



# LIFESTYLES AND DIET RELATED TO NUTRITIONAL STATUS AND DM2 RISK IN YOUNG WOMEN FROM TWO COLOMBIAN UNIVERSITIES

ESTILOS DE VIDA Y ALIMENTACIÓN RELACIONADOS CON EL ESTADO NUTRICIONAL Y EL RIESGO DE DM2 EN MUJERES JÓVENES DE DOS UNIVERSIDADES COLOMBIANAS

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## ABSTRACT

**Objective:** To analyze the lifestyles and diet related to nutritional status and the risk of DM2 and in female students of two Colombian universities. **Methods:** a descriptive, cross-sectional, multidimensional and exploratory study, carried out in a sample of 220 women, nutrition and dietetic (NaD) students selected by random medsampling of proportions[1]. A questionnaire was applied to identify sociodemographic variables, lifestyles related to food and DM2 risk according to the FINDRISC test; BMI, waist circumference (WC), fat percentage, and active body substance index (IACS) were determined. Bivariate analysis was performed using Statgraphics v.16, the chi2 test was applied with 95% confidence and statistical significance ( $p < 0.05$ ). **Results:** Overweight and obesity according to BMI (21.4%) showed statistical significance with the frequency of consumption of sugary drinks, packaged products, sugars and sweets, fast foods and alcoholic beverages; These two eating practices were related to very high cardiovascular risk by waist circumference and excessive fat percentage, which also presented significance with excessive screen time; the IACS was related to the classification of physical activity. According to the FINDRISC test, 91% had DM2 risk factors; 20.5% presented medium risk and 2.3% high. **Conclusions:** Lifestyle and diet were related to anthropometric indicators: body weight, fat distribution, and body composition; are risk factors for the development of DM2 in young women. It is necessary to promote protective factors to maintain a healthy weight.

**Keywords:** Lifestyle; Nutritional status; Risk; Diabetes mellitus type 2; Students. (Source: MESH-NLM)

## RESUMEN

**Objetivo:** Analizar los estilos de vida y alimentación relacionados con el estado nutricional y el riesgo de DM2 y en mujeres estudiantes de dos universidades colombianas. **Métodos:** estudio de tipo descriptivo, transversal, multidimensional y exploratorio, realizado en una muestra fue de 220 mujeres, estudiantes de nutrición y dietética (NyD) seleccionadas por muestreo aleatorio de proporciones. Se aplicó un cuestionario para identificar variables sociodemográficas, estilos de vida relacionados con alimentación y el riesgo DM2 según test FINDRISC; se determinó el IMC, perímetro de cintura (PC), porcentaje de grasa e índice de sustancia corporal activa (IACS). Se realizó análisis bivariado, utilizando Statgraphics v.16, se aplicó la prueba chi2 con 95% de confianza y significancia estadística ( $p < 0,05$ ). **Resultados:** El sobrepeso y obesidad según IMC (21,4%) mostró significancia estadística con la frecuencia de consumo de bebidas azucaradas, productos de paquete, azúcares y dulces, comidas rápidas y bebidas alcohólicas; estas dos prácticas alimentarias se relacionaron con el riesgo cardiovascular muy alto por PC y con el porcentaje de grasa excesivo que además presentó significancia con el tiempo excesivo en pantallas; el IACS se relacionó con la clasificación de la actividad física (AF). Según la prueba de FINDRISC, el 91% presentaron factores de riesgo de DM2; el 20,5% presentó riesgo medio y el 2,3% alto. **Conclusiones:** Los estilos de vida y alimentación se relacionaron con indicadores antropométricos: el peso corporal, la distribución de la grasa y la composición corporal; son factores de riesgo para el desarrollo de DM2 en mujeres jóvenes. Es necesario promover factores protectores para mantener un peso saludable.

