Differences in the Associations Between Sociodemographic and Lifestyle Factors with Dietary Patterns in Mexican Men and Women.

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Abstract

Background. Diet is one of the leading risk factors for developing non-communicable diseases and is related to sociodemographic and lifestyle factors, including sex. We aimed to investigate the associated factors of dietary patterns among adults living in Mexico City by sex.

Methods. We used data from a city-wide representative survey conducted between May and June 2015 in Mexico City (n=1,142). Self-reported information about sociodemographic and lifestyle variables was collected. Dietary information was collected using a semi-quantitative food frequency questionnaire. Dietary patterns were constructed by cluster analysis. We used sex-specific multivariable multinomial logistic models to assess the association of demographic and lifestyle factors with dietary patterns using.

Results. Three dietary patterns were identified: basic, prudent and fast food. Among men and women, higher school attainment was associated with a lower relative probability of having a basic rather than prudent dietary pattern (women: RRR= 0.8, 95% CI: 0.8, 0.9; men: RRR= 0.8, 95% CI:0.7, 0.9). Compared to single men, divorced or separated men (RRR=3.8, 95% CI: 1.3, 11.2) and those living with a partner (RRR=2.6, 95% CI: 1.1, 6.0) had a higher relative probability of consuming a fast food dietary pattern than the prudent one. Men living with a partner (RRR=3.0, 95% CI:1.1, 8.6) or working long shifts (RRR=3.8, 95% CI: 1.3, 11.1) had a higher probability of consuming a basic pattern rather than a prudent one compared to peers.

Conclusion. Differences by sex in the associations between sociodemographic factors and dietary patterns may be due to gender roles. Public policies and programs should consider the gender perspective to accomplish positive results in both men and women.

Background

Unhealthy diets are leading risk factors for non-communicable diseases (NCDs), which account for more than two-thirds of the deaths globally [1, 2]. Other NCDs risk factors, such as physical inactivity, sitting time, or tobacco and alcohol consumption, are generally clustered within individuals and may be influenced by gender roles [3].

Previous studies that described the dietary patterns in the Mexican population have found differences by sex [4–7]. Specifically, it has been observed that women consume healthier foods such as vegetables and fruits, while men eat more red and processed meats [4, 6]. Additionally, women tend to eat more sweets and cakes, while men consume more sugar-sweetened and alcoholic beverages [4, 5]. These habits are probably associated with other lifestyle and sociodemographic factors. However, to our knowledge, no study in the Mexican population has analyzed the association of lifestyle and sociodemographic factors with dietary patterns by sex.

The characterization of dietary patterns through demographic and lifestyle factors may identify target groups for interventions, especially in highly urbanized regions, where residents may face greater challenges to engage in healthy lifestyles [8, 9]. Further, understanding differences in associated factors by sex may allow better targeting of nutrition-related programs and policies.

This study aimed to evaluate the association of sociodemographic and lifestyle factors with dietary patterns in a representative sample of adults living in Mexico City by sex.

Methods

Design and study population

Data come from the Mexico City Diabetes Representative Study, a cross-sectional study conducted between May and June 2015. Participants were selected through cluster sampling, using basic geostatistical areas (AGEB, for its Spanish acronym) as the primary sampling unit. From each AGEB, systematic sampling was conducted to select six houses within six blocks. In each house, two adults aged 20–69 were systematically selected. Trained personnel collected information through face-to-face interviews with validated questionnaires. The response rate for the original study was 69%. Information on 1,334 adults was collected. We excluded adults with invalid or incomplete information on lifestyle and sociodemographic variables. We also excluded individuals with extreme total energy intake (with energy intake/basal metabolic rate < 0.05 or energy intake / estimated energy intake ratio > 3 S.D.), as previously described [10]. Thus, the analyses were conducted with 1,142 individuals (413 men and 729 women).

Sociodemographic and lifestyle factors

Data were collected using survey measures from the National Health and Nutrition Survey in Mexico [11]. Demographic variables included age, sex, years of school attainment, socioeconomic status (SES), marital status, and employment status.

