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BREAKFAST AND ABDOMINAL OBESITY IN ADULTS

Amaya Calore, Antonieta Isabel[1], https://orcid.org/0009-0007-7712-2478, Caldera Noto, Cindy Alejandra[1] https://orcid.org/0009-0008-3790-4210, Márquez Mata, Rosangel Carolina https://orcid.org/0009-0005-0004-7153, Hazel Barboza Zambrano[2] http://orcid.org/0000-0002-3519-6168, y Hazel Anderson Vásquez[2] *Orcid: http://orcid.org/0000-0001-8780-4332*,

[1]School of Nutrition and Dietetics, Faculty of Medicine. University of Zulia, Venezuela
[2]Specialty in Clinical Nutrition, Division of Graduate Studies, Faculty of Medicine, University of Zulia, Venezuela.

Corresponding author: Dr. Hazel Anderson Vásquez. Email:hazelanderson2001@gmail.com

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ABSTRACT

Introduction: Abdominal obesity is associated with metabolic syndrome and cardiovascular disease. Breakfast has been associated with beneficial health effects, such as lower body mass index and better insulin sensitivity. Objective: Determine the impact of breakfast consumption on abdominal obesity. Methods: Descriptive, observational, cross-sectional, non-experimental and correlational research, carried out in 206 obese patients (95 men and 111 women) with an average age of 48±12 years; who underwent anthropometric evaluation (weight, height, BMI, circumference/waist, circumference/hip, waist/height index, waist/hip index); dietary evaluation (24-hour history, breakfast quality index). The statistics were Student's t, ANOVA, Chi square and Kruskal Wallis. Results: The waist circumference of 170 subjects (83%) presented abdominal obesity. Regarding the foods consumed for breakfast, it was low in vegetables and fruits. Regarding the quality of breakfast: 60% consumed a breakfast of improvable quality, 30% of good quality, 7% of poor quality and 3% of insufficient quality. Among the female sex, breakfast of improvable quality predominated; while the poor quality was observed in men and with increasing age the quality decreased. All subjects presented a high cardiovascular risk independent of the quality of the breakfast consumed. No association was found between breakfast consumption and abdominal obesity. **Conclusions:** Patients have high body fat reserves, the quality of breakfast without quantitative control does not reduce the degree of obesity or cardiovascular risk.

Keywords: obesity, abdominal obesity, breakfast, nutritional evaluation

INTRODUCTION

Obesity is a public health problem which is progressively expanding in the world, which is why it is considered one of the most critical medical objectives since it is a factor that favors the development of morbidity (1). Obesity can promote the development of type 2 diabetes mellitus, hepatic steatosis, cardiovascular diseases, stroke, high blood pressure, osteoarthritis, sleep apnea and certain types of cancer (endometrium, breast, ovary, prostate, liver and colon). All of them can lead to a higher risk of mortality (2).

It is considered a disease with multifactorial etiology where genetics, age, sex, sedentary lifestyle, eating behavior, drugs, chronodisruption, epigenetics, gestational programming, intestinal microbiota, eating

pattern and some endocrine disorders are related. They result in complexity for the subjects (1). Likewise, it has been established that a body mass index (BMI) greater than 30 kg/m2 is an indicator of obesity or general adiposity. However, this value may vary with ethnicity. Likewise, it is recognized that the waist/height ratio indicates abdominal adiposity. Those subjects with a waist/height ratio greater than or equal to 0.5 are classified as having high abdominal adiposity (2).

In this order of ideas, the distribution of body fat, in the specific case of abdominal obesity, is associated with metabolic syndrome and cardiovascular disease and is also an independent risk factor for all-cause mortality. Anthropometric measures of abdominal obesity include waist circumference, waist-to-hip ratio, and waist-to-height ratio. It can also be performed with 3D body scanning, bioelectrical impedance, ultrasound, dual-energy X-ray absorptiometry (DXA), and magnetic resonance imaging (3).

In this sense, Balkau et al (4) in 2007 conducted a study with 168,159 participants aged between 18-80 years, from 63 countries. These authors concluded that waist circumference showed a greater probability of cardiovascular disease and type diabetes. 2 than BMI in participants from most regions of the world. Likewise, Tarqui-Mamani et al (5) in 2017 determined the risk of cardiovascular disease according to abdominal circumference in 16,832 Peruvians ≥ 12 years of age, finding that 50.1% presented a low risk of cardiovascular disease, 22.8% a high risk and 27 .1% very high risk.

On the other hand, there are factors that favor this obesity, such as dietary factors, including the consumption of hypercaloric diets, high in saturated fats, associated with situations such as a sedentary life, which are factors related to the increase in the problem (6). Nowadays, within the meals consumed during the day, there appears to be a global recognition that breakfast should play a significant role in helping consumers achieve an optimal nutritional profile (7).

Breakfast is defined as the first meal of the day that breaks the overnight fast, or the meal consumed within 2 to 3 hours of waking up, which includes at least one food or drink and can be consumed anywhere. It has been reported that both Western and Eastern populations define an adequate breakfast as one that provides at least 20-25% of energy needs (7,8).Its consumption has been associated with a variety of beneficial health effects, such as lower body mass index and improved insulin sensitivity, which are significant risk factors for cardiovascular disease and type 2 diabetes mellitus (8).
In particular, the inhabitants of a certain region can consume what is produced in their natural space or environment, after which they can exchange food as a way to cover a food deficit or change their daily diet.

In general terms, breakfast consumption habits, conducted without any health criteria or nutritional purpose, can generate impacts on individuals (9). For this reason, it is important to know how food consumption during breakfast is promoting abdominal obesity in adults.