**Palabras clave:** Estilo de vida; Estado nutricional; Riesgo, Diabetes mellitus tipo 2; Estudiantes. (Fuente: DeCS-BIREME)

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## INTRODUCTION

College students represent a group of young adults who are exposed to a number of changes in their environment as they enter college, a crucial period for the development of lifestyles and their future health<sup>(1)</sup>. a crucial period for the development of lifestyles and their future health<sup>(2)</sup>. The university context is characterized by new relationships, independence, and self-determination, especially in migrant students, added to the dedication to academic activities, which configure a lifestyle characterized by sedentary lifestyles derived from screen exposure time, permanence in classrooms, insufficient physical activity (PA) practice, irregular eating schedules and preference for ready meals or fast food<sup>(3)</sup>.

Lifestyle constitutes a general way of life, based on the interaction of living conditions and individual patterns of behavior related to health, influenced by socio-cultural factors; values, norms, attitudes, habits and behaviors that cover all areas of human beings<sup>(4)</sup>. The lifestyles and eating habits of young students determined by the university environment and the dynamics of their academic responsibilities generate unhealthy practices that can cause alterations in their health and nutritional status characterized by the presence of overweight and obesity, greater presence of visceral fat and excessive percentage of body fat<sup>(5)</sup>. Nutrition and dietetics (N&D) students have as a protective factor the knowledge acquired in their training process; however, they are exposed to environmental factors that put them at risk of presenting in the short and medium term chronic noncommunicable diseases such as DM2<sup>(5)</sup>.

This research aimed to analyze lifestyles and diet related to nutritional status and risk of DM2 in young students of the N&D career in two Colombian universities. It could be useful to implement measures to control risk factors, prevent the development of DM2 and its complications from the early stages of adult life in health professionals.

## METHODS

### Design and study area

The study is of the type descriptive, cross-sectional, multidimensional and exploratory, with a quantitative approach.

### Population and sample

The population consisted of female students enrolled in the N&D program at Colombian higher education institutions: the Universidad de Antioquia (U1) located in the city of Medellín and the Universidad Metropolitana (U2) in Barranquilla; the study was conducted according to an agreement of academic cooperation and interest in the welfare of their future professionals. Men did not participate because they represent a low proportion among the students.

The proportion random sampling technique was used, with a maximum permissible error of 3.9% and a reliability level of 95%, with parameters  $P=Q=0.5$ . The sample size was 220 students, female: 106 from U1 and 114 from U2; the participating students were selected by simple random sampling. The inclusion criteria were: to be women over 18 years of age, to be omnivorous and to be enrolled at the time of the study. Students who were pregnant, breastfeeding, with cancer, autoimmune or metabolic diseases (DM), vegans or high-performance athletes were excluded.

### Variables

The sociodemographic variables studied were age, social stratum, university of origin and semester attended at the time of the study. Lifestyle and dietary variables: practice and classification of PA and time dedicated to screen-based activities, frequency of consumption of fruits, vegetables, sugars and sweets; sodas or sweetened soft drinks, snacks, packaged products, fried foods, fast foods and alcoholic beverages. Nutritional status was determined with BMI, WC, fat percentage classification and active body substance index (ABSI). The FINDRISC<sup>(6-8)</sup> which measures the overall risk of presenting DM2 in 10 years, assigning scores to the variables age, BMI, WC as an indicator of cardiovascular risk, PA practice, daily fruit and vegetable consumption (FV), family history of DM2, consumption of drugs for arterial hypertension, and history of hyperglycemia.

### Procedures and instruments

A questionnaire was designed in google docs® to be self-completed by the participants; this included the FINDRISC test, which has been validated for





Colombia<sup>(9)</sup>. The lifestyle and dietary variables included in the Food and Nutrition Situation Survey for Colombia were also incorporated into the questionnaire<sup>(10)</sup>. These instruments have been validated. Anthropometric measurements were taken by nutritionists trained in the ISAK technique<sup>(11)</sup>. The weight (in kg) was measured with a SECA 813 digital scale, the height (in cm) was measured with a SECA 206 stadiometer, the BMI was calculated (weight in kg/height in m<sup>2</sup>) and classified according to the WHO cut-off points adopted by the Colombian Ministry of Health: thin (<18.5), adequate (18.5-24.9), overweight (25.5), underweight (25.5), overweight (25.5) and obese (25.5)<sup>(12)</sup>. BMI was calculated as: underweight (< 18.5), adequate (18.5-24.9), overweight (25.0- 29.9) and obese (≥30).

Waist circumference was measured with a Lufkin tape measure at the midpoint between the last rib and the iliac crest; a measurement greater than or equal to 80 cm was defined as abdominal obesity for women<sup>(12)</sup>. The percentage of fat was obtained by body density with the measurement of the subcutaneous folds of the biceps, triceps, subscapular and ileocrestal folds measured with a Slim Guide adipometer, using the formula of Durnin and Womersley, to calculate the percentage of fat =  $(4.95/D - 4.5) * 100$ .  $D$  in g/cm<sup>3</sup> =  $c - (m \times \log \text{sum folds})$ ,  $c$  and  $m$  vary according to age and sex<sup>(13,14)</sup>. The IAKS was calculated using Tittel and Wutscherk's formula:  $\text{IAKS} = \text{kg ACM} \times 1000 \times 100/T^3(\text{cm})$ . This index is expressed in g/cm<sup>3</sup>; its relative value presents a standardized view of the amount of lean tissue in a given volume of body mass and was classified as: poor, fair or high<sup>(15)</sup>.

Once the FINDRISC test scores were summed, the risk of DM2 was determined and classified into the following categories: No Risk: 0 points, low risk: 1 to 7, medium risk: 7-12 and high risk more than 12, according to the FINDRISC study, this cut-off point is interpreted as a high probability of having DM2 or another glucose regulation abnormality<sup>(9)</sup>.

### Statistical analysis

The information was systematized in Windows Office and Excel tools. The results were presented in bivariate tables with relative and absolute frequencies; to identify the statistical association, the chi-squared test was applied with a confidence level of 95%. Statgraphics software version 16 was used and statistical significance was determined with  $p$  values <0.05.

### Ethical aspects

This study complies with the ethical standards of the Declaration of Helsinki; it was classified without risk, according to Resolution 008430 of 1993 of the Colombian Ministry of Health. It was approved by the ethics committee of the study universities and the participants signed an informed consent form.

## RESULTS

A total of 220 women participated in the study, 106 (48.0%) from U1 and 114 (52.0%) from U2, aged between 18 and 29 years, the mean was  $21.7 \pm 2.5$  years; 54.3% of them lived in the middle socioeconomic stratum, followed by 42.5% in the low socioeconomic stratum. Eighty-five percent were in their fifth to ninth semester at the time of the study. Mean BMI was  $22.7 \pm 2.6$  (14- 39); PC was on average  $71.2 \pm 7.2$  (57- 105); fat percentage was  $29.3 \pm 4.4$  (14- 41) and mean IAKS was  $1.0 \pm 0.1$  (0.7- 1.5). According to the FINDRISC test, 91% of participants presented risk factors for DM2; there was no statistically significant difference in overall risk of developing DM2 by university ( $p > 0.05$ ). The mean total score was  $4.1 \pm 2.9$  and the DM2 risk classification was 68.2% low risk, 20.5% medium risk and 2.3% high risk.

According to the FINDRISC test, a family history of first and second degree with a diagnosis of DM1 or DM2, no daily consumption of VF, lack of daily PA practice for at least 30 minutes and excess weight (BMI > 25) contributed more to the risk of DM2 ( $p < 0.05$ ). Table 1 shows the relationship of the risk factors for DM2 according to the FINDRISC test, by university.

**Table 1.** Risk factors for DM2 according to the FINDRISC test in Nutrition and Dietetics students from two Colombian universities.

Variable	Risk by variable score	Risk of DM2 according to FINDRISC test variables.							
		DM2 risk Total population		Risk of DM2 U1		Risk of DM2 U2		Chi <sup>2</sup>	p-value
		N	%	n	%	N	%		
<b>Daily consumption of fruits and vegetables</b>	Yes	114	51,8%	47	44,3%	67	58,8%	4,56	<b>0,030</b>
	No	106	48,2%	59	55,7%	47	41,2%		
<b>Physical activity</b>	Yes	118	53,6%	53	50,0%	65	57,0%	0,82	0,360
	No	102	46,4%	53	50,0%	49	43,0%		
<b>Family history of DM</b>	Yes	115	52,3%	54	50,9%	61	53,5%	0,06	0,800
	No	105	47,7%	52	49,1%	53	46,5%		
<b>Body Mass Index</b>	Yes	47	21,4%	14	13,2%	33	28,9%	8,06	<b>0</b>
	No	173	78,6%	92	86,8%	81	71,1%		
<b>Waist circumference</b>	Yes	33	15,0%	7	6,6%	15	13,2%	2,6	0,100
	No	198	90,0%	99	93,4%	99	86,8%		
<b>Consumption of medications for hypertension</b>	Yes	11	5,0%	2	1,9%	9	7,9%	4,1	0,040
	No	209	95,0%	104	98,1%	105	92,1%		
<b>Personal history of hyperglycemia</b>	Yes	7	3,2%	2	1,9%	5	4,4%	1,1	0,290
	No	213	96,8%	104	98,1%	109	95,6%		
<b>Total</b>	Yes	200	90,9%	95	89,6%	105	92,1%	0,69	0,400
	No	20	9,1%	11	10,4%	9	7,9%		

Source: Own elaboration

Note: the criterion to define if there is presence of risk corresponds to scores greater than or equal to 1 and No, corresponds to scores of zero for the answers of each variable of the Findrisc test, age is not included in the table since 100% of the population was under 45 years of age.

Table 2 presents the lifestyle and dietary variables and their relationship with nutritional status indicators such as BMI, WC, fat percentage and IAKS. In this investigation, excess weight according to BMI showed statistical significance with the risk of DM2 ( $p < 0.001$ ) and was related to the consumption of sugars and sweets, sodas or sugary soft drinks, fast foods and

snacks. CP, an indicator of visceral fat accumulation and impaired glucose metabolism, was identified as a risk factor in 10% in this study.[16] was identified as a risk factor in 10% in this study, and was related to the consumption of fast food and alcoholic beverages, without showing statistical significance with the risk of DM2 ( $p = 0.50$ ).



**Table 2.** Lifestyles and diet related to body mass index, waist circumference, fat percentage and Active Body Substance Index in nutrition and dietetics students from two Colombian universities.

Variables - Categories	Frequency (%)	Body Mass Index	p-value		
			Waist circumference	Percentage of fat	Active body substance index
<b>Physical Activity Classification</b>					
Sedentary	109 (50%)				
Slight	77 (35%)	0,155	0,982	0,077	0,043
Moderate/Active	34 (15%)				
<b>Screen Time</b>					
< 3 hours	100 (45%)				
4-6 hours	78 (35%)	0,612	0,875	<b>0,006</b>	0,670
7-9 hours	32 (15%)				
> 9 hours	10 (5%)				
<b>Fruit consumption</b>					
Never	5 (2%)				
Fortnightly	14 (6%)	0,206	0,602	0,276	0,002
Weekly	74 (34%)				
Diary	127 (58%)				
<b>Consumption of vegetables</b>					
Never	5 (2%)				
Fortnightly	9 (4%)	0,678	0,549	0,169	0,549
Weekly	60 (28%)				
Diary	146 (66%)				
<b>Consumption of sugars and sweets</b>					
Never	38 (17%)				
Fortnightly	30 (14%)	<b>0,001</b>	0,206	0,103	0,326
Weekly	77 (35%)				
Diary	75 (34%)				
<b>Consumption of Soda or Sweetened Soft Drinks</b>					
Never	138 (63%)				
Fortnightly	38 (17%)	<b>0,001</b>	0,242	0,266	0,026
Weekly	36 (16%)				
Diary	8 (4%)				
<b>Consumption of snacks (packaged products)</b>					
Never	101 (46%)				
Fortnightly	37 (17%)	<b>0,027</b>	0,334	0,336	0,051
Weekly	70 (32%)				
Diary	12 (5%)				
<b>Consumption of fried products</b>					
Never	59 (27%)				
Fortnightly	64 (29%)	0,402	0,661	0,54	0,145
Weekly	79 (36%)				
Diary	18 (8%)				