Socioeconomic status was constructed using principal components analysis (PCA). Entered into the PCA were household characteristics (flooring material, ceiling, walls, water source, sewerage, number of persons residing in the household, and domestic appliances). The main extracted factor was divided into tertiles and used as a proxy for low, middle, and high SES. The detailed methodology is described elsewhere [12].

Marital status was defined considering four categories: single, living with a partner, divorced or separated, and widowed.

Employment status was defined based on the answers to two questions. First, participants were asked if they had worked at least for an hour in the last week. Those who answered "yes" were asked, "How many hours per week do you spend in your main job?". Working hours per week were categorized considering legal working hours per week in Mexico as the cut-off point (i.e., 48 or less per week or > 48 hours per week) [13]. The reference category for this variable included unemployed participants.

Lifestyle variables included smoking status, sleeping habits, alcohol consumption, sitting time, and physical activity levels. Smoking status was assessed considering the questions 1) "Have you smoked 100 cigarettes or more in your life?" and 2) "Are you currently smoking?". Current smokers were those who answered "yes" to both questions; ever smokers answered "yes" to question 1) and "no" to question 2), and never smokers answered "no" to both questions.

Sleeping habits were defined using the question "On average, how many hours do you sleep per day?" with five possible answers: 5 or less, 6, 7, 8, and 9 or more hours. Healthy sleeping habits were defined as sleeping between 6–8 hours per day, and unhealthy sleeping hours as 5 or less or 9 or more hours per day.

Alcohol consumption was classified into three categories: never consuming alcohol, consuming 5 drinks per week or less, or more than 5 drinks per week.

Physical activity was measured using the short version of the International Physical Activity Questionnaire (IPAQ). IPAQ consists of 7 questions that measure physical activity of moderate to vigorous intensity, as well as walking and sitting time. This instrument has good reliability in assessing moderate to vigorous physical activity among Mexican adults [14]. Data were processed following the IPAQ Analysis guidelines [15], and metabolic equivalent (MET)-minutes per week for total physical activity were calculated. Participants were classified as with low (< 600 MET-minutes/week or without activity reported), moderate (600–1500 MET-minutes/week), and high levels (≥1500 MET-minutes/week) of total physical activity.

IPAQ also measures sitting time as an indicator of sedentary activity over the past 7 days. Hours and minutes of sitting time in one day of the last seven days were asked. Daily sitting hours were estimated.

Dietary patterns

Diet information was collected with a validated semi-quantitative food frequency questionnaire (SFFQ) used in the National Health and Nutrition Survey in Mexico [11]. The SFFQ described the consumption of 140 foods over the past seven days before the interview and was administered by trained personnel using standardized data collection and entry procedures [16]. Food consumption is characterized by frequency categories ranging from never to seven days and one to six times per day. For each food, a commonly used portion size is specified on the SFFQ. We converted the reported consumption into grams of intake per day. Energy and nutrient values were estimated using a Food Composition Table compiled by the National Institute of Public Health [16].

Foods and beverages from the SFFQ were categorized into 23 food groups to identify dietary patterns (Supplementary Table 1). The food items were placed in a specific food group by the similarity of nutrient profiles (e.g., the proportion of lipids, proteins, carbohydrates, or dietary fiber) or amount of sugar added (e.g., sweetened beverages). We classified the group of tortillas as a sole component because of its culinary use in Mexican culture. Each food group's contribution to the total energy intake was calculated

as a percentage and standardized (z-score). A cluster analysis was performed to derive dietary patterns by the k-means method [17, 18] based on the food group's contribution. Two to five solutions were tested. The solution that best discriminated across groups while maintaining enough cases in each group was selected. We also considered the Calinski-Harabaz criterion to determine the optimal number of clusters. We used the percentage energy contribution that significantly differed from other food groups between clusters to define dietary patterns. Patterns were named based on the major food groups and nutrients that characterized each group relative to others and considering a minimum of 0.30 in z-score.

Statistical analysis

The resulting dietary patterns were described according to the mean energy contribution (%). Descriptive statistics were obtained for continuous and categorical sociodemographic and lifestyle variables, in the total sample and across sex. The adjusted relative risk ratio (RRR) of belonging to a dietary pattern was assessed through a multinomial logistic model stratified by sex. We considered the dietary patterns as the outcome variable using the healthier pattern as the reference category, and sociodemographic (age, sex, years of school attainment, socioeconomic status, marital status, and employment status), and lifestyle factors (smoking status, sleeping habits, alcohol consumption, sitting time, and physical activity level) as independent variables. The significance level was established at alpha 0.05. All the analyses were performed using expansion weights and adjusted by survey design with the SVY module of Stata 14 ®.

Results

Three major dietary patterns were identified. Patterns were named after the foods with the highest contribution to energy within each. The first pattern had the highest contribution to total energy intake from foods that may be considered healthier (i.e., unsweetened dairy, fruits, oilseeds, vegetables, and wholemeal bread); thus, we named this pattern "prudent'. The highest contribution to total energy for the second pattern was from sweetened cereals, maize-based foods, sweetened beverages, sweets and desserts, and fast food; we named this pattern 'fast food' because of its high contribution for processed and ultra-processed foods. The third pattern was characterized by high consumption of maize-tortillas and legumes, considered basic elements of the Mexican diet [19]; therefore, this pattern was named 'basic' (Table 1)

Table 1
Percent contribution to total energy intake from food groups by dietary pattern

Dietary Pattern	Prudent	Fast Food	Basic	Total
Food group	%			
Dairy (not sweetened)	13.07	6.94	5.94	8.17
Maize tortillas	10.42	11.37	28.24	17.14
Fruits	10.02	4.70	4.96	6.18
Chicken and egg	6.68	4.38	7.01	5.92
Sweetened cereals	6.45	12.84	5.83	8.68
Red and procesed meat	4.46	4.90	6.52	5.36
Soups, broths and pasta	4.32	3.06	4.63	3.95
Maize-based foods	4.18	9.99	5.10	6.73
Sweets and desserts	4.17	6.98	3.74	5.09
Fruit and vegetables juices	4.02	2.03	2.22	2.62
Rice and potatoes	3.64	2.86	4.24	3.55
Oilseeds	3.56	1.79	1.15	2.02
Vegetables	3.36	1.43	1.89	2.10
Sweetened beverages	3.28	9.19	5.84	6.46
Wholemeal bread	3.17	0.64	0.33	1.19
White bread and flour tortilla	3.15	4.29	4.72	4.15
Fast food	2.66	5.37	1.73	3.37
Cereals ready to consumption	1.92	0.50	0.34	0.81
Flavored and sweetened dairy products	1.81	1.41	0.87	1.68
Legumes	1.81	0.95	2.36	1.32
Salty snacks	1.74	2.66	1.36	1.96
Fish and seafood	1.50	0.36	0.36	0.66
Fats	0.61	1.38	0.62	0.91

Table 2 presents the characteristics of study participants, in the total sample and by sex. In the total sample, the most consumed pattern was the 'fast food' pattern, and the less consumed one was the 'prudent' pattern (41.5 vs. 24.9%); a similar distribution was observed in men and women. Participants had in average 12.5 years of school education (equivalent to high-school education), were from the low

and middle SES (58.0%), mostly living with a partner (55.9%), and were employed. Almost a third were current smokers (31.2%), three in every four adults reported consuming 5 or less alcoholic drinks per week, 13.7% of the participants had unhealthy sleeping habits, and 8.9% reported low physical activity levels.

Table 2
Characteristics of study participants by gender in Mexico City, 2015

	Total sample n = 1,142	Men, n = 413 Mean or % (95%CI)	Women, n = 729 Mean or % (95%CI)
Total		45.1 (41.5, 48.9)	54.9 (51.2, 58.5)
Dietary pattern			
Prudent	24.9(21, 29.3)	21.9 (17.0, 27.6)	27.4 (22.5, 32.9)
Fast Food	41.5 (37.1, 46.1)	43.2 (37.5, 49.2)	40.1 (35.1, 45.4)
Basic	33.6 (29, 38.5)	34.9 (29.0, 41.3)	32.5 (27.4, 37.9)
Sociodemographic variables			
Age	40.1 (39.0, 41.1)	39.3 (37.7, 40.8)	40.7 (39.6, 41.9)
School attainment	12.5 (12.1, 12.9)	12.8 (12.3, 13.3)	12.2 (11.8, 12.7)
Socio-economic status			
Low	20.8 (17.3, 24.7)	17.3 (13.0, 22.6)	23.6 (19.8, 28.0)
Middle	37.2 (32.8, 41.9)	35.9 (29.9, 42.5)	38.2 (33.0, 43.8)
High	42.1 (36.6, 47.8)	46.8 (39.6, 54.2)	38.1 (32.6, 44.0)
Marital status			
Single	30.9 (27.4, 34.6)	36.8 (30.8, 43.3)	26.1 (22.1, 30.4)
Living with a partner	55.9 (51.4, 60.3)	55.1 (48.8, 61.2)	56.6 (51.1, 62.0)
Divorced / Separated	9.6 (7.8, 11.8)	7.0 (4.7, 10.4)	11.7 (9.1, 14.9)
Widowed	3.6 (2.7, 4.8)	1.1 (0.5, 2.3)	5.7 (4.3, 7.5)
Employment status [b]			
Unemployed	38.3 (34.5, 42.3)	22.5 (17.3, 28.9)	51.3 (46.3, 56.3)
Working 48 hrs. or less per week	38.1 (33.8, 42.7)	39.1 (32.3, 46.3)	37.3 (32.5, 42.5)
Working more than 48 hrs per week.	23.5 (20.3, 27.1)	38.4 (32.6, 44.5)	11.3 (8.7, 14.7)
Lifestyle variables			
Smoking status			
Never	43.1 (40.0, 46.4)	29.2 (24.3, 34.6)	54.6 (49,4, 59.7)
Former	25.7 (22.5, 29.1)	27.2 (22.1, 33.0)	24.4 (20.6, 28.7)

	Total sample n = 1,142	Men, n = 413 Mean or % (95%CI)	Women, n = 729 Mean or % (95%CI)
Current	31.2 (27.7, 34.9)	43.6 (37.9, 49.5)	21.0 (17.1, 25.5)
Sleeping habits [c]			
Healthy	86.3 (83.5, 88.8)	89.0 (83.8, 92.7)	84.2 (80.9, 86.9)
Unhealthy	13.7 (11.2, 16.5)	11.0 (7.4, 16.2)	15.8 (13.1, 19.1)
Alcohol consumption			
Never	18.9 (16.0, 22.2)	10.0 (7.11, 14.0)	26.2 (22.2, 30.6)
5 drinks/week or less	75.7 (71.7, 79.3)	79.4 (73.1, 84.6)	72.7. (68.1, 76.8)
More than 5 drinks/week	5.4 (3.9, 7.5)	10.6 (7.4, 14.9)	1.2 (0.6, 2.3)
Sitting time (hrs./day)	3.9 (3.7, 4.1)	4.2 (3.9, 4.5)	3.6 (3.4, 3.9)
Physical activity levels [d]			
Low	8.9 (7.12, 10.9)	11.4 (8.7, 14.9)	6.7 (4.8, 9.4)
Moderate	3.7 (2.5, 5.33)	2.6 (1.3, 5.1)	4.6 (2.8, 7.4)
High	87.5 (84.9, 89.7)	86.0 (82.4, 89.0)	88.7 (84.5, 91.8)

Differences between men and women were observed. Women were mostly in the low SES level and divorced, separated, or widowed. Also, a higher percentage of women were unemployed, never smokers, and non-alcohol drinkers. Additionally, women reported to be more active and less sedentary than men.

Table 3 shows the multivariate sex-stratified associations of sociodemographic and lifestyle factors with dietary patterns. Among men and women, school attainment was associated with a lower probability of consuming a 'basic' pattern rather than a 'prudent' one. No other significant associations between sociodemographic or lifestyle variables and dietary patterns were observed among women. Among men, those living with a partner had a higher probability of consuming a 'fast food' pattern or a 'basic' pattern rather than a 'prudent' one (RRR = 2.6, 95% IC = 1.1, 6.0; RRR = 3.0, 95% IC = 1.1, 8.6, respectively) than single men; similarly, those divorced or separated had a higher probability of belonging to the 'fast food' pattern rather than the 'prudent' pattern, compared to single men. Additionally, men working for more than 48 hours per week had a higher probability of consuming a 'basic' pattern rather than a 'prudent' one, compared to unemployed men (Table 3).

Table 3
Multivariate and sex-stratified association of sociodemographic and lifestyle factors with dietary patterns (Mexico City, 2015)

	Total sample n = 1,142		**Men, n = 413**		**Women, n = 729**	
	RRR (95%CI)		**RRR (95%CI)**		**RRR (95%CI)**	
	Fast food vs. Prudent	**Basic vs. Prudent**	**Fast food vs. Prudent**	**Basic vs. Prudent**	**Fast food vs. Prudent**	**Basic vs. Prudent**
Sociodemographic variables						
Women vs. Men	0.8 (0.5, 1.3)	0.7 (0.4,1.3)				
Age	0.9 (0.9, 1.0)	1.0 (0.9, 1.0)	0.9 (0.9, 0.9)	1.0 (0.9, 1.0)	0.9 (0.9, 1.0)	0.9 (0.9, 1.0)
School attainment	0.9 (0.9, 1.0)	**0.8 (0.8, 0.9)**	0.9 (0.8, 1.0)	**0.8 (0.7, 0.9)**	0.9 (0.9, 1.0)	**0.8 (0.8, 0.9)**
Socio-economic status						
Low	1.0	1.0	1.0	1.0	1.0	1.0
Middle	1.1 (0.6, 1.7)	1.1 (0.7, 1.8)	1.0 (0.4, 2.5)	1.2 (0.5, 2.9)	1.0 (0.6, 1.7)	1.2 (0.7, 2.2)
High	1.0 (0.5, 2.0)	0.6 (0.3, 1.2)	1.3 (0.5, 3.4)	1.2 (0.4, 3.4)	0.9 (0.4, 1.8)	0.5 (0.3, 1.0)
Marital status						
Single	1.0	1.0	1.0	1.0	1.0	1.0
Living with a partner	1.7 (1.0, 2.7)	**2.7 (1.5, 4.7)**	**2.6 (1.1, 6.0)**	**3.0 (1.1, 8.6)**	1.4 (0.7, 2.7)	1.9 (1.0, 3.6)
Divorced / Separated	2.2 (1.0, 4.8)	1.9 (0.9, 4.1)	**3.8 (1.3, 11.2)**	2.8 (0.8, 10.4)	1.8 (0.7, 5.0)	1.4 (0.5, 3.6)
Widowed	**3.0 (1.1, 8.3)**	1.9 (0.7, 5.6)	2.7 (0.2, 35.0)	0.9 (0.1, 14.9)	2.3 (0.7, 7.7)	1.8 (0.5, 6.2)
Employment status						
Unemployed	1.0	1.0	1.0	1.0	1.0	1.0

	Total sample n = 1,142		Men, n = 413		Women, n = 729	
	RRR (95%CI)		RRR (95%CI)		RRR (95%CI)	
Working 48 hrs. or less per week	1.1 (0.7, 1.8)	1.0 (0.6, 1.4)	1.0 (0.5, 2.3)	2.0 (0.8, 4.9)	1.1 (0.7, 2.0)	0.7 (0.4, 1.1)
Working more than 48 hrs per week.	1.2 (0.7, 2.1)	**1.7 (1.0, 2.9)**	1.1 (0.4, 2.6)	**3.8 (1.3, 11.1)**	1.0 (0.5, 2.2)	1.0 (0.5, 2.0)
Lifestyle variables						
Smoking status						
Never	1.0	1.0	1.0	1.0	1.0	1.0
Former	0.9 (0.5, 1.6)	1.1 (0.6, 2.0)	1.2 (0.5, 3.1)	1.0 (0.4, 2.4)	0.8 (0.4, 1.4)	1.3 (0.6, 2.5)
Current	1.4 (0.7, 2.5)	1.3 (0.7, 2.3)	2.0 (0.7, 5.9)	2.0 (0.7, 5.5)	1.0 (0.5, 1.9)	0.7 (0.4, 1.5)
Sleeping habits						
Healthy	1.0	1.0	1.0	1.0	1.0	1.0
Unhealthy	0.9 (0.5, 1.7)	1.1 (0.6, 1.9)	0.8 (0.3, 2.4)	1.0 (0.3, 2.9)	1.1 (0.6, 2.0)	1.3 (0.7, 2.4)
Alcohol consumption						
Never	1.0	1.0	1.0	1.0	1.0	1.0
5 drinks/week or less	1.2 (0.7, 2.1)	1.0 (0.6, 1.8)	2.2 (0.6, 7.5)	1.8 (0.5, 6.9)	1.1 (0.6, 1.8)	0.8 (0.4, 1.6)
More than 5 drinks/week	1.5 (0.5, 4.7)	1.2 (0.4, 3.9)	2.3 (0.4, 11.7)	2.6 (0.6, 10.7)	0.8 (0.1, 5.1)	0.1 (0.01, 2.3)
Sitting time (hr/day)	1.0 (0.9, 1.0)	1.0 (0.9, 1.0)	0.9 (0.8, 1.0)	0.9 (0.8, 1.0)	1.0 (0.9, 1.1)	1.0 (0.9, 1.1)
Physical activity levels						
Low	1.0	1.0	1.0	1.0	1.0	1.0
Moderate	0.7 (0.2, 2.6)	0.8 (0.2, 2.6)	1.3, (0.1, 20.9)	1.2 (0.1, 26.0)	0.8 (0.3, 2.6)	0.6 (0.2, 2.1)

	Total sample n = 1,142		Men, n = 413		Women, n = 729	
	RRR (95%CI)		RRR (95%CI)		RRR (95%CI)	
High	1.2 (0.5, 2.6)	1.0 (0.4, 2.1)	1.1 (0.3, 4.4)	1.0 (0.3, 3.5)	1.5 (0.7, 3.0)	1.0 (0.4, 2.3)
[a] Model was adjusted for all the lifestyle variables, age (years), sex, accumulated school years and socioeconomic status (tertiles).						
[b] Dietary patterns defined by cluster analysis. Prudent pattern was used as reference.						
[c] Healthy sleeping habits consider people reporting sleeping between 6–8 hours. Unhealthy habits consider people reporting less than 6 hours and more than 8 hours.						
[d] Working hours defined by Mexican labor Law.						
[e] Physical activity levels defined by IPAQ categories						
[f] $p < 0.05$						

Discussion

We were able to identify three major dietary patterns in the surveyed population in Mexico City, which we called: prudent, fast food, and basic. While several demographic factors were associated with dietary patterns among men, in women, only education was identified as an associated factor. Additionally, patterns were associated with sociodemographic but not lifestyle factors, rejecting our hypothesis that dietary patterns are clustered with lifestyle factors.

The present study results are consistent with studies reporting positive associations between education with healthier dietary patterns. Higher education might be associated with increased nutrition knowledge and higher compliance with dietary recommendations [20, 21]. However, a national representative study in Mexico reported that higher education was associated with higher consumption of ultra-processed food containing critical ingredients (i.e., sugar, sodium, and saturated fat) related to the development of chronic diseases [22]. The higher development and urbanization in Mexico City could partially explain the differences with national findings. Urbanization can contribute to differences in sociodemographic characteristics, such as education. [23] Additionally, differences observed at national level and those found in our study might be explained by the analytic approach since we did not explore the contribution of ultra-processed foods to each pattern.

Associations between dietary patterns and most demographic factors were only observed in men but not in women. Although explaining these findings is challenging, these associations may respond to gender role constructs. In Mexican culture, men have been traditionally considered as "providers." On the other hand, women tend to be responsible for family care and well-being [24, 25], with a priority role as wives

and mothers (31,32). Although it has been observed that married couples seem to engage in the same diet [26], we observed that men living with a couple adhere to the basic and fast food pattern, while these associations were not observed in women. We found similar but stronger associations for divorced or separated men. Similarly, working for more than 48 hours was associated with a higher probability of having a basic pattern in men, but not women. The basic pattern identified in our study has characteristics of a "*comida corrida*" in Mexico. The "comida corrida" is a cheap home-cooked lunch (< 3 USD) available in "*fondas*" or small restaurants that cater to Mexican working-class adults. Due to the high commuting times in Mexico City, most people have to eat out of the home, making this food option a very affordable and accessible one, especially for those that work long periods.

Reports suggest that single men have a greater risk of unhealthy dietary patterns than women, but these associations are inconsistent [27]. Particularly in nutritional behaviors, several studies have reported that men are more influenced by standards that denote power and strength, with no health concerns [28] preferring fatty meals with a strong flavor [28], which are highly represented in the basic pattern (i.e., red and processed meat). Additionally, men tend to eat more in fast food restaurants and eat snacks while watching television compared to women [28]. These findings may help explain the adherence of men to the fast food and basic patterns. Results from the Mexican National Survey of Use of Time consistently showed that men invest less time in preparing food at home compared to women. Moreover, these results were not different in homes where women have activities inside and outside the house [29, 30].

In contrast, it is widely known that women adhere to healthier diets, mainly by stress produced by social pressure, to maintain a body figure under social standards [28]. However, there is no evidence of these adaptations in our results. Further studies should focus on understanding the influence of gender roles on the association between marital status and diet.

Studies exploring associations between dietary patterns and lifestyle variables are sparse. Previous reports showed associations between unhealthy lifestyles, such as current smokers [31], sedentary behavior [32], or poor sleep [33], with unhealthy diets. Furthermore, a nationally representative study in Mexico showed that the "refined foods and sweets" pattern had the highest alcohol contribution [4]. On the other hand, previous studies have been consistent in reporting associations between physical activity and dietary patterns with high intakes of fruits and vegetables, dairy, nuts, and whole grains, or components of a healthy diet [8, 34–40]. However, all these lifestyle characteristics can be influenced by gender roles and sociodemographic factors.

Our study has several limitations that need to be acknowledged. First, even though dietary patterns offer a broader vision of how populations eat, they are specific to the population studied, limiting the findings' comparability. Second, an inherent limitation of the cross-sectional design of this survey is that temporal associations cannot be inferred. Finally, all the information was self-reported, which may be influenced by social desirability [41–43]. However, a non-differential error can be expected from our study since the participants did not know the study hypothesis. Although, a differential error in self-reported variables could be expected by sex, and stratification may help to understand this error. Strengths include the

representative sample of adults living in Mexico City and the use of validated questionnaires, including the SFFQ.

Additionally, potential confounders were considered in the analysis. Also, dietary patterns identified in this study were similar to those found in other studies in Mexico [44, 45]. Despite the limitations, the results of this study provide an overview of the association between sociodemographic and lifestyle factors with dietary patterns in men and women living in Mexico City.

Conclusions

Men living in Mexico City with lower education, non-single, and working long hours (i.e., more than the established by the law), adhere to unhealthy diets. These associations are likely to be driven by gender roles. The design of nutrition programs should consider gender perspective in order to accomplish positive results in both men and women.

Abbreviations

NCDs
Non-communicable diseases
AGEB
Basic geostatistical areas
SES
Socioeconomic status
PCA
Principal components analysis
IPAQ
International Physical Activity Questionnaire
MET
Metabolic equivalent tasks
SFFQ
Semi-quantitative food frequency questionnaire
RRR
Relative risk ratio

Declarations

Ethics approval and consent to participate

Written consent form was obtained from all participants before data collection. The study protocol was approved (ID CI1295) by the Ethics Committee of the National Institute of Public Health (Instituto Nacional de Salud Pública, INSP).

Consent for publication

Not applicable.

Availability of data and materials

The datasets used and analysed during the current study are available from the corresponding author on reasonable request.

Competing interests

The authors declare that they have no competing interests.

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Authors' contributions

CIOS, CHA, AJ conceived of this analysis. CIOS, CHA, and NASO conducted the analysis. AJ and NLO supervised the statistical analysis. CIOS, CHA and NASO wrote the original draft. SB conceived, designed and executed the original study. NLO, AJ and SB revised the manuscript critically for intellectual content. All authors read and approved the final manuscript.

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