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Dietary intake, adequacy of energy and nutrients in older working people

Consumo dietario, adecuación de energía y nutrientes para personas mayores que trabajan

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Abstract

As the population ages, their diet changes and their energy and nutrient intake tends to decrease, affecting their body composition. The objective of this study was to evaluate the association between body composition, energy intake, and macro and micronutrient intake in people over 50 who continue in work activities. 82 people, from the Guadalajara Metropolitan Area in Jalisco, Mexico, were the participants. Questionnaires were applied to collect sociodemographic, physical activity and food consumption (FCFC) data, as well as anthropometric and body composition measures. A multivariate linear regression analysis was performed to associate the percentage of body fat with caloric intake and the intake of micro and macronutrients. The results showed that high intake of energy, carbohydrates, cereals with fat, food of animal origin and oils with protein are related to a high percentage of body fat (R^2 = 0.42, *p-value* = 0.001). From this study, it is necessary to reconsider the nutrition strategies of older people. An inadequate diet could influence their nutritional status and health. It is suggested to attend the diet for this population group.

Keywords: Dietary intake, physical activity, energy and nutrients, Mexican older people.

Resumen

Conforme la población envejece, su alimentación se modifica y su ingesta de energía y nutrimentos tiende a disminuir afectando su composición corporal. El objetivo de este estudio fue evaluar la asociación entre la composición corporal, ingesta de energía, macro y micronutrientes en personas mayores de 50 años que continúen en actividades laborales. Los participantes fueron 82 personas, de la Zona Metropolitana de Guadalajara, Jalisco, México. Se aplicaron cuestionarios para recabar datos sociodemográficos, actividad física y consumo de alimentos (CFCA) y se realizaron medidas antropométricas y de composición corporal. Se realizó un análisis de regresión linear multivariable para asociar el porcentaje de grasa con la ingesta de micro y macro nutrientes, así como la ingesta calórica. Los resultados demostraron que la ingesta elevada de energía, hidratos de carbono, cereales con grasa, alimentos de origen animal y de aceites con proteína se relaciona con un elevado porcentaje de grasa corporal (R^2=0.42, *p-value* =0.001). A partir de este estudio es necesario revalorar las perspectivas desde las cuales se aborda el manejo nutricional de las personas mayores. Una dieta inadecuada podría influir en su estado nutricional y su salud. Se sugiere atención a la dieta en este grupo de población.

Palabras clave: Ingesta dietética, actividad física, energía y nutrientes, personas mayores.

Introduction

As age increases, there are a large number of factors that change, including diet, therefore affecting energy consumption and macro and micronutrients (Wellman & Kamp, 2013).

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The intake of energy and nutrients has frequently been reported to be below recommended levels in elderly people (Engelheart & Akner, 2015). Some authors have suggested that these changes start from the age of 50 (Maila, Audain, & Marinda, 2019). Loss of muscle mass begins around age 50, accelerating after age 60. Fat mass continues to increase until around age 75 (Kyle, Genton, Hans, Karsegard, Slosman & Pichard, 2001).

In Mexico there is little evidence regarding the consumption of nutrients by older adults, particularly at 50 years or older (De la Cruz-Góngora, Martínez-Tapia, Cuevas-Nasu, Flores-Aldana, & Shamah-Levy, 2017). So far, the available studies tend to focus on the nutritional problems of older adults, in relation to the risks of malnutrition based on the Body Mass Index (BMI) and nutrient deficiencies (De la Cruz-Góngora et al., 2017; Shamah-Levy et al., 2008). However, Mexico is a country where 75.2% of the population over 20 years of age are overweight and obese (Encuesta Nacional de Salud y Nutrición [ENSANUT], 2018).

In this context, the availability of hypercaloric and ultra-processed foods is high, so people of all ages have access to them (Davis, Keeney, & Ramsay, 2017). Likewise, currently accelerated lifestyles and excessive workloads promote this type of intake and have also led to high rates of sedentary lifestyle (Ortiz-Hernández, Delgado-Sánchez, & Hernández-Briones, 2006).