Fast food consumption					
Never	97 (44%)				
Occasional	1 (0,5%)				
Fortnightly	64 (29%)	<b>0,013</b>	<b>p&lt;0,001</b>	<b>&lt;0,001</b>	<b>0,019</b>
Weekly	57 (26%)				
Diary	1 (0,5%)				
Consumption of alcoholic beverages					
Never	169 (76,8%)				
Fortnightly	36 (16,4%)	<b>0,001</b>	<b>0,001</b>	<b>0,008</b>	<b>0,013</b>
Weekly	13 (5,9%)				
Diary	2 (0,9%)				

Source: Own elaboration

## DISCUSSION

Studies such as the one conducted by Medina C et al.<sup>(17)</sup> have evidenced that N&D students engage in unhealthy practices that trigger excess weight, added to family history of diseases such as DM2; despite having knowledge about healthy lifestyles and nutrition for the prevention of chronic diseases. However, Solera-Sánchez and Gamero-Lluna<sup>(18)</sup> argue that health sciences students have healthier habits compared to those trained in other disciplines, and Flórez-Escobar et al.<sup>(1)</sup> found that N&D students in Colombia carry out healthy practices for the different dimensions of lifestyle, except for PA.

This study identified the presence of one or more risk factors for the development of DM2, with a lower level of risk than the findings of Al-Shudifat AE et al.<sup>(19)</sup> in Jordanian university women with 5.2% at moderate or high risk and slightly elevated 26.7% according to the FINDRISC test, a finding similar to the study by Aris A et al.<sup>(20)</sup> The study found 5.9% of Malaysian youths at high risk and 23.8% at moderate risk; Algadheeb et al.<sup>(21)</sup> found 1.2% medical students in India at high risk and 55% at medium risk; similar to 1.5% and 12.0% at medium or high risk found by Nnamudi et al. in young Nigerians<sup>(22)</sup>. The statistically significant relationship between a history of first- and second-degree relatives with a diagnosis of DM1 or DM2 and the risk of developing the disease was similar to that observed by Pertseva N et al.<sup>(23)</sup> in 37.0% of the Ukrainian population and in 72% in Jordanian women reported by Al-

Shudifat AE et al.<sup>(19)</sup>

Overweight and obesity according to BMI, one of the main risk factors for DM2, coincides with the presence of excess weight in women between 18 and 64 years of age reported in the last National Survey of Food and Nutrition Situation in Colombia, obesity 22.4% and overweight 37.2%. Shudifat AE et al.<sup>(10)</sup> lower figures than in this study were found by Al-Shudifat AE et al. Shudifat AE et al.<sup>(19)</sup> in Jordan (14.6%), similar figures were observed by Tokaç E et al.<sup>(21.0%)</sup> in Ankara and higher prevalences were identified by Ruano et al. Shudifat AE et al.<sup>(5)</sup> in Ecuador (25.5%), Tran DM Shudifat AE et al.<sup>(4)</sup> Shudifat AE et al.<sup>(4)</sup> in the USA (56.4%), Antwi J et al. Shudifat AE et al.<sup>(24)</sup> (36.4%), Pineda K et al. Shudifat AE et al.<sup>(25)</sup> (25.88%), which requires an in-depth study of the risk factors in each context and the health knowledge of young people.

