Al-Rafidain J Med Sci. 2026;11(2):285-292.
DOI: https://doi.org/10.54133/ajms.v11i2.3373

AJMS

Online ISSN (3219-2789)

Research Article

Chronic Disease Risk Factors Among Adults in Relizane, Algeria: A Comprehensive Study

Zouheyr Hadri[1,2]*, Fouad Affane[1,2], Sofiane Boudalia[3,4], Rachida Kirdi[5,6], Abdellah Rahali[7], Badreddine Moussaoui[8]

[1]*Faculty of Natural and Life Sciences, Department of Nutritional Sciences, University of Relizane-Ahmed Zabana, Bourmadia BP 48000, Relizane, Algeria;* [2]*Laboratory of Environment, Natural Plant Substances, and Food Technology, University of Relizane-Ahmed Zabana, Bourmadia BP 48000, Relizane, Algeria;* [3]*Laboratory of Biology, Water and Environment, University of May 8, 1945 Guelma, Guelma 24000, Algeria;* [4]*Department of Ecology and Environmental Engineering, University of May 8, 1945 Guelma, Guelma 24000, Algeria;* [5]*Laboratory of Biomaterials and Transport Phenomena LBMPT, University Yahia Fares, Urban pole, 26000 Medea, Algeria;* [6]*Laboratory of Nutrition, Biodiversity and Environment, Faculty of Sciences, University of Yahia Fares of Medea, Algeria;* [7]*Department of Microbiology and Biochemistry, Faculty of Sciences, University of Mohamed Boudiaf, M'sila, Algeria;* [8]*Laboratory of Beneficial Microorganisms, Functional Food and Health (LMBAFS), Faculty of Natural Sciences and Life, University of Abdelhamid Ibn Badis, Mostaganem, Algeria*

Received: 17 August 2026; Revised: 10 October 2026; Accepted: 22 October 2026

Abstract

Background: Chronic diseases, especially diabetes, hypertension, and hypercholesterolemia, are an increasing public health burden in Algeria. ***Objectives***: To investigate the anthropometric, behavioral, nutritional, and socio-emotional determinants related to chronic diseases in adults of Relizane, Algeria. ***Methods***: A cross-sectional observational study was carried out during the period of February to April 2023 on 262 adult subjects recruited from Ahmed Francis Hospital in Oued R'hiou, Province of Relizane. Data were collected through face-to-face interviews based on a structured questionnaire that included sociodemographic characteristics, anthropometric measurements, lifestyle behaviors, dietary habits, physical activity, sleep, and chronic disease status. Multivariable logistic regression was used to identify independent factors associated with diabetes, hypertension, and hypercholesterolemia. ***Results***: Overweight and obesity affected 49.24% and 17.56% of participants, respectively, with significantly higher obesity prevalence among women (p<0.01). Diabetes was the most prevalent chronic condition, followed by hypertension and hypercholesterolemia. Female sex and older age were independently associated with hypertension and hypercholesterolemia, while emotional stress was significantly associated with diabetes (adjusted OR= 2.614, p=0.003). Diabetes was also significantly associated with hypertension (OR=3.02) and hypercholesterolemia (OR=2.88; both p=0.001). Only 17.56% of participants engaged in sports activities. ***Conclusions***: Chronic diseases in adults are marked by a heavy burden of excess weight and multiple modifiable behavioral and socio-emotional risk factors. Specific strategies are needed to increase physical activity, healthy eating, stress management, and nutritional education, particularly among women and older adults.

Keywords: Age; Chronic diseases; Emotional shock; Nutrition; Physical activity.