The combination of different factors can generate an obesogenic environment. For example: nutritional alterations such as the modification of the diet that has been noticed worldwide, since over the years the consumption of foods with high calorie content, rich in sugars but low in vitamins, fiber, macronutrients and minerals has increased. As well as the modification in the number of foods consumed during the day due to lack of time for consumption, purchase or preparation of food (10).

Regarding the role of breakfast, numerous observational studies associate eating regularly with better weight control in adults (11,12). The ANIBES study (Anthropometry, Intake and Energy Balance in Spain), based on food and nutrition surveys, had the objective of determining anthropometric data, the intake of macronutrients and micronutrients, as well as the practice of physical activity, socioeconomic data and lifestyles in Spain. It is confirmed that the risk of having abdominal obesity is 1.5 times higher in those who skip breakfast when compared to those who always eat breakfast, and the risk is even higher among smokers (12).

An association has also been observed between skipping breakfast with increased weight, BMI, abdominal obesity, and other cardiovascular and metabolic risk factors such as hypertension, dyslipidemia, diabetes, and atherosclerosis (8). Compared to the numerous observational studies that associate breakfast, weight and body composition, it contrasts that there are few longitudinal and intervention studies that have been able to analyze the role of breakfast in weight control and, above all, long-term studies (13).

Based on everything previously stated, the present research aims to evaluate the quality of breakfast in obese adults and its relationship with abdominal obesity as a cardiovascular risk factor. It has the purpose of obtaining information about the foods consumed in the first meal of the day to develop strategies that allow better management of this pathology.

METHODS

The present research is descriptive, observational with a cross-sectional design, non-experimental and correlational. The population was made up of 470 patients who attended the Clinical Nutrition external consultation service at the Amado Clinic in the city of Maracaibo, Venezuela, during the period between July 2022-July 2023.

A non-probabilistic random sample consisting of 214 patients was calculated. The inclusion criteria were the following: a) Of both genders, b) Age between 20 - 65 years, c) with a BMI greater than 30 kg/m2 and d) no history of kidney disease, autoimmune diseases or cancer. All research procedures were performed in accordance with the Declaration of Helsinki (14), individual written informed consent was obtained from all participants.

Procedures

In all patients who met the inclusion criteria, a protocol was carried out to collect information in a nutritional history, where epidemiological, clinical, anthropometric and dietary data were noted. In the nutritional evaluation, the body dimension measurements by a specialist in Clinical Nutrition, previously trained and with standardized methods in Anthropometry. Body weight was obtained using a Health o Meter Continental Scale Corporation platform scale, Bridgeview, Illinois, USA, calibrated in kg (0.1 kg). In the nutritional evaluation of the subjects, the following anthropometric techniques were applied to evaluate body dimension:

Weight and height: The patient with the minimum of clothing on, after having evacuated the rectum and bladder, was weighed on the scale balanced at zero. The subject was placed in an erect position, with the upper limbs on both sides of the body, the palms and fingers of the hands straight and extended downwards, the patient facing forward, standing, with the weight distributed equally on both feet and these slightly separated (15).

Likewise, height was measured with the accompanying height meter of the Health o Meter Continental Scale Corporation, Bridgeview, Illinois, USA platform scale calibrated in cm (0.1 cm). The subject without shoes stood with his heels together at a 45° angle. The heels, buttocks, back and occipital region were in contact with the vertical surface of the height meter. The recording was taken in cm and the subject kept his head in the Frankfurt Plane (15).

Regarding the Body Mass Index (BMI), the weight and height data of the individual were taken, the Quetelet equation was executed: weight (kg)/height (m)2. The classification was used: 30-34.9 kg/m2 = Obesity I; 35-39.9 kg/m2 = Obesity II and >40 kg/m2 = Obesity III according to the WHO criteria (16).

For the waist/height indicator: it was obtained by dividing the waist circumference by the height, both measured in centimeters. The cut-off point used for both sexes was >0.50, an indicator of cardiovascular risk (17). Waist circumference (WC) was measured with the individual standing, taking as a reference for measurement the midpoint between the last rib and the iliac crest in a plane horizontal to the ground. The individual was relaxed, upright, in profile; the arms resting on the thighs and the abdomen exposed, in the position described. The lower costal edge and the upper edge of the iliac crest were palpated, both on the right side. Thus, the measuring tape was taken at the middle vertical distance and then the same was done on the left side (15).

Once the mean was marked on both sides with a dermal marker, the tape was placed without compressing it, around the waist to measure the circumference and taking the corresponding reading. For the anthropometric measurement of waist circumference, the criteria of Reis et al17 were applied. The following were considered as reference: Men with a WC >/= 94 cm and women with a WC >/= 80 cm have abdominal pre-obesity and increased risk of comorbidity; Men with a WC >/= 102 cm and women with a WC >/= 88 cm have abdominal obesity and high risk of comorbidity (18).

Hip circumference was obtained by asking the subject to uncover the part that includes the hip to palpate the greater trochanters of the head of the femur. Once the trochanters were located, the measuring tape was placed without compressing it around them, at their maximum circumference, and the reading was taken (15). The Waist Hip Index (WHR) was calculated by dividing these circumferences; the following scale was used (16): Cardiovascular risk: Men: >0.90 and Women: >0.80.

Diet Assessment

Finally, a dietary history was taken which consisted of three parts: 1) 24-hour anamnesis to know the type of food consumed. 2) Food consumption preference. 3) Questions, specific to breakfast consumption - The 24-hour recall is a retrospective method in which the interviewee is asked to remember all the foods and drinks ingested in the preceding 24 hours, or during the previous day, using measurements practical as a reminder. The food consumption preference consists of a list of foods, or food groups, where it is requested whether or not to consume certain foods. It consisted of 45 items (19).

On the other hand, the Breakfast Quality Index (BQI) was applied, which has been developed as a tool to evaluate the nutritional quality of breakfast at the individual and population level (20). The scoring system for food group components was qualitative. For example, quantities consumed were not considered and only whether the food group was reported as consumed or not in dietary records was considered. Likewise, the fourth component was included according to the combined consumption of cereals, dairy products, and fruits or vegetables at breakfast on at least one day (20, 21).

The categories to evaluate the quality of breakfast were: good quality (includes at least one portion of

each of the three food groups considered), improvable quality (includes a portion of food from two different groups), insufficient (includes a portion of food from a group), poor quality (includes foods that do not belong to the previous groups (20,21)

Statistical analysis of data

Data analysis was performed using the Statistical Package for the Social Sciences (IBM SPSS), version 20 for Windows. The mean was used as a measure of central location, as well as the standard deviation as measures of dispersion only in those quantitative variables with a normal distribution. To verify the normal distribution of the data, the Kolmogorov-Smirnov test was applied.

On the other hand, the qualitative variables were expressed in the form of absolute and relative frequencies. Variables such as gender, age, anthropometric nutritional status and the risk indicator waist circumference were used as grouping factors, while body dimension variables and food groups were used as target variables. The results were analyzed in contingency tables. The association of frequency distributions between two groups was performed using Pearson's Chi square test. To compare the means, Student's t-test and ANOVA were used for parametric variables and Kruskal Wallis for non-parametric variables. Results were considered statistically significant with values of $p<0.05$.

RESULTS

In the present research, 206 subjects met the inclusion criteria. Table 1 represents the epidemiological and anthropometric characteristics of the subjects evaluated according to gender. It is observed in the male gender that the BMI was 33.9±3.1 kg/m2, the circumference/waist (C/C) of 108.8±10.8 cm, waist/height ratio (WHR) of 0.63±0.06 and waist/hip ratio (WHR) of 0.96±0.09. In the female gender, the BMI was 34.2±3.2 kg/m2, the circumference/waist was 99.1±10.8 cm, the waist/height index was 0.62±0.06 and the waist/hip ratio of 0.85±0.07. Significant differences were observed for waist circumference, waist/hip ratio (P=0.000)

TABLE 1
EPIDEMIOLOGICAL AND ANTHROPOMETRIC CHARACTERISTICS OF THE SUBJECTS EVALUATED ACCORDING TO GENDER

	Gender			
	Male (n=95)	Female (n=111)	Total (n=206)	(p=<0.05)
Age (years)	49±11	49±13	48±12	0.078
Anthropometric measures				
Weight (kg)	99.7±12.7	86.1±10.2	92.3±13.3	0.000
Size (cm)	1.71±0.07	1.58±0.05	1.64±0.09	0.000
BMI (kg/m^2)	33.9±3.1	34.2±3.2	34.1±3.1	0.427
Circumference/waist(cm)	108.8±10.8	99.1±10.8	103.6±11.4	0.000
Girth/hip (cm)	112.7±9.5	116.0±9.6	114.5±9.7	0.013
Cardiovascular risk indicators				
Waist/height ratio	0.63±0.06	0.62±0.06	0.63±0.06	0.333
Waist/hip ratio	0.96±0.09	0.85±0.07	0.90±0.10	0.000

Data expressed as mean ± SD. It is considered significant when it is p<0.05
p: determined by Student's t Test

Table 2 represents the epidemiological and anthropometric characteristics of the subjects evaluated according to the waist circumference indicator, which classifies them into pre-obesity and abdominal obesity. The abdominal preobesity group was made up of 37 individuals with a BMI of 34.5±3.2 kg/m2, waist circumference=91.7±7.5 cm, waist/height ratio= 0.55±0. .03 and the waist/hip ratio=0.84±0.07. In the abdominal obesity group made up of 177 subjects, the BMI was 31.8±1.6 kg/m2, waist circumference=106.0±10.4 cm, waist/height ratio= 0.64± 0.05 and the waist/hip ratio=0.92±0.10. A significant response was found in all parameters (p=0.000) with the exception of height.

TABLE 2
EPIDEMIOLOGICAL AND ANTHROPOMETRIC CHARACTERISTICS OF THE SUBJECTS EVALUATED ACCORDING TO THE WAIST CIRCUMFERENCE SCALE

	Waist circumference index scales			
	Abdominal Preobesity (n=36)	Abdominal Obesity (n=170)	Total (n=206)	(p=<0.05)
Age (years)	39±12	49±11	47±12	0.000
Anthropometric measures				
Weight (kg)	87.2±9.5	93.4±13.7	92.3±13.3	0.001
Size (cm)	1.65±0.09	1.64±0.09	1.64±0.09	0.484
BMI (kg/m^2)	31.8±1.6	34.5±3.2	34.1±3.1	0.000
Circumference/waist(cm)	91.7±7.5	106.0±10.4	103.6±11.4	0.000
Girth/hip (cm)	108.7±9.3	115.7±9.3	114.5±9.7	0.000
Cardiovascular risk indicators				
Waist/height ratio	0.55±0.03	0.64±0.05	0.63±0.06	0.000
Waist/hip ratio	0.84±0.07	0.92±0.10	0.90±0.10	0.000

Data expressed as mean ± SD. It is considered significant when it is p<0.05
p: determined by Student´s t Test

Table 3 records the consumption of culinary preparations at breakfast according to the degree of abdominal obesity in the subjects evaluated. Very little variety was observed in the most frequently consumed foods. It is observed that in the abdominal preobesity group the most frequently consumed culinary preparations were arepa with ham and cheese (14%), sandwich with ham and cheese (10%) and eggs 8%. In the abdominal obesity group, the most consumed culinary preparations were arepa with ham and cheese (66%), sandwich with ham and cheese (53%), and banana with cheese (32%). Although the abdominal obesity group had a greater frequency of consumption of the most calorie-rich foods, no differences were found between the two groups.

TABLE 3
CONSUMPTION OF CULINARY PREPARATIONS AT BREAKFAST IN GROUPS WITH ABDOMINAL PREOBESITYAND IN ABDOMINAL OBESITY

TYPES OF CULINARY PREPARATIONS	Waist circumference index				
	Preobesity abdominal (n=36)		Abdominal obesity (n=170)		
	Consumption at breakfast				(p=<0.05)
	Yeah	No	Yeah	No	
Arepa with ham and cheese	29(14)	7(3)	136(66)	34(17)	0.573
Sandwich with ham and cheese	21(10)	15(7)	108(53)	62(30)	0.343
Pancakes	5(2)	31(15)	27(13)	143(70)	0.125
Pita bread with ham and cheese	2(1)	35(16)	14(8)	163(75)	0.497
Mandocas (corn tortilla)	2(1)	34(17)	17(8)	153(74)	0.318
Croissant	1(1)	35(17)	10(4)	160(78)	0.396
Banana with cheese	11(6)	25(12)	68(32)	101(51)	0.166
Turnovers	8(4)	28(14)	38(18)	132(65)	0.590
Yuca with cheese	11(6)	25(12)	50(23)	120(58)	0.518
Eggs	18(8)	18(9)	77(38)	93(47)	0.328

Data expressed as n(%). It is considered significant when it is p<0.05
p: determined by Pearson's Chi square

Table 4 represents the consumption of drinks at breakfast according to the waist circumference scale in the subjects evaluated. In general, the majority did not consume drinks with breakfast. However, in the abdominal pre-obesity group, it was observed that milk had the highest consumption (8%) followed by milk with oats (6%) and coffee with milk (5%), while, in the abdominal obesity group, milk had the highest frequency of consumption (28%) followed by black coffee (22%), then soft drinks and oat milk (19% each).

TABLE 4
CONSUMPTION OF BEVERAGES AT BREAKFAST IN ABDOMINAL PREOBESITYAND IN ABDOMINAL OBESITY

Types of drinks	Waist circumference index				(p=<0.05)
	Abdominal Preobesity (n=36)		Abdominal obesity (n=170)		
	Consumption at breakfast				
	Yeah	No	Yeah	No	
Milk	17(8)	19(9)	60(28)	110(65)	0.165
Coffee with milk	11(5)	25(12)	37(17)	133(65)	0.242
Milk with oats	13(6)	23(11)	40(19)	130(64)	0.127
Black coffee	6(3)	30(15)	47(22)	123(61)	0.185
Tea with sugar	8(4)	28(14)	31(15)	139(67)	0.532
Carbonated drinks	7(3)	29(16)	41(19)	129(64)	0.358
Milk with cereal	9(4)	27(13)	31(15)	139(68)	0.334
Pasteurized juices	6(3)	30(15)	24(11)	146(72)	0.431
Chocolate drink with milk	4(2)	32(15)	31(15)	139(68)	0.316
Fruit juice	9(4)	27(13)	25(12)	145 (71)	0.123
Forum with milk	4(2)	32(16)	11(5)	158(78)	0.324

Data expressed as n(%). It is considered significant when it is p<0.05
p: determined by Pearson's Chi square

Table 5 represents the consumption of vegetables and fruits according to their percentage content of carbohydrates at breakfast according to the waist circumference scale in the subjects evaluated. In the pre-abdominal obesity group, with respect to the consumption of vegetables, it is observed that5% vegetables (spinach, lettuce, cucumber), presented the highest frequency of consumption (24%) followed by10% vegetables (tomato, onion, carrot) (19%). Regarding fruits at 5%, 10% and 15% and regarding fruits at 20%, they were only consumed by 7 patients (19%).

In the abdominal obesity group in the same table 5, it is observed that the5% vegetables already mentioned, presented the highest frequency of consumption (24%) followed by10% vegetables (19%), which they used as a condiment. In the same table 4, with respect to fruits, 19% of the subjects with abdominal obesity consumed 5% fruits. The fruits with the lowest consumption were fruits at 15% (peach, apple, soursop, mango, pineapple) and 20%(bananas) representing 9% and 7% respectively. In general, a low consumption of fruits and vegetables was found in both groups, not statistically significant.

TABLE 5
CONSUMPTION OF VEGETABLES AND FRUITS ACCORDING TO THEIR PERCENTAGE CARBOHYDRATE CONTENT IN BREAKFAST IN ABDOMINAL PREOBESITYAND IN ABDOMINAL OBESITY

Groups of vegetables and fruits according to their content Carbohydrates (%)	Waist circumference index				(p=<0.05)
	Abdominal Preobesity (n=36)		Abdominal Obesity (n=170)		
	Consumption at breakfast				
	Yeah	No	Yeah	No	
5% vegetables (spinach, lettuce, cucumber)	12(33)	25(67)	43(24)	134(76)	0.303
10% vegetables (Tomato, onion, carrot)	9(24)	28(76)	33(19)	144(81)	0.429
5% fruits (Melon, watermelon, strawberries, lemon)	6(16)	31(84)	33(19)	144(81)	0.728
Fruits at 10% (Passion fruit, guava, Papaya, orange, grapes)	6(16)	31(84)	30(17)	147(83)	0.914
Fruits at 15% (Peach, apple, soursop, mango, pineapple)	6(16)	31(84)	16(9)	161(91)	0.191
Fruits at 20% (Bananas)	(19)	30(81)	13(7)	164(93)	0.028

Data expressed as n (%). It is considered significant when it is p<0.05
p: determined by Pearson's Chi square

When analyzing Table 6, according to the waist circumference scales, the abdominal preobesity group represented 36% of the total group, with a predominance of the male gender (64%). Regarding the quality of breakfast, 44% consumed a type of breakfast of improvable quality, 41% a good quality breakfast. 12% of poor quality and 3% of insufficient quality.

In this same table 6, it is observed that in the abdominal obesity group, it can be seen that 57% were women and 43% were men. Regarding the quality of breakfast, 60% consumed a type of breakfast of improvable quality, 30% a good quality breakfast. 7% of poor quality and 3% of insufficient quality. A significant difference was found with respect to the predominance in the female gender and its greater frequency in the consumption of breakfast of improvable quality (39%). In the good quality breakfast, the values between genders were similar.

TABLE 6
BREAKFAST QUALITY ACCORDING TO GENDER ACCORDING TO ABDOMINAL PREOBESITYAND IN ABDOMINAL OBESITY

BREAKFAST QUALITY	Waist circumference index scales							
	Abdominal Preobesity (n=36)				Abdominal Obesity (n=170)			
	Gender							
	M	F	Total	p<0.05	M	F	Total	p<0.05)
Good quality (Contains a portion of dairy, cereals and fruits)	10(27)	5(14)	15(41)		27(16)	24(14)	51(30)	
Improved quality (Includes a portion from two different groups)	10(28)	6(16)	16(44)		35(21)	67(39)	102(60)	
Insufficient: (Includes a portion of food from a group)	1(3)	0(0)	1(3)	0.81	2(1)	4(2)	6(3)	0.024
Poor quality (Includes processed foods, fried foods, pastries.)	2(6)	2(6)	4(12)		8(5)	3(2)	11(7)	
Total	23(64)	13(36)	36(100)		72(43)	98(57)	170(100)	

Table 7 shows the epidemiological and anthropometric characteristics of the subjects evaluated according to the quality of breakfast. It is observed that the older they are, the quality of breakfast decreases. All subjects presented a high cardiovascular risk determined by waist circumference, waist/height ratio and waist/hip ratio independent of the quality of the breakfast consumed.

TABLE 7
EPIDEMIOLOGICAL AND ANTHROPOMETRIC CHARACTERISTICS OF THE SUBJECTS EVALUATED ACCORDING TO THE QUALITY OF THE BREAKFAST

	Breakfast quality				
	Good quality (n=66)	Improvable quality (n=118)	Insufficient quality (n=7)	Poor quality (n=15)	(p=<0.05)
Age (years)	47±11	48±12	50±10	52±10	0.452
Anthropometric measures					
Weight (kg)	92.9±13.2	92.6±13.9	89.9±9.8	91.6±12.2	0.948
Size (cm)	1.64±0.09	1.63±0.09	1.61±0.06	1.64±0.09	0.603
BMI (kg/m^2)	33.9±3.3	34.3±3.21	34.3±3.09	33.6±2.59	0.694
Circumference/waist(cm)	102.9±11.5	104.2±11.7	104.0±10.3	105.4±10.7	0.652
Girth/hip (cm)	114.5±12.5	114.9±8.2	111.0±5.7	114.5±9.9	0.781
Cardiovascular risk indicators					
Waist/height ratio	0.62±0.06	0.63±0.06	0.64±0.05	0.63±0.06	0.533
Waist/hip ratio	0.90±0.10	0.90±0.10	0.94±0.12	0.92±0.11	0.752

Data expressed as mean ± SD. It is considered significant when it is p<0.05
p: determined by one-way ANOVA

Finally, in Table 8, no association was found between the anthropometric indicators of cardiovascular risk and the quality of the breakfast consumed by the participants. A predominance of abdominal obesity with cardiovascular risk is observed.

TABLE 8
ASSOCIATION BETWEEN THE ANTHROPOMETRIC INDICATORS OF CARDIOVASCULAR RISK AND THE QUALITY OF THE BREAKFAST CONSUMED BY THE PARTICIPANTS

Indicators Anthropometric cardiovascular risk	Breakfast quality				Total (206)	(p=<0.05)
	Good quality (n=66)	Improvable quality (n=118)	Insufficient quality (n=7)	Poor quality (n=15)		
Waist circumference						
Preabdominal obesity	15(42)	16(34)	1(3)	4(11)	36(100)	0.330
abdominal obesity	51(30)	102(60)	6(4)	11(6)	170(100)	
Waist/height index						
No cardiovascular risk	1(0)	0(0)	0(0)	0(0)	1(100)	0.548
With cardiovascular risk	65(32)	118(58)	7(3)	15(7)	205(100)	
Waist/hip ratio						
No cardiovascular risk	15(37)	21(51)	0(0)	5(12)	41(100)	0.253
With cardiovascular risk	51(31)	97(59)	07(4)	10(6)	165(100)	

Data expressed as n (%). It is considered significant when it is p<0.05*p*: determined by Kruskal Wallis

DISCUSSION

Obesity refers to the excessive accumulation of fat in the body and the pattern of fat distribution, in this case abdominal fat, called abdominal or visceral obesity, which is considered the most serious form of fat distribution, since predisposes individuals to various metabolic disorders and diseases (22). On the other hand, it has been reported that eating a healthy breakfast is associated with better control of body weight and indicators of healthy cardiometabolic risk, both in children and adults (9).

The objective of this research was to determine the association between the quality of breakfast and obesity and its association with anthropometric indicators of cardiovascular risk. It was observed that all subjects presented a high cardiovascular risk independent of the quality of breakfast consumed. A greater consumption in women of a breakfast of improvable quality was found; while poor quality breakfast had a higher frequency of consumption in men, and with increasing age the quality of breakfast decreased. No significant differences were found between breakfast quality and anthropometric cardiovascular risk associated with obesity.

Waist circumference and BMI alone are positively associated with morbidity and mortality independent of age, sex, and ethnicity (23). It should be noted that, according to BMI, the waist/height ratio and circumference/hip observed in the present study are similar to those reported by Álvarez Marín (24) in 2020, in his work on the prevalence of abdominal obesity in administrative workers in the city of Machala, Ecuador; where the female sex predominated with 59.3% and the age group of 35 to 39 years with 23.1%, the male sex was more prevalent.

Abdominal obesity is a risk factor for health, favoring the development of comorbidities such as: dyslipidemia, high blood pressure, insulin resistance, diabetes mellitus. and cardiovascular diseases (25). In this order of ideas, Hidalgo et al., (26), carried out an epidemiological, cross-sectional study with a sample of 1,496 people found a prevalence of abdominal obesity in adults in the State of Pernambuco, Brazil of 64.4%, lower than that reported in the present research.

On the other hand, healthy eating in adults is conditioned by their eating habits. A typical diet for an adult should include at least three main meals, with four generally recommended. Regarding breakfast, it should be noted that in this work only the quality of breakfast was evaluated, which is determined by the type of food consumed. In this order of ideas, the predominant basic groups at breakfast should be dairy products, cereals and fruit or fresh fruit juice; with dairy products and cereals (cookies, bread, pastries, breakfast cereals) being preferred by the subjects (27).

In this sense, Akbarzade et al., (28) evaluated abdominal obesity in 850 Iranian subjects according to the waist-hip ratio (HR/C ≥0.9 for men, ≥0.85 for women) and waist circumference (that is, abdominal obesity if ≥102 cm for men, WC ≥88 cm for women) with the quality of breakfast, reported a significant relationship between the dietary pattern of “bread and cereals, meat products and coffee” and the waist/hip ratio , although no significant relationship was observed between general obesity and breakfast dietary patterns. Similar results observed in the present investigation.

On the other hand, the Latin American Nutrition and Health Study (29) with a sample of 8,714 participants aged between 15 and 65 years analyzed the food and nutrient intake of nationally representative samples of

urban populations from 8 countries in Los Angeles (Argentina, Brazil, Chile, Colombia, Costa Rica, Ecuador, Peru and Venezuela) in 2014-2015, to evaluate the general quality of the diet of individuals. These authors concluded that at breakfast, white breads/rolls/tortillas were the most consumed food group (60%), followed by butter/margarine (40%) and coffee/tea without milk (34%-50%). Results that coincide with the present investigation (29).

Likewise, Min et al., (30) in a study of Korean adults, indicated a Western breakfast pattern that included eggs, refined cereals, and processed meat was associated with an increased risk of metabolic syndrome, of which abdominal obesity is a component. key, compared to a breakfast pattern of fruits, nuts and vegetables.

No association was found between breakfast consumption and obesity, or with anthropometric indicators of cardiovascular risk. Breakfast intake may be associated with diet quality, body composition, and chronic disease risk markers (31). In contrast, skipping breakfast is linked to a low-quality diet, poor cognitive performance, and negative health outcomes (7). Cardiovascular diseases constitute a global health challenge influenced by the factors that determine health, with diet being one of the most influential factors. In this sense, it has been determined that the frequency, quality and quantity of the diet within eating habits play a predominant role (32).

As for the consumption of culinary preparations at breakfast, it confirms the results expressed by the Commission for Human Rights of the State of Zulia (Codhez), where they express that, in this region, culturally there is a marked consumption of high-calorie foods in the breakfast (33). In this sense, Sun et al., (34) reported that consumption of a fast food-style breakfast, rich in energy and high in fat, resulted in an increase in postprandial oxidative stress.

On the other hand, Coronel (27) evaluated the quality of breakfast in 55 (only 3% with obesity) nutrition students at the University of the Faculty of Health Sciences, Argentina. Most of the breakfasts were evaluated under the category of good quality breakfast, that is, they contain at least one food from the group of dairy products, cereals and fruit. This author reported that 34.5% were in the breakfast category of improvable quality, only 14.5% included a dairy, a cereal and a fruit in this meal. Among the strengths of this research work, it is worth highlighting that there is little published evidence that evaluates the impact of breakfast on obese people in clinical practice (mainly focusing on schoolchildren and adolescents and on the epidemiological part).

Another important aspect was the low consumption of fruits and vegetables within the qualitative value of the breakfast of the subjects studied. There is extensive scientific evidence about the benefits for human health of the consumption of fruits and vegetables, due to the properties derived from phytochemical compounds and combinations of nutrients, specifically vitamins and minerals (35).These results are similar to those reported by Delley et al., (36) from their study in 460 German-speaking Swiss residents where they evaluated the quality of breakfast, concluding that the composition of the Swiss breakfast is moderately healthy and lacks fruits and whole grain products. .

Finally, in these subjects, where obesity has already been established, it is important to develop dietary strategies where weight status, caloric and nutrient needs, food preferences, and cardiometabolic risk factors must be considered. This is why it is recommended to carry out nutritional education where all treatment approaches must consider qualitative and quantitative food selection, in addition to a negative energy balance (37).

CONCLUSIONS

All subjects presented a high cardiovascular risk determined by the abdominal distribution of body fat, regardless of the quality of the breakfast consumed. Although breakfast predominated, it was characterized by very low consumption of vegetables and fruits; which infers, from a clinical point of view, that they are patients with a chronic pathology, where not only the quality, but also the management of the portions and energy density of the predominant food groups in their diet must be considered.