The prevalence of excess weight according to BMI and its statistical significance with the risk of DM2, is similar to that observed by Pertseva et al. Shudifat AE et al.<sup>(23)</sup> Pineda<sup>(25)</sup> identified association of excess weight in students with fast food consumption, no daily consumption of VF, alcohol intake and insufficient time dedicated to PA. The relationship of alcohol consumption with overweight coincides with other studies in university students: Parra-Soto et al.<sup>(26)</sup> in Latin Americans, Booranasuksakul U et al.<sup>(27)</sup> in Thais and Pertseva et al.<sup>(23)</sup> in Ukrainians (72.8%). Regarding WC, other studies have found a higher prevalence and statistical significance of WC greater than 80 cm: 28.4% in Jordan, and 37.1% in Ukrainian students<sup>(19)</sup> and 37.1% in Ukrainian students<sup>(23)</sup> Antwi, J et al.<sup>(24)</sup> identified a WC



of 81.1+15.8. The lack of PA practice in this study was higher than in Jordanian youths (44.6%)<sup>(19)</sup> although it was not related to excess weight, intensity showed statistical significance with IAKS; different studies have evidenced sedentary lifestyle as one of the determinants of overweight and obesity in young people; Legetic B et al.<sup>(28)</sup> affirms that the risk of DM2 is reduced with the practice of PA due to its effect on the maintenance of body weight and reduction of adiposity; Zheng Y.<sup>(29)</sup> found beneficial effect of exercise related to insulin sensitivity, glycemic control and the relation with excess weight ( $p < 0.050$ )<sup>(26)</sup> Flórez-Escobar et al.<sup>(1)</sup> identified that Colombian N&D students, despite having healthy lifestyles, do not practice PA; Kobayashi S et al.<sup>(30)</sup> observed that 67.3% of Japanese N&D students practice mild PA; likewise, 51.4% of Ukrainian youth do not practice PA daily<sup>(23)</sup>.

In our study, the absence of daily VF consumption was found to be higher than that observed in students from Jordan (42.4%)<sup>(19)</sup> and Ukraine (40%)<sup>(23)</sup>. The low VF intake is a modifiable factor for DM2 risk, although it is not considered as a predictive indicator of DM2, according to Durán et al.<sup>(31)</sup> according to Durán et al.<sup>(32)</sup> fiber has a protective effect for the development of DM2, making it useful for defining diet-related prevention actions. Unhealthy dietary practices related to changes in weight and body composition are frequent in young university students; this was recorded by Maza et al.<sup>(33)</sup> in a review of the literature; in Peru, consumption of these products increased from 13.3% in first-year medical students to 18.7% in the sixth year of medical school<sup>(34)</sup>.

In young Colombian N&D students, daily consumption of snacks and soft drinks was found in 10.0%, of packaged products 2 to 3 times per week in 29.0% and 26.0% for soft drinks<sup>(35)</sup> and Flórez et al. showed 61.2%

of occasional consumption of fast foods, fried foods, or sweets and 58% of sodas or sugary drinks. In Ukrainian students the daily consumption of fast foods was 2.1%, once a week 35.0% and 62.9% consumed less frequently<sup>(23)</sup>. The results of this study reaffirm the evidence of risk factors and protective factors for the development of DM2 in NYD students, despite the fact that the percentage of high risk is lower than that found in young people from other disciplines and older population, it reaffirms the relationship of lifestyles and diet with excess weight and the risk of developing DM2.

### Limitations

The food consumption frequency study was qualitative and self-reported.

### CONCLUSIONS

The nutritional knowledge and age of the population participating in this study are protective factors for lifestyles and diet, a situation that is evidenced by the higher frequency of students with low risk and some without risk of developing DM2; however, they are not sufficient for its prevention, and the presence of risk factors related to overweight and obesity according to BMI, the percentage of excess fat and cardiovascular risk according to waist circumference was observed. The intake of snacks, sweets and sugars, soft drinks and fast food showed statistical significance with body weight according to BMI and abdominal obesity. Higher frequency of alcoholic beverage consumption was related to higher waist circumference and lower frequency to higher IAKS. The early identification of the risk of DM2 in the young population is relevant for its prevention; it allows the study and intervention of the determinants of the university environment for the promotion of healthy lifestyles and nutrition.

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