عوامل خطر الأمراض المزمنة بين البالغين في غليزان، الجزائر: دراسة شاملة

الخلاصة

الخلفية: الأمراض المزمنة، وخاصة السكري، وارتفاع ضغط الدم، وارتفاع الكوليسترول الدم، تشكل عبئا متزايدا على الصحة العامة في الجزائر. **الأهداف**: التحقيق في المحددات الأنثروبومترية والسلوكية والتغذوية والاجتماعية العاطفية المرتبطة بالأمراض المزمنة لدى بالغي غليزان، الجزائر. **الطرائق**: أجريت دراسة رصدية مقطعية خلال الفترة من فبراير إلى أبريل 2023 على 262 شخصًا بالغا تم تجنيدهم من مستشفى أحمد فرانسيس في واد رهيو، ولاية غليزان. تم جمع البيانات من خلال مقابلات وجها لوجه استنادا إلى استبيان منظم شمل الخصائص الاجتماعية الديموغرافية، والقياسات الأنثروبومترية، وسلوكيات نمط الحياة، والعادات الغذائية، والنشاط البدني، والنوم، وحالة الأمراض المزمنة. تم استخدام الانحدار اللوجستي متعدد المتغيرات لتحديد العوامل المستقلة المرتبطة بالسكري وارتفاع ضغط الدم وفرط الكوليسترول. **النتائج**: أثرت زيادة الوزن والسمنة على 49.24٪ و17.56٪ من المشاركين على التوالي، مع انتشار أعلى بشكل ملحوظ للسمنة بين النساء (p<0.01). كان السكري هو الحالة المزمنة الأكثر انتشارا، يليه ارتفاع ضغط الدم وفرط الكوليسترول. ارتبط الجنس الأنثوي والعمر الأكبر بشكل مستقل بارتفاع ضغط الدم وفرط الكوليسترول، بينما كان التوتر العاطفي مرتبطا بشكل كبير بالسكري (معدل p=0.003، OR= 2.614). كان السكري مرتبطا أيضا بشكل ملحوظ بارتفاع ضغط الدم (OR=3.02) وفرط كوليسترول الدم (OR=2.88؛ كلاهما p=0.001). فقط 17.56٪ من المشاركين شاركوا في الأنشطة الرياضية. **الاستنتاجات**: تتميز الأمراض المزمنة لدى البالغين بثقل الوزن الزائد وعوامل خطر سلوكية واجتماعية عاطفية قابلة للتعديل. هناك حاجة إلى استراتيجيات محددة لزيادة النشاط البدني، والأكل الصحي، وإدارة التوتر، والتثقيف الغذائي، خاصة بين النساء وكبار السن.

Corresponding author: Zouheyr Hadri. Faculty of Natural and Life Sciences, Department of Nutritional Sciences, University of Relizane-Ahmed Zabana, Bourmadia BP 48000, Relizane, Algeria; Email: zouheyr.hadri@univ-relizane.dz

Article citation: Hadri Z, Affane F, Boudalia S, Kirdi R, Rahali A, Moussaoui B. Chronic Disease Risk Factors Among Adults in Relizane, Algeria: A Comprehensive Study. *Al-Rafidain J Med Sci*. 2026;11(2):285-292. doi: https://doi.org/10.54133/ajms.v11i2.3373

© 2026 The Author(s). Published by Al-Rafidain University. This is an open access journal issued under the CC BY-NC-SA 4.0 license (https://creativecommons.org/licenses/by-nc-sa/4.0/).

INTRODUCTION

Chronic illnesses, often known as non-communicable diseases (NCDs), are the primary cause of death in the majority of developed and many developing countries. Globally, chronic illnesses like diabetes, cancer, respiratory conditions, and cardiovascular disease claimed 58 million lives in 2005 [1]. Chronic disease is becoming more common and more expensive as people live longer. By 2030, chronic illness is predicted to cost the global economy $47 trillion [2]. In 2015, non-communicable diseases (NCDs) accounted for 30.7% (US$74.6 billion) of approximately US$243 billion in revenue loss caused by the disease burden in Africa [3]. The population of Algeria is witnessing a significant change in disease trends, evident in the increasing prevalence of non-communicable diseases, particularly metabolic disorders like diabetes, hypertension, and high cholesterol levels. According to national data, 14.4% of adults have diabetes, over 50% are overweight or obese, and 23.6% have hypertension [4].

The economic burden of diabetes is considerable, with annual costs estimated at up to 2.7 million DZD (≈ €17,740) per person. Over a five-year period, these expenditures could reach 2,174 billion DZD (≈ €14.29 billion) for the national diabetic population, which is projected to grow to approximately 4 million individuals by 2027. Furthermore, the progression of prediabetes to diