	15 6 9	15 7 8	14 9 5	13 8 5	13 7 6	13 7 6	15 7 8	13 9 4	13 9 4	15
Total lipids (MJ/24h) Fatty acids (MJ/24h) - - Saturated - Monounsaturated - Polyunsaturated	34 6 16 7	35 17 9	37 12 10 12	41 25 10 6	41 23 12 5	41 8 17 9	35 8 17 8	41 20 14 6	41 25 10 5	39
Total carbohydrates (MJ/24h) - Simple - complex	51 12 39	50 13 37	49 14 35	46 21 25	46 20 26	46 15 31	50 13 37	46 21 25	46 21 25	46

MD: Mediterranean diet (Keys, 1995; Renaud et al, 1995; Luc et al, 2006). [a] : Values are expressed as percentage of total energy.

Table 6: Qualitative contribution of different nutrients in patients and controls

Nutrients	Controls	GI	GII	GIII	GIV	GV	GVI	GVII	GVIII	MD
Total energy[a] (MJ/24h)	10,30 ± 1,23	10,35 ± 1,26	10,70 ± 1,62	12,39 ± 1,92**	12,92 ± 2,00**	11,95 ± 1,85*	12,05 ± 1,61*	13,39 ± 2,09***	14,86 ± 2,30***	8
Total protein[a] (g/24h) - animal[b] - vegetable[b]	95,69 ± 11,40 43 57	95,14 ± 12,94 45 55	90,94 ± 15,32 62 38	94,05 ± 16,04 65 35	99,40 ± 16,79 55 45	95,73 ± 16,13 52 48	110,40 ± 17,50* 46 54	102,16 ± 17,28 70 30	114,01 ± 19,16*** 71 29	72 60 40
Total lipids[a] (g/j) Total fatty acids - - Saturated[b] - Monounsaturate[b] - Polyunsaturated[b]	91,67 ± 20,47 21 54 25	94,80 ± 10,60 22 52 26	105,74 ± 24,99* 36 29 35	135,87 ± 32,05* 62 24 14	141,01 ± 33,32** 58 30 12	129,67 ± 30,64* 31 25 44	110,66 ± 24,47 23 51 26	146,72 ± 34,73*** 49 35 16	162,39 ± 38,17*** 63 25 12	83 25 50 25
Total carbohydrates[a] (g/j) -Simple[b] -Complex[b]	314,62 ± 43,1 24 76	310,61 ± 51,52 25 75	311,13 ± 52,20 29 71	341,30 ± 57,24*** 46 54	356,16 ± 59,75*** 44 56	327,50 ± 54,94*** 32 68	361,64 ± 63,33* 26 74	368,72 ± 62,31*** 46 54	409,48 ± 68,46*** 47 53	220 25 75

[a]: Values are mean ± SD.; [b] : Values are expressed as percentage.; *: Patients versus cntrols; * P<0.05; ** P<0.01; *** P<0.001.; MD: Mediterranean diet (Keys, 1995; Renaud et al, 1995; Luc et al, 2006).

Table 7: Distribution of consumed food in patients and controls

Nutriments (g/24h)	Controls	GI	GII	GIII	GIV	GV	GVI	GVII	GVIII
Milk and dairy products	138,3 ± 18,3	253,8 ± 18,2	298,6 ± 16,4	198,7 ± 15,3	206,4 ± 17,8	268,5 ± 12,3	225,1 ± 15,5	203,3 ± 13,7	140,2 ± 11,6
Red meat	32,7 ± 7,2	34,5 ± 8,5	182,7 ± 21,3	242,1 ± 23,5	336,4 ± 21,4	180,4 ± 11,3	43,12 ± 11,2	356,8 ± 29,5	395,8 ± 36,2
Poultry	23,1 ± 2,3	24,5 ± 3,1	66,3 ± 7,3	127,2 ± 12,2	123,4 ± 15,3	68,3 ± 7,8	33,1 ± 4,2	132,7 ± 10,7	145,2 ± 16,2
Fish	13,2 ± 2,1	11,1 ± 2,2	10,5 ± 3,2	11,6 ± 3,2	9,2 ± 1,3	23,6 ± 9,2	13,9 ± 3,0	9,7 ± 2,6	10,8 ± 4,3
eggs	31,6 ± 5,4	33,8 ± 6,1	56,2 ± 7,2	98,7 ± 6,2	112,6 ± 8,7	64,5 ± 7,6	43,26 ± 3,8	128,5 ± 15,8	132,5 ± 11,3
Fruits	213,2 ± 25,8	208,1 ± 28,2	202,3 ± 23,5	196,1 ± 19,6	103,5 ± 18,4	183,8 ± 13,2	185,3 ± 25,2	145,6 ± 12,8	125,3 ± 15,6
Vegetables	271,2 ± 53,4	268,1 ± 45,4	177,3 ± 12,7	102,3 ± 45,3	97,9 ± 17,6	103,6 ± 31,3	107,2 ± 13,5	107,5 ± 15,2	95,2 ± 21,2
Bread	263,4 ± 23,8	196,8 ± 19,3	200,2 ± 17,4	184,4 ± 18,4	190,8 ± 16,3	193,6 ± 12,1	126,3 ± 19,5	107,6 ± 16,3	87,1 ± 12,4
Cereals	161,7 ± 29,4	128,4 ± 10,4	95,3 ± 13,2	107,2 ± 16,3	113,7 ± 11,3	128,7 ± 15,3	135,3 ± 17,4	108,5 ± 12,5	98,5 ± 9,4
Potato	200,7 ± 35,9	189,6 ± 23,7	112,3 ± 13,6	56,7 ± 5,2	85,7 ± 10,3	97,8 ± 9,6	173,7 ± 12,3	32,6 ± 7,3	41,2 ± 16,2
Dried vegetables	79,4 ± 6,2	69,6 ± 7,3	59,2 ± 7,8	61,7 ± 8,6	58,3 ± 3,2	68,3 ± 5,6	71,2 ± 10,1	50,2 ± 6,7	55,8 ± 3,3
Margarine	11,2 ± 3,1	11,6 ± 3,2	11,3 ± 3,7	12,8 ± 4,6	10,3 ± 2,7	11,0 ± 4,6	10,3 ± 1,7	10,3 ± 5,2	10,8 ± 1,6
Oil	12,2 ± 3,4	13,5 ± 4,2	12,2 ± 3,2	13,5 ± 2,1	12,1 ± 2,7	11,7 ± 3,5	11,8 ± 2,3	10,6 ± 3,1	9,6 ± 2,3
Olive oil	0	0	0	0	0	0	0	0	0

Values are mean ± SD.

4. Discussion

We have already indicated that numerous epidemiological studies have shown that populations at high risk of coronary heart disease are characterized by high intakes of fat rich in saturated fatty acids in their diet and a high intake of cholesterol (Bruckert et al, 1994; Woo et al, 1999; Nettleton et al, 2017).

Among factors influencing coronary mortality in industrialized countries, eating habits occupy a prominent place. It is therefore interesting to try to correlate them with the different frequencies of cardiovascular diseases.

Distribution of different nutrients in the population of patients studied shows a protein energy consumption of 13 to 15%. This intake allows sufficient coverage of needs and it corresponds to security intake (Table 5).

Animal protein intake (45 to 70%) is predominant in the majority of patients, who consume a lot of red meats, poultry and eggs. On the other hand, the proportion of vegetable proteins is low (30 to 55%) (Table 6). But in general, a mixed protein intake (of animal and vegetable origin) can be compensated by the different essential amino acids constituting these different proteins. Animal protein intake is higher than the recommended daily intake which must be 30 % of total proteins (Apfelbaum et al, 1989).

The consumption of fats is important to determine since saturated fats are the main cause of disorders of lipid metabolism, and promote hypercholesterolemia and atheromatous pathology.

With 35 to 41% of total energy intake, lipid intake in patients is far from the recommended intake (30%) to avoid in order to avoid the affections like obesity and atheromatosis. However, our results confirm those of (Keys, 1995; Renaud et al, 1995; Luc et al, 2006), obtained in other Mediterranean countries, since these authors find lipids energy intakes between 35 and 42% (Table 5).

Moreover, lipid intake is predominantly (58 to 63%) saturated fatty acids in GIII, GIV, GVII and GVIII, monounsaturated fatty acid (51 to 52%) patients in GI and GVI, and polyunsaturated fatty acids (35 to 44%) in patients of GII and GV of total fatty acids. This distribution of fatty acids is different from that found by other authors in different Mediterranean diets, namely 1/4 of saturated, 1/4 of polyunsaturated and 1/2 of monounsaturated fatty acids (Keys, 1995; Renaud et al, 1995; Luc et al, 2006). These authors describe a Mediterranean-type diet as consisting of few meat, fish, fruits and vegetables, olive oil and olives. Olive oil is no longer consumed by patients in this study.

The vegetable oil consumed by patients is mostly sunflower oil. This oil, in the form of margarine or liquid, is used for cooking as well as for salads and cakes. This oil is considered as a "good fat". It contains unsaturated fatty acids considered protective against atherosclerosis and dyslipidemia. They also have the advantage of having a hypotriglyceridemic and hypocholesterolemic effect while increasing HDL-C, due to the presence of polyunsaturated fatty acids (Craplet & basdevant, 1990). The effect of unsaturated fatty acids brought by the oil consumed by patients remains negligible in view of a high intake of saturated fatty acids, especially through the consumption of meat, eggs, milks and dairy products (Table 7).

In patients in this study, carbohydrate intake accounts for 46 to 50% of the total caloric intake. These carbohydrates are provided by bread, potatoes, and couscous, that is, largely in the form of complex sugars for GI, GII, and GVI patients. For all patients, these intakes are in conformity with global energy intake determined by (Luc et al, 2006)) in some Mediterranean countries, ie 50 to 55%, with a distribution in conformity between the two types of carbohydrates among patients of GI, GII and GVI, ie 1/4 of simple carbohydrates and 3/4 of complex carbohydrates, which is not the case in patients of groups GIII, GIV, GVII and GVIII where this distribution is approximately 1/2 for each type of carbohydrate (Table 5).

In addition, patients, without being large consumers of coffee (boiled coffee most often), take 2 to 3 cups daily.

In 1983, Thelle et al., Found that drinking 9 or more cups of boiled coffee (country or turkish) a day is associated with an average 10% increase in cholesterol in men and 8% in women, with a statistically significant dose effect curve. This study was also confirmed by (Jee et al, 2001; Antti, 1993). However, this dose effect curve is not found for other types of coffee (instant coffee, coffee filtered on paper) (Naidoo et al, 2011).

It should be known that the means used to quantitatively estimate a subject's food intake have limits. It is essential to supplement these raw data with information on the respondent's behavior and environment. It is good to know the social environment of the subject, it affects his eating habits and allows to formulate more relevant questions about their diet.

Thus, the low socio-economic level, the absence or the lack of nutritional culture of studied population, influences considerably the mode and the conditions of feeding. Some patients have low incomes and live in large families, with average food hygiene and a few

varied diet. However, their Mediterranean-type diet leads to levels of total cholesterol and triacylglycerols at the upper limit of normal, compared to total cholesterol and triacylglycerols levels in industrialized countries (O'hrare et al, 2002; Stone et al, 2014).

Our population of 223 men and 225 women. The interrogation showed that women did not smoke. For men, all smokers consumed an average of one pack a day.

The impact of nutrition on cardiovascular diseases, and in particular on ischemic heart disease, involves serum lipid levels and other risk factors (obesity, diabetes, smoking, sedentary lifestyle), the genesis or consequences are influenced by nutritional factors.

Mediterranean diet in some patient groups maintains cholesterol and triacylglycerols at the upper limit of the usual values. This diet should protect against any risk of coronary heart disease, as many authors agree (Fung et al, 2009 ; De Pergola and D'Alessandro, 2018 ; Martínez-González et al, 2019). In addition, identification of an individual relationship between eating behavior and illness does not mean that there is a causal relationship between food factor and disease. Patients in this study have a balanced energy intake despite a diet very few varied. In addition, these patients do not follow a particular diet despite their pathology. It seems that other risk factors (obesity, diabetes, smoking, sedentary lifestyle) contribute to a large extent in the development of cardiovascular disorders in these subjects.

Conclusion

This study has shown that about half of the study population is characterized by a low socio-economic level. Caloric distribution of food ration during different meals of the day is criticizable compared to recommended distribution. A predominance of animal protein and saturated fatty acid intake is noted in the majority of patient groups, compared to Mediterranean diet. The proportion of complex carbohydrates is high and higher than that of the Mediterranean diet in the majority of patient groups. Dietary cholesterol intake largely exceed that of Mediterranean diet in most patients. Dietary fiber intake is low in all patients of this study. The most consumed foods in the majority of patients are red meat, poultry and eggs. The least consumed foods are fish, bread, fruits and vegetables, milk and dairy products. In addition to the risk factors observed in patients in this study such as obesity, diabetes, smoking and sedentary lifestyle, this mode of feeding can contribute to the development of cardiovascular disorders in these subjects. However, some individual nutritional advice would be beneficial for each patient. These advices are, however, more preventive than curative. Thus, it is necessary to reduce the consumption of cholesterol-rich foods without totally excluding them, to prefer unsaturated fats to saturated fats, to take a little more milk and dairy products, to eat more fish, to moderate soda intakes, to moderate coffee consumption and quit smoking, moderate sugary drinks (lemonade) and take more water and practice daily and regular exercise. This advice is most often aimed at obese patients, but hypertensive and diabetic patients can also follow. Lastly, a better caloric distribution of food ration during meals is advised.

References

1. Alix E. (2007). Carences nutritionnelles des sujets âgés en institution. *Feuillets de biologie*. 48 (276): 33-40.
2. Antti A. (1993). The effect of coffee on serum lipids and its clinical considerations. *Cardiovascular risk factors*. 3(4): 239-243.
3. Apfelbaum M.; Forrat C. et Nillus P. (1989). Abrégé de diététique et nutrition. *Ed. MASSON (2ème édition)*. 474p.
4. Bruckert E.; Emmerich J; Thomas D.; Charpak Y.; Bichon L. et CLergeot A. (1994). Influence d'une campagne d'information sur les facteurs de risque cardiovasculaires dans une ville Française (Epernon ville d'étude). *Rev.Epidem. et Santé publ*. 42(2): 128-137.
5. Craplet C. & Basdevant A. (1990). Hypertriglycéridémie. Enquête étiologique et orientations thérapeutiques. *Cah.Nutr.Diet*. 5: 355-357.
6. Cubeau J. & Pequignot F. (1991). Utilisation des mesures ménagères dans les enquêtes faisant appel à la mémoire. *Cah. Nut. Diet.*;26:4.
7. De Pergola G. and D'Alessandro A. (2018). Influence of Mediterranean Diet on Blood Pressure. *Nutrients*.; 10(11): 1700.
8. Fogli-Cawley J.J.; Dwyer J.T.; Saltzman E.; McCullough M.L.; Troy L.M.; Meigs J.B. and Jacques P.F. (2007). The 2005 Dietary Guidelines for Americans and risk of the metabolic syndrome. *Am. J. Clinical Nutrition*. 86: 1193 - 1201.
9. Fung T. T.; Rexrode K. M.; Mantzoros C. S.; Manson J.E.; Willett W. C. and Hu F. B. (2009). Mediterranean Diet and Incidence of and Mortality From Coronary Heart Disease and Stroke in Women. *Circulation*.; 119:1093-1100.
10. Getz G.S. and Reardo N C.A. (2007). Nutrition and Cardiovascular Disease. *Arteriosclerosis, Thrombosis, and Vascular Biology*. 27:2499.
11. Hata Y. & Nakajima K.J. (2000). Life-style and serum lipids and lipoproteins. *Atheroscler. Thromb.*; 7(4):177-97.

12. Jee S.H.; He J.; Appel L.J.; Whelton P.K.; Suh I.; and Klag M.J. (2001). Coffee consumption and serum lipids: a meta-analysis of randomized controlled clinical trials. Am. J. *Epidemiol*. 153(4):353-62.
13. Jun S.; Thuppal S.V.; Maulding M.K.; Eicher-Miller H.A.; Savaiano D.A. and Bailey R.L. (2018). Poor Dietary Guidelines Compliance among Low-Income Women Eligible for Supplemental Nutrition Assistance Program-Education (SNAP-Ed). *Nutrients*. 10(3): 327-337.
14. KEYS A. (1995). Mediterranean diet and the public health: personal reflections. *Am. J. Clin. Nutr*. 61 (suppl6): 1321-23.
15. Lange E.; Krusiec J. and Kulik A. (2011). Selected nutritional behaviors of overweight women and men. *Probl. Hig. Epidemiol*. 92(3): 580-582.
16. Li M.; Ho K.; Hayes M. and Ferruzzi M.G. (2019). The Roles of Food Processing in Translation of Dietary Guidance for Whole Grains, Fruits, and Vegetables. *Annu. Rev. Food Sci. Technol*.; 25(10):569-596.
17. Lichtenstein A.H.; Appel L.J.; Brands M.; Carnethon M.; Daniels S.; Franch H.A.; Franklin B.; Kris-Etherton P.; Harris W.S.; Howard B.; Karanja N; Lefevre M.; Rudel L.; Sacks F; Van Horn L.; Winston and Wylie-Rosett J. (2006). Diet and Lifestyle Recommendations Revision 2006: A Scientific Statement From the American Heart Association Nutrition Committee. *Circulation*.114: 82 - 96.
18. Luc G.; Lecerf J.M.; Bard J.M.; Hachulla E.; Fruchart J.C. and Devulder B. (2006). Cholestérol et athérosclérose. *Edition MASSON. Collection abrégés*. Paris. 246p.
19. Mares-Perlman J.A.; Klein B.E.; Klein R.; Ritter L.L.; Fisher M.R. and Freudenheim J. L. (1992). A diet history questionnaire ranks nutrient intakes in middle-aged and older men and women similarly to multiple food records. *J. Nutr*. 123:489–501.
20. Martinez-Gonzalez M.Á. & Martin-Calvo N. (2013). The major European dietary patterns and metabolic syndrome. *Rev. Endocr. Metab. Disord*. 14(3):265-71.
21. Martínez-González M. Á.; Gea A. & Ruiz-Canela M. (2019). The Mediterranean Diet and Cardiovascular Health A Critical Review. *Circ Res*. 124:779-798.
22. Musse N. & Mejean L. (1991). Les enquêtes alimentaires chez l'homme = Dietary surveys in man. *Cahiers de nutrition et de diététique*. 26 (4): 238-240.
23. Nettleton J. A.; Brouwer I. A.; Geleijnse J. M. and Hornstra G. (2017). Saturated Fat Consumption and Risk of Coronary Heart Disease and Ischemic Stroke: A Science Update. *Ann Nutr Metab*. 70(1): 26–33.
24. Naidoo N.; Chen C.; Rebello S. A.; Speer K.; Tai E. S.; Lee J.; Buchmann S.; Koelling-Speer I. and Van Dam R. M. (2011). Cholesterol-raising diterpenes in types of coffee commonly consumed in Singapore, Indonesia and India and associations with blood lipids: A survey and cross sectional study. *Nutr J*. 10: 48.
25. O'hrare A.; Hsu C.Y. Bacchetti P. and Johansen K. (2002). Peripheral vascular disease risk factors among patients undergoing haemodialysis. *J. Am. Soc. Nephrol*. 13: 497-503.
26. Renaud S.; De Lorgeril M.; Delaye J. and Guidollet J. (1995). Cretan mediterranean diet for prevention of coronary heart disease. *Am.J.Clin.Nutr*. 61 (suppl): 1360S-7S.
27. Retelny V.S.; Neuendorf A. and Roth J.L. (2008). Nutrition protocols for the prevention of cardiovascular disease. *J. Nutr. Clin. Pract*. 23(5):468-76.
28. Schlienger J.-L.; Perrin A.-E.; Vinzio S. and Simon C. (2003). Syndrome plurimétabolique = Dietary treatment of hypertriglyceridemic. *Cahiers de nutrition et de diététique*. 38(2):130-134.
29. Siri-Tarino P. W.; Sun Q.; Hu F. B. and Krauss R. M. (2010). Saturated fat, carbohydrate, and cardiovascular disease. *Am. J. Clinical Nutrition*. 91(3): 502 - 509.
30. Souci S.W.; Fachmann W. and Kraut H. (2000). La composition des aliments. Tableaux des valeurs nutritives, 6th ed. Stuttgart: *CRC Press & Medpharm Scientific Publishers*. 5-1182.
31. Stone N. J.; Robinson J. G.; Lichtenstein A. H.; Merz C. N. B.; Blum C.B.; Eckel R. H.; Goldberg A. C.; Gordon D. and D. Levy. (2014). 2013 ACC/AHA Guideline on the Treatment of Blood Cholesterol to Reduce Atherosclerotic Cardiovascular Risk in Adults. A Report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines. *Circulation*. 129:S1–S45.
32. Tanasescu M.; Cho E.; Manson J.E. and Hu F.B. (2004). Dietary fat and cholesterol and the risk of cardiovascular disease among women with type 2 diabetes. *Am. J. Clinical Nutrition*. 79(6): 999-1005.
33. Thelle D.S.; Arnesen E. and Forde O.H. (1983). The Tromso heart study. Does coffee raise serum cholesterol? *N. Eng. J. Med*. 308: 1454-1457.

34. Tremolière J.; Serville Y.; Jacotot R. et Dupin H. (1984). Les bases de l'alimentation. *Tome I. Ed. TSF*. Paris (10ème édition). 554p.
35. Woo K.S.; Chook P.; Raitakari O.T. and McQuillan B. (1999). Westernisation of Chinese adults and increased subclinical atherosclerosis. *Arterioscler. Thromb. Vasc. Biol*. 19: 2487-2493.
36. Yoo S.; Nicklas T.; Baranowski T.; Zakeri I.; Yang S.; Srinivasan S.R. and Berenson G.S. (2004). Comparison of dietary intakes associated with metabolic syndrome risk factors in young adults: the Bogalusa Heart Study. *Am. J. Clinical Nutrition*. 80:841-848.

9/25/2019