INTEREST CONFLICT

None declared by the authors

REFERENCES

1. Anderson Vásquez H E. What diet should be selected in the treatment of obesity? An Venez Nutr. 2020; 33 (1): 41-50. Available at: http://ve.scielo.org/scielo.php?script=sci_arttext&pid=S0798-07522020000100041&lng=es.
2. Mayoral LP, Andrade GM, Mayoral EP, Huerta TH, Canseco SP, Rodal Canales FJ, Cabrera-Fuentes HA, Cruz MM, Pérez Santiago AD, Alpuche JJ, Zenteno E, Ruíz HM, Cruz RM, Jerónimo JH, Pérez-Campos E Obesity subtypes, related biomarkers & heterogeneity. Indian J Med Res. 2020; 151(1):11-21. DOI: https://dx.doi.org/10.4103/ijmr.IJMR_1768_17.
3. Fang H, Berg E, Cheng X, Shen W. How to best assess abdominal obesity. Curr Opin Clin Nutr Metab Care. 2018;21(5):360-365. DOI: https://dx.doi.org/10.1097/MCO.0000000000000485.

4. Balkau B, Deanfield JE, Després JP, Bassand JP, Fox KA, Smith SC Jr, Barter P, Tan CE, Van Gaal L, Wittchen HU, Massien C, Haffner SM. International Day for the Evaluation of Abdominal Obesity (IDEA): a study of waist circumference, cardiovascular disease, and diabetes mellitus in 168,000 primary care patients in 63 countries. Circulation. 2017;116(17):194251. DOI: https://dx.doi.org/10.1161/CIRCULATIONAHA.106.676379.
5. Tarqui C, Álvarez D, Espinoza P. Cardiovascular risk according to abdominal circumference in Peruvians. An Fac med. 2017; 78(3):287-91. DOI: https://dx.doi.org/10.15381/anales.v78i3.13760.
6. Guerrero Pérez A. Food transculturation in Venezuela and its influence on the development of obesity. Electronic Journal of Political Psychology 2017; 15 (38). Available in:http://www.psicopol.unsl.edu.ar/pdf/2017-Julio-Articulo%2006.pdf
7. Ruiz Moreno E, Valero Gaspar T, Rodríguez Alonso P, Diaz-Roncero A, Gómez Carus A, Ávila Torres JM, Varela Moreiras, G. Spanish Nutrition Foundation. Status of Breakfast in Spain. Spanish Nutrition Foundation. 2018 83 pp. Available in:https://www.fen.org.es/publicacion/estado-de-situacion-sobre-el-desayuno-en-espana
8. Basdeki ED, Argyris AA, Efthymiou O, Athanasopoulou E, Sfikakis PP, Protogerou AD, Karatzi K. Systematic Breakfast Consumption of Medium-Quantity and High-Quality Food Choices Is Associated with Better Vascular Health in Individuals with Cardiovascular Disease Risk Factors. Nutrients. 2023;15(4):1025. DOI: https://dx.doi.org/10.3390/nu15041025.
9. López Sobaler, Ana M., Cuadrado Soto, Esther, Peral Suárez, África, Aparicio, Aránzazu, & Ortega, Rosa M. Importance of breakfast in the nutritional and health improvement of the population. Hospital Nutrition, 2018 35(spe6), 3-6. DOI: https://dx.doi.org/10.20960/nh.2278.
10. Vázquez Torres, NC Influence of nutritional risk factors on the appearance of overweight in adults. Psic-Obesity,2021;10(37). Available at: https://revistas.unam.mx/index.php/psic/article/view/80523
11. Marangoni F, Poli A, Agostoni C, Di Pietro P, Cricelli C, Brignoli O, et al. A consensus document on the role of breakfast in the attainment and maintenance of health and wellness. Biomed Act. 2009; 80 (2): 166-171.PMID: 19848056
12. Navia B, López-Sobaler AM, Villalobos T, Aranceta-Bartrina J, Gil Á, González-Gross M, Serra-Majem L, Varela-Moreiras G, Ortega RM. Breakfast habits and differences regarding abdominal obesity in a cross-sectional study in Spanish adults: The ANIBES study. PLoS One. 2017;12(11):e0188828. DOI:https://dx.doi.org/10.1371/journal.pone.0188828
13. Uzhova I, Fuster V, Fernández-Ortiz A, Ordovás JM, Sanz J, Fernández-Friera L, López-Melgar B, Mendiguren JM, Ibáñez B, Bueno H, Peñalvo JL. The Importance of Breakfast in Atherosclerosis Disease: Insights From the PESA Study. J Am Coll Cardiol. 2017; 70 (15): 1833-1842. DOI:https://dx.doi.org/10.1016/j.jacc.2017.08.027
14. World Medical Association. World Medical Association Declaration of Helsinki: ethical principles for medical research involving human subjects. JAMA. 2013;310(20):2191-2194. DOI: https://dx.doi.org/10.1001/jama.2013.281053.
15. ISAK. International Standards For Anthropometric Assessment. International Society for the Advancement of Kinanthropometry. National Library of Australia. 2001. 123 pp
16. World Health Organization. BMI classification. 2015. Available in:http://www.who.int/bmi/index.jsp?introPage=intro_3.html.
17. Reis JP, Araneta MR, Wingard DL, Macera CA, Lindsay SP, Marshall SJ. Overall obesity and abdominal adiposity as predictors of mortality in us White and black adults. Ann Epidemiol. 2009; 19 (2): 134-142. DOI: https://dx.doi.org/10.1016/j.annepidem.2008.10.008.
18. Jablonowska-LietzB. Wrzosek M, Wlodarczyk M, Nowicka G (2017). New indexes of body fat distribution, visceral adiposity index, body adiposity index, waist-to-height ratio, and metabolic disturbances in the obese. Kardiol Pol. 2017;75(11):1185-1191. DOI: https://dx.doi.org/10.5603/KP.a2017.0149.
19. Ferrari Mariela Angela. Estimation of intake by 24-hour recall. DIAETA. 2013; 31 (143):20-25.Available at: http://www.scielo.org.ar/scielo.php?script=sci_arttext&pid=S1852-73372013000200004&lng=es.
20. Lesani, A., Barkhidarian, B., Jafarzadeh, M. Bahareh B, Akbarzade Z, Djafarian K and ShabBidar S. Time-related meal patterns and breakfast quality in a sample of Iranian adults. BMC Nutr. 2023; 9 (13). DOI:https://doi.org/10.1186/s40795-022-00666-w
21. O'Neil CE, Byrd-Bredbenner C, Hayes D, Jana L, Klinger SE, Stephenson-Martin S. The role of breakfast in health: definition and criteria for a quality breakfast. J Acad Nutr Diet. 2014; 114 (12 Suppl): S8-S26. DOI: https://dx.doi.org/10.1016/j.jand.2014.08.022.
22. Chaudhary M, Sharma P. Abdominal obesity in India: analysis of the National Family Health Survey-5 (2019-2021) data. Lancet Reg Health Southeast Asia. 2023; 14: 100208. DOI:https://dx.doi.org/10.1016/j.lansea.2023.100208.
23. Ross R, Neeland IJ, Yamashita S, Shai I, Seidell J, Magni P, Santos RD, Arsenault B, Cuevas A, Hu FB, Griffin BA, Zambon A, Barter P, Fruchart JC, Eckel RH, Matsuzawa Y, Després JP . Waist circumference as a vital sign in clinical practice: a Consensus Statement from the IAS and ICCR

Working Group on Visceral Obesity. Nat Rev Endocrinol. 2021; 16 (3): 177-189. DOI: https://dx.doi.org/10.1038/s41574-019-0310-7.
24. Álvarez Marín M. Prevalence of abdominal obesity in administrative workers in the city of Machala. 2020; XV (24): 1243. Available in:https://www.revista46portalesmedicos.com/revista-medica/prevalencia-de-obesidad-abdominal-entrabajadores-administrativos-de-la-ciudad-de-machala/
25. Aune D, Sen A, Norat T, Janszky I, Romundstad P, Tonstad S, Vatten LJ. Body Mass Index, Abdominal Fatness, and Heart Failure Incidence and Mortality: A Systematic Review and Dose-Response Meta-Analysis of Prospective Studies. Circulation. 2016; 133 (7): 639-649. DOI:https://dx.doi.org/10.1161/CIRCULATIONAHA.115.016801
26. Hidalgo Villarreal VI, Cabral PC, Batista Filho, Sequeira-de-Andrade LAS, Arruda Ilma KG de, Silva Santos da et al. Abdominal obesity in adults in the State of Pernambuco, Brazil: a cross-sectional epidemiological study. Rev Esp Nutr Hum Diet. 2020; 24 (3): 190-202. DOI:https://dx.doi.org/10.14306/renhyd.24.3.849.
27. Colonel G. The quality of breakfast and its relationship with body mass index. Rev Esp Nutr Comunitaria 2018; 24 (Suppl 3): 96-104. DOI: https://doi.org/10.14642/RENC.2018.24.sup3.5211
28. Kovalskys I, Fisberg M, Previdelli A. N, Pereira JL, Zimberg IZ, Guajardo V, Fisberg R, Ferrari G, Gómez G, Rigotti A, Cortés Sanabria LY. Yépez García M. C, Herrera-Cuenca M, Liria Domínguez M R. Breakfast in Latin America: Evaluation of Nutrient and Food Group Intake Toward a Nutrient-Based Recommendation. Journal of the Academy of Nutrition and Dietetics. 2021; 122 (6): 1099-1113. DOI:https://doi.org/10.1016/j.jand.2021.11.012
29. Akbarzade Z, Mohammadpour S, Djafarian K, Clark CCT, Ghorbaninejad P, Mohtashami M, Shab-Bidar S. Breakfast-Based Dietary Patterns and Obesity in Tehranian Adults. J Obes Metab Syndr. 2020; 29 (3): 222-232. DOI: https://doi.org/10.7570/jomes20042.
30. Min C, Noh H, Kang YS, Sim HJ, Baik HW, Song WO, Yoon J, Park YH, Joung H. Breakfast patterns are associated with metabolic syndrome in Korean adults. Nutr Res Pract. 2012; 6 (1): 61-67. DOI:https://doi.org/10.4162/nrp.2012.6.1.61
31. Roshanmehr F, Tahara Y, Makino S, Tada A, Abe N, Michie M, Shibata S. Association of Japanese Breakfast Intake with Macro- and Micronutrients and Morning Chronotype. Nutrients. 2022; 14 (17): 3496. DOI: https://doi.org/10.3390/nu14173496.
32. Ibáñez B, Fernández-Alvira JM. Breakfast Is a Marker for Cardiovascular Risk Prediction. J Am Coll Cardiol. 2019; 73 (16): 2033-2035. DOI: https://doi.org/10.1016/j.jacc.2019.02.033.
33. Commission for Human Rights of the State of Zulia (Codhez). Food security in Maracaibo Annual report 2019. Available in:https://fscluster.org/sites/default/files/documents/codhez_seguro_alimentaria_en_maracaibo_informe_anual_2019.pdf.
34. Sun M, Wang Cross-Sectional Study. Nutrients.2022; 14 (20): 4378. DOI: https://doi.org/10.3390/nu14204378.
35. Majdan M, Bobrowska-Korczak B. Active Compounds in Fruits and Inflammation in the Body. Nutrients. 2022;14(12):2496. DOI: https://doi.org/10.3390/nu14122496
36. Delley M, Brunner TA. Breakfast eating patterns and drivers of a healthy breakfast composition. Appetite. 2019; 137: 90-98. DOI: https://doi.org/10.1016/j.appet.2019.02.006
37. Wiechert M, Holzapfel C. Nutrition Concepts for the Treatment of Obesity in Adults. Nutrients. 2021; 14 (1): 169. DOI: https://doi.org/10.3390/nu14010169.