However, today, Mexico ranks 37th out of 43 countries evaluated regarding the quality of retirement (Hernández, 2018); and although there are various laws or pension systems in the country that allow retirement from work activities from a certain age or with respect to years of service (Cámara de Diputados, 2017; Cantú, 2015), economic need is a factor that has led older people up to 74 years to continue in work activities (Ramos, 2016; Rodríguez, 2018). This may be a determining factor in the lifestyle of adults over the age of 50, taking into account that this age is considered in Mexico as the onset of aging (Aguila, Díaz, Manqing Fu, Kapteyn, & Pierson, 2011). Above all, they represent 19.58% of the 119.5 million inhabitants in Mexico (Instituto Nacional de Estadísticas y Geografía [INEGI], 2015). Those lifestyles include physical activity and energy and nutrient intake. However, older adults may be more susceptible to complications from eating habits. There are adverse social and psychological factors such as poverty, isolation, difficulty buying and preparing meals; cognitive impairment, depression, among others, that can affect the nutritional characteristics of the elderly population (Saka, Kaya, Osturk, Erten, & Karan, 2010).

In this context, it is essential to carry out research that relates the adequate intake of energy and nutrients with the nutritional status of people over 50 years of age. Despite the fact that the aging of the population can be considered a success of public health policies and socioeconomic development; it is also a challenge for society, which must adapt to it in order to maximize the health and functional capacity of the elderly; as well as their social participation and safety (Organización Panamericana de la Salud [OPS]/Organización Mundial de la Salud [OMS], 2004). Due to the above, the objective of this work was to evaluate the association between body composition and energy intake and macro and micronutrient intake in people over 50 who continue in work activities.

Method

Participants

A quantitative investigation was carried out, where 82 participants were evaluated; people over 50 years of which 46 men and 36 women (56.1% and 43.9% respectively). The sample represents the people who voluntarily agreed to participate in the study, who completed all the instruments and who identified themselves as workers. Data collection was carried out in the Guadalajara Metropolitan Area, Jalisco, Mexico and was carried out in 2 state government agencies.

Instruments

Firstly, a questionnaire was applied to investigate sociodemographic data such as income and occupation, in addition, it was asked about the type, frequency, duration and intensity of physical activity. Options were proposed for types of activity such as walking, running, cycling, swimming, weight training, exercise classes such as aerobics or dancing, among others. In addition, participants were allowed to report the particular type of activity they carry out, if they are not among the options. Furthermore, participants were allowed to report some type of activity that they carry out, if it is not described in the options. Secondly, weight and body components were calculated using an Omron® brand bioimpedance scale (HBF-511T-E / HBF-511B-E). The waist circumference was measured, with a Lufkin® brand metal tape measure, just midway between the lower rib and the iliac crest, at the end of a normal expiration. Hip circumference was measured at its most prominent level. Height was measured with a Smartmed® brand stadiometer. Lastly, the collection of intake data was performed using an adapted version of the Food Consumption Frequency Questionnaire (FCFC) by Macedo-Ojeda, Marquez-Sandoval, Fernández-Ballart, and Vizmanos (2016), which is validated for the Mexican population.

Procedure

The monthly income of the participants was evaluated based on the ranges proposed by the Mexican Association of Market Research Agencies (In Spanish: Asociación Mexicana de Agencias de Investigación de Mercado [AMAI], 2018). Occupation was classified according to The

National Occupational Classification System (SINCO) (INEGI, 2011), which was categorized according to Lares-Michel et al. (2018) at low, medium and high occupational level. At the high level, officials, directors and chiefs, professionals and technicians, auxiliary workers in administrative activities and merchants were included. On the other hand, employees in sales and sales agents, workers in personal services and surveillance, workers in agricultural activities, livestock, forestry, hunting and fishing; artisanal workers, industrial machinery operators, assemblers, drivers and transport drivers and housewives, were placed at the middle level and at the low-level workers were included in elementary and support activities (Lares-Michel et al., 2018).

For anthropometric data, based on weight and height, the Body Mass Index (BMI) was evaluated, dividing the weight by the square of the height (WHO, 2020). For adults between the ages of 50 and 59, the WHO (2020) classification was used. For adults over 60 years of age, the OPS/OMS (2004) standard classification for older adults was used. All measurements were made by certified nutritionists following the techniques of Suverza and Haua (2010). The cut points of the fat mass were determined according to Pi-Sunyer (2000). Muscle mass percentages and visceral fat levels were determined according to the bioimpedance equipment user manual (OMROM, 2017).

To evaluate the intake, 245 foods were included, which were divided into 17 groups. These were: milks (including yogurt), cheeses, animal foods (meat and by-products of beef, pork, chicken, fish, shellfish, and eggs); vegetables, fruits, oils without protein (vegetable oils, avocado), oils with protein (nuts), legumes (beans, lentils, etc.); non-fat cereals (corn tortilla, wheat bread, potatoes, etc.), cereals with fat (potato chips, sweet bread), sugars with and without fat (chocolates and caramels were combined); fast food (pizza, hamburgers, etc.), Mexican food (pozole, enchiladas, etc.), condiments (pepper, etc.), non-alcoholic beverages, alcoholic beverages and others such as supplements or multivitamins and artificial and natural sweeteners. Subsequently, the original consumption frequency options proposed in the FCFC were expanded and ungrouped (Macedo-Ojeda et al., 2016), in order to identify a more accurate consumption frequency. Finally, 15 different possible frequencies of consumption were obtained, which ranged from 1 to 5 times a year to 7 times a week. Which in turn were converted to monthly frequencies. Based on this, the rations established in the FCFC were multiplied or divided by the corresponding frequencies to obtain grams or milliliters consumed per day. Energy and nutrient intake was calculated based on Mexican food composition tables (Ledesma Solano, Chávez Villasana, Peréz-Gil, Mendoza Martínez, & Calvo Carrillo, 2010; Pérez Lizaur, Palacios González, Castro Becerra & Flores Galicia, 2014). Macro and micronutrients were included. Nutrient adaptation was carried out with the tables of reference nutritional values of vitamins and inorganic nutrients for people over 51 in Mexico (Gutiérrez-Robledo, Ruiz-Arregui, & Velázquez, 2008). The unidentified values were obtained from other sources, for example, the recommended intake of potassium was obtained from the WHO (2019) and the suggested intake of fiber, iron and ethanol were obtained from Macedo-Ojeda et al. (2016). The adequacy of energy intake was made with the Valencia (2008) tables. For the adequacy of carbohydrates, 55% of the estimated average energy requirement was used as a reference; 15% for preteins; 30% for lipids, saturated fats (7%), Polyunsaturated (8%), Monoinsaturated (15%) and cholesterol (<300 mg), (De la Cruz-Góngora et al., 2017; Food Drugs Administration [FDA], 2020; Macedo-Ojeda et al., 2016).

For physical activity, this was classified as aerobic and anaerobic. As a general classification, the International Physical Activity Questionnaire [IPAQ], 2016) was used, which includes three categories. These were adequate regarding minutes per activity session. The first, which is low physical activity, was considered when a person performs physical activity less than 3 times per week. The second corresponds to moderate physical activity that includes any of the following 3 criteria: 3 or more days of vigorous activity of at least 20 minutes per day or 5 or more days of moderate intensity activity or walking at least 30 minutes per day or 5 or more days of any combination of moderate to vigorous intensity walking. Finally, the third category was classified as high physical activity, which is determined with any of the following 2 criteria: vigorous intensity activity for at least 3 days at least 60 minutes, or 7 or more days with any combination of walking, moderate or vigorous intensity for at least 60 minutes per day.

Statistical analysis

First, a data normality test was performed using the Shapiro-Wilk test. In the same way, a Welch correction was applied in all the t-tests for the data with unequal variance. Then, descriptive analyzes of sociodemographic and physical activity data were performed; also, of those referring to anthropometric data, body composition, energy and nutrient intake. Subsequently, a chi-square test (X^2) was performed between anthropometric data and body composition data according to sex and referring to the prevalence proportions of nutritional status. Student's t-tests were performed among these data. Also, t-test between men and women regarding intake of food groups, energy and nutrients. Afterwards, an adaptation of the energy and nutrients was made with respect to the reference values of each one, according to the age and sex. A Student's t-test was also applied between the adequacy values. Finally, a multivariate linear regression analysis for relationship between fat percentage and some micronutrients, macronutrients and dietary intakes was performed. A *p-value* < 0.05 was considered significant. The analyzes were carried out with the STATA V15 statistical software.

Ethics considerations

This study was approved by the Ethics Committee of the University of Guadalajara CEICUC (registration number CEICUC-PGE-004). Likewise, the principles of the Helsinki declaration were followed, and all the participants signed an informed consent before being included in the study.

Results

Table 1
Sociodemographic and physical activity characteristics of the participants

Mean age	**59 ± 7 years**	
	n	**%**
Sex		
Female	36	43.9
Male	46	56.1
Occupational level		
High	65	79.2
Medium	12	14.6
Low	5	6.1
Monthly income		
0-2699	4	4.8
2700-6799	8	9.7
6800-11599	20	24.3
11600-34999	48	58.54
>35000	2	2.4
Physical Activity		
Low	25	30.4
Moderate	42	54.8
High	12	14.6
Physical Activity type		
Aerobic	75	91.46
Anaerobic	7	8.54

Table 1. where the characteristics of the population are presented, shows that 79.2% were part of the high occupational level, that is, they performed administrative activities, such as professionals, officials or bosses. Only 6% corresponded to employees in elementary and support activities, such as cleaning personnel. In the same way, it is observed that 58.54% reported income between $ 11,600 and $ 34,999 pesos per month. Only 30.4% of the population was considered sedentary or with low physical activity, while 54.8% carried out activity with moderate regularity. Of these activities, 91.46% correspond to aerobic physical activity, such as walking, jogging, swimming, cycling and dancing.

Anthropometric data are presented in Table 2. The average BMI of the population was 29.33 ± 4.32 and there were no significant variations regarding sex. In the case of the percentage of fat, an average of 36.69 ± 8.06 was identified; however, the percentage of fat in women was statistically higher, with an average of 43.33 ± 6.10, in contrast to 31.50 ± 5.02 in men (*p-value* = 0.000 and *d Cohen's* = 2.11). The average percentage of muscle in the population was 26.95 ± 4.21, however, statistically it was higher for men with an average percentage of 29.88 ± 2.99 compared to 23.29 ± 2.14 in women (*p-value* = 0.000 and *d Cohen's* = 2.44). The average visceral fat was 12.48 ± 3.98 and was higher in men than in women (14.51 ± 3.73 vs 10.05 ± 2.73, respectively), (*p-value* = 0.000 and *d Cohen's* = 1.33). The same has happened with the waist circumference whose average was 98.46 ± 12.11 centimeters. In women it was 91.63 ± 11.95 while in men it was 103.81 ± 9.28 centimeters (p-value = 0.000 and *d Cohen's* = 1.14). In metabolic age and waist circumference there were no statistically significant differences. Regarding the proportions of prevalence of low weight, normal weight, overweight and obesity, the X^2 test only identified differences between men and women corresponding to waist circumference (See Table 2).

The analysis of dietary intakes by food groups and separated by sex (see table 3) shows that the consumption of milk (including yogurt, *p-value* = 0.023 and *d Cohen's* = 0.29), cereals with fat such as sweet breads and potato chips (*p-value* = 0.022 and *d Cohen's* = 0.41), and alcoholic beverages (*p-value* = 0.014 and *d Cohen's* =0.46) was higher in men than in women. In women, the consumption of protein oils such as walnuts, peanuts and almonds (p-value = 0.000 and *d Cohen's* = 0.39) and of oils without protein (*p-value* = 0.030 and *d Cohen's* = 0.30), was statistically higher than that of men. In the case of fruits and vegetables, although there was no statistically significant difference, it was possible to identify a trend of higher intake by women than by men, that is, 345.4 ± 44.5 grams of vegetables / day and 406.9 ± 46.8 of fruits / day vs. 270.6 ± 24.8 grams of vegetables / day and 371.4 ± 0.09 grams of fruits / day respectively.

Table 4 shows the intake of energy, nutrients and their adequacy with respect to the reference values for each one. In general, both men and women meet 100% of the adequacy of almost all nutrients and even some are significantly exceeded, such as saturated fatty acids. Caloric intake was higher in women than in men, so the percentage of fitness was higher (*p-value* = 0.000 and *d Cohen's* = 0.07). In the case of fiber, women exceeded the adequacy percentage, while men did not complete it (*p-value* = 0.0238 and *d Cohen's* = 0.16). Lipid intake and its adequacy was also higher in women (*p-value* = 0.0232 and *d Cohen's* = 0.25). Iron consumption was higher in women; however, the fitness percentage was higher in men (*p-value* = 0.0007 and *d Cohen's* = 0.07). Magnesium intake was higher in women (*p-value* = 0.0036 and *d Cohen's* = 0.02). Ethanol was considerably higher in men than in women. While men have an average adequacy of 44.16 ± 60.94%, women reach only 18.01 ± 26.59% (*p-value* = 0.018 and *d Cohen's* = 0.50). Nutrients that were statistically different between sexes regarding amounts were monounsaturated fatty acids (p-value = 0.003 and *d Cohen's* = 0.39), pyridoxine (p-value = 0.046 and *d Cohen's* = 0.21) and ethanol (p-value = 0.004). According to the results, only the adequacy of carbohydrates, fiber, calcium, selenium and

Table 2
Descriptive and comparative analysis between anthropometric and body composition characteristics of the participants by sex

Variables	Total n=82		Female n=36		Male n=46		d Cohen's	*p-value* *t*-test	*p-value* X^2
	(Mean ± SD)	n (%)	(Mean ± SD)	n (%)	(Mean ± SD)	n (%)			
BMI	29.33 ± 4.32		29.16 ± 5.07		29.47 ± 3.69				
Under weight	21.8 ± 0.14	2 (2.44)	21.7	1 (2.7)	21.9	1 (2.1)	0.06	0.752	0.497
Normal weight	24.88 ± 1.97	21 (25.6)	23.99 ± 1.81	11 (30.5)	25.87 ± 1.70	10 (21.7)			
Overweight	28.90 ± 1.25	37 (45.1)	28.51 ± 1.51	12 (33.3)	29.09 ± 1.09	25 (54.3)			
Obesity	34.99 ± 2.62	22 (26.8)	35.17 ± 2.24	12 (33.3)	34.77 ± 3.13	10 (21.7)			
Fat percentage	36.69 ± 8.06		43.33 ± 6.10		31.50 ± 5.02				
Normal	20.5	1 (1.2)	-	0 (0)	20.5	1 (2.1)	2.11	0.0000*	0.937
Overweight	28.1 ± 5.21	6 (7.3)	32.83 ± 0.87	3 (8.3)	23.36 ± 0.35	3 (6.5)			
Obesity	37.60 ± 7.68	75 (91.4)	44.29 ± 5.42	33 (91.6)	32.34 ± 4.38	42 (91.3)			
Muscle mass	26.95 ± 4.21		23.29 ± 2.14		29.88 ± 2.99				
Low	26.89 ± 4.34	58 (70.7)	21.62 ± 1.38	18 (50)	29.32 ± 2.77	40 (86.9)	2.44	0.0000*	0.840
Normal	27.09 ± 3.97	24 (29.2)	24.97 ± 1.25	18 (50)	33.46 ± 1.58	6 (13.04)			
Metabolic age	64.2 ± 1.08		64.3 ± 1.7		64.2 ± 1.3		0.24	0.9203	0.939
Visceral fat	12.48 ± 3.98		10.05 ± 2.73		14.51 ± 3.73				
Normal	7.68 ± 1.28	22 (26.8)	7.56 ± 1.31	16 (44.4)	8 ± 1.26	6 (13.04)	1.3	0.0000*	0.401
Excess	14.33 ± 2.98	60 (73.1)	12.05 ± 1.73	20 (55.5)	15.56 ± 2.79	40 (86.96)			
Waist circumference	98.46 ± 12.11		91.63 ± 11.95		103.81 ± 9.28				
Normal	77.33 ± 7.71	6 (7.3)	72.5 1.73	4 (11.1)	87 ± 2.82	2 (4.3)	1.14	0.0000*	0.042*
High	100.13 ± 10.76	76 (92.6)	94.02 ± 10.39	32 (88.8)	104.57 ± 8.73	44 (95.6)			
Hip circumference	104.4 ±1.4		102.9 ±3.2		105.5±0.8		0.18	0.3937	0.435

Note: BMI: Body Mass Index. Statistical significance was considered at *p-value* ≤ 0.05. with Welch correction.

folic acid did not meet 100% of the recommended intake. However, the values were generally high, since the lowest level of adequacy was 80.76% with respect to folic acid in women. However, energy intake had an adequacy of 143.33% in women and 112.78% in men. In addition, the intake of saturated fatty acids was alarming, since it represented 442.33% and 436.98% of the recommendation, in women and men, respectively.

To meet the main objective of the study, a multivariate linear regression was performed between the percent-

Table 3
Comparison of dietary intake by food groups between sexes

Variables	Female n=36 (Mean ± SD)	Male n=46 (Mean ± SD)	d Cohen's	p-value
Milks (includes yogurt)	155.4 ± 28.7	213.9 ± 31.03	0.29	0.023*
Cheeses	22.3 ± 3.6	29.68 ± 10.3	0.13	0.271
Animal origin foods (meats, fish and eggs)	190.5 ± 25.5	174.3 ± 14.5	0.12	0.563
Vegetables	345.4 ± 44.5	270.6 ± 24.8	0.33	0.125
Fruits	406.9 ± 46.8	371.4 ± 0.09	0.21	0.313
Protein Oils (i.e. nuts)	17.9 ± 5.2	8.7 ± 1.4	0.39	0.000*
Legumes	91.8 ± 12.6	98.8 ± 10.7	0.08	0.673
Cereals without fat	221.9 ± 21.3	237.7 ± 21.7	0.11	0.467
Fatty cereals	33.8 ± 4.3	47.7 ± 5.9	0.41	0.022*
Oils without protein	34.1 ± 3.8	27.4 ± 2.9	0.30	0.030*
Sugars with and without fat	49.5 ±6.5	45.3 ± 4.8	0.11	0.389
Fast food	56.0 ± 10.5	55.8 ± 5.8	0.03	0.979
Mexican food	202.3 ± 28.9	197.4 ± 18.6	0.03	0.794
Condiments	5.8 ± 0.9	4.7 ± 0 .7	0.17	0.206
Drinks	1734.1 ± 192.03	1974.09 ± 199.9	0.18	0.236
Alcoholic drinks	23.9 ± 6.7	61.8 ± 14.8	0.46	0.014*
Others	3.01 ± 1.2	3.10 ± 1.11	0.01	0.930

Food group consumption is presented as mean ± SD; *p-value* <0.05 is significant. with Welch correction

Table 4
Descriptive analysis of nutrient intake and adequacy and comparison between sexes

Variables	Female n=36 (Mean ± SD)	Adequacy % (Mean ± SD)	Male n=46 (Mean ± SD)	Adequacy % (Mean ± SD)	d Cohen's	p-value	*p*-value for adequacy
Energy (Kcal)	2484.6 ± 148.7	143.33 ± 55.35	2416.6 ± 137.5	112.78 ± 46.32	0.07	0.623	0.000*
Fiber (g)	31.8 ± 2.3	106.12 ± 46.61	29.6 ± 1.9	84.58 ± 38.02	0.16	0.268	0.0238*
Carbohydrates (g)	323.6 ± 21.5	94.11 ± 13.85	330.3 ± 19.6	99.80 ± 13.53	0.04	0.733	0.0653
Protein (g)	104.5 ± 6.4	115.23 ± 23.19	99.7 ± 6.03	110.23 ± 16.19	0.11	0.431	0.2540
Lipids (g)	91.1 ± 6.3	109.61 ± 17.73	81.5 ± 5.2	100.81 ± 16.53	0.25	0.073	0.0232*
Saturated fatty acids (g)	27.2 ± 2.08	442.33 ± 159.04	25.08 ± 1.8	436.98 ± 92.31	0.17	0.247	0.8490
Monounsaturated fatty acids (g)	25.6 ± 1.9	186.51 ± 29.75	21.2 ± 1.3	175.179 ± 20.05	0.39	0.003*	0.0430*
Polyunsaturated fatty acids (g)	18.5 ± 2.1	250.89 ± 133.38	17.3 ± 2.2	274.76 ± 261.17	0.08	0.618	0.6190
Cholesterol (mg)	349.5 ± 32.4	116.53 ± 64.91	378.2 ± 28.4	126.06 ± 64.36	0.14	0.318	0.5089
Calcium (mg)	1180.2 ± 68.8	98.35 ± 34.42	1307.7 ± 105.9	108.97 ± 59.85	0.22	0.234	0.3456
Phosphorus (mg)	1527.2 ± 94.09	218.17 ± 80.65	1520.7 ± 96.8	217.24 ± 93.80	0.10	0.947	0.9624
Iron (mg)	24.09 ± 1.4	114.74 ± 41.80	23.9 ± 1.4	159.57 ± 67.00	0.09	0.918	0.0007*

Variables	Female n=36 (Mean ± SD)	Adequacy % (Mean ± SD)	Male n=46 (Mean ± SD)	Adequacy % (Mean ± SD)	d Cohen's	p-value	*p*-value for adequacy
Magnesium (mg)	472.2 ± 31.1	181.65 ± 71.83	467.6 ± 30.7	137.55 ± 61.29	0.02	0.883	0.0036*
Sodium (mg)	2691.6 ± 247.9	168.22 ± 92.96	2387.1 ± 234.5	151.78 ± 82.39	0.18	0.202	0.3990
Potassium (mg)	4516.05 ± 288.1	128.6626 ± 49.26	4409.7 ± 272.5	125.63 ± 52.66	0.05	0.698	0.7910
Zinc (mg)	14.2 ± 0.9	129.32 ± 52.93	13.7 ± 0.8	124.63 ± 51.80	0.08	0.562	0.6880
Selenium (mg)	49.3 ± 6.10	102.77 ± 76.37	44.5 ± 3.8	92.80 ± 54.08	0.15	0.220	0.4912
Vitamin A (µg RE)	833.02 ± 70.3	146.14 ± 74.05	839.5 ± 81.2	115.00 ± 75.47	0.11	0.936	0.0652
Ascorbic acid (mg)	321.6 ± 35.4	428.88 ± 283.35	282.2 ± 23.3	335.98 ± 188.52	0.21	0.487	0.0792
Thiamine (mg)	2.3 ± 0.15	261.83 ± 104.24	2.5 ± 0.20	255.86 ± 138.63	0.16	0.212	0.8304
Riboflavin (mg)	2.5 ± 0.14	278.61 ± 94.27	2.8 ± 0.19	257.39 ± 118.88	0.24	0.092	0.3835
Niacin (mg)	22.7 ± 1.45	189.70 ± 72.61	21.2 ± 1.3	163.70 ± 72.65	0.15	0.314	0.1117
Pyridoxine (mg)	11.6 ± 1.6	893.99 ± 762.79	9.9 ± 0.8	763.60 ± 445.20	0.21	0.046*	0.3357
Folic acid (µg)	371.5 ± 27.3	80.76 ± 35.72	376.8 ± 27.6	81.93 ± 40.77	0.02	0.846	0.8923
Cobalamin (mg)	6.8 ± 0.63	189.98 ± 106.26	7.4 ± 0.6	207.60 ± 128.89	0.14	0.329	0.5096
Ethanol (g)	2.5 ± 0.63	18.01 ± 26.59	6.3 ± 1.2	44.16 ± 60.94	0.50	0.004*	0.0188*

Energy and nutrients intake is presented as mean ± SD; *p-value* <0.05 is significant. with Welch correction

age of fat as a dependent variable and all the micro and macronutrients represented in tables 3 and 4 as predictor variables. However, when performing the variance inflation factor (VIF) test to quantify the intensity of multicollinearity, all variables with a value greater than 10 were eliminated. The final model allowed associating the percentage of fat with total energy, fiber consumption, carbohydrates, proteins; as well as lipids, foods of animal origin, oils with protein, cereals with fat and with Mexican food, calcium and magnesium. The model presents an R^2 of 0.42 which is considered large and a significant *p-value* of 0.001 (Table 5). In particular, a significant relationship was found between the percentage of fat and energy intake (*p-value* = 0.026), carbohydrates (*p-value* = 0.047), proteins (*p-value* = 0.043), lipids (*p-value* = 0.043), milk (*p-value* = 0.004), animal foods (*p-value* = 0.010), oils with protein (*p-value* = 0.004), cereals with fat (*p-value* = 0.008) and Mexican food (*p-value* = 0.004).

Discussion

An alarming micronutrient deficiency has been reported in older adults in Mexico, which are important for maintaining good health and a healthy aging process (De la Cruz-Góngora et al., 2017). However, the results of this research differ significantly with these findings. In general, the dietary recommendations for older adults have been oriented towards regulatory compliance with macro and micronutrients, due to physiological factors, their appetite tends to decrease and consequently their food intake. In most cases, this situation has been related to malnutrition (Wellman & Kamp, 2013). However, in this research, the nutritional profile of the study population differed completely from that reported by authors such as Engelheart and Akner (2015) who reported, respectively, a BMI of 23.2 and 24.0 in elderly Swedish men and women, who live in their homes. In our study, an average BMI of 28.94 was identified in women and 29.47 in men. Although the average ages also differ from the first study, one of the aspects that make the most difference is work activity. At the national level, and according to the study by Shamah-Levy et al. (2008), 67.0% of males and 72.6% of females are overweight or obese when applying the BMI indicator. According to the waist circumference indicator, 74.0% of males and 87.7% of females have abdominal obesity. However, the percentage of body fat, compared to BMI, is an indicator that is little used in epidemiological studies, despite the fact that it has been indicated as a better index of obesity (Fatima, Rehman, & Chaudhry, 2014; Pasco et al., 2014). Our re-

Table 5
Multivariate linear regression analysis for relationship between fat percentage and some micronutrients, macronutrients and dietary intakes

Variables	**Coefficient**	**95% C.I.**		**p-value**
		Lower	**Upper**	
Energy (Kcal)	-0.045	-0.085	-0.005	0.026*
Fiber (g)	0.216	-0.009	0.442	0.060
Carbohydrates (g)	0.153	0.001	0.305	0.047*
Protein (g)	0.226	0.007	0.444	0.043*
Lipids (g)	0.751	0.357	1.14	0.000*
Calcium (mg)	-0.003	-0.009	0.002	0.204
Magnesium (mg)	-0.011	-0.030	0.008	0.262
Milks	-0.013	-0.23	-0.0045	0.004*
Animal origin foods (meats, fish and eggs)	-0.038	-0.68	-0.009	0.010*
Protein oils	-0.150	-0.250	-0.50	0.004*
Fatty cereals	-0.826	-0.124	-0.022	0.008*
Mexican foods	-0.026	-0.437	-0.008	0.004*

p-value <0.05 is significant. Values were adjusted for BMI. R-squared of the model= 0.42 and *p-value*=0.001

sults showed that using body fat percentage, only 2.1% of men have adequate fat percentage and no woman has adequate fat ranges for their age. In other words, for men and women, 8.3% and 6.5% are overweight, and an alarming 91.6% and 91.3% are obese, respectively. Furthermore, this indicator was the only variable that was shown to have a statistically significant relationship with the intake of nutrients and some foods (R^2 = 0.42, *p-value* = 0.001). High intake of energy, carbohydrates, cereals with fat and the consumption of food associated with complete diets such as milk and yogurt, were related to the percentage of body fat. Similarly, foods of animal origin (i.e. beef, pork, chicken, eggs) and oils with protein such as nuts have been linked. This is in contrast to what was referred by Abreu et al. (2012), who noted that the intake of dairy products has been shown to have beneficial effects on bodyweight and body fat. This opens a debate on whether the consumption of milk and its derivatives is necessary in older adults due to its calcium content, or whether it is better to obtain this nutrient through supplementation in order to avoid excess adiposity (Elbon, Johnson, & Fischer, 1998). On the other hand, the percentages of muscle mass in the population were also alarming. In both men (86.9%) and women (50%), the percentages were below the appropriate levels. This finding is paradoxical with regard to the protein intake that exceeds the recommended one, with an adequacy of 115.23% in women and 110.23% in men, as well as the physical activity identified, which indicated that 54.8% of the total sample is moderately active. However, a very important aspect is the type of physical activity performed. It was identified that 91.46% of the participants carry out aerobic exercises, such as walking, jogging, swimming, dancing or cycling; while only 8.54% carry out anaerobic physical activity, such as strength exercises with weights. Recent evidence has indicated that the combination of both types of physical activity is necessary to maintain adequate muscle mass, not only in older adults, but also according to the age of each individual (Navas-Enamorado, Bernier, Brea-Calvo, & de Cabo, 2017). Therefore, the population older than 50 years should be oriented to carry out this type of activities. From this study it is necessary to adapt the perspectives from which the nutritional management of the elderly is approached. Although adults from the age of 50 were included in this study, it is necessary to consider that currently in Mexico, there are 74-year-old adults developing work activities (Ramos, 2016; Rodríguez, 2018) that could be influencing their nutritional and health status. Therefore, it is necessary that policies aimed at the regulation of work and retirement of older adults, consider these types of factors. Finally, it should be noted that this study has limitations such as the sample size and the fact that all the participants are workers. Therefore, it is proposed to carry out comparative studies between older adults who do not work and older adults who continue to work. These new studies could identify clearer trends in the changes that occur in lifestyles, including physical activity, energy and nutrient consumption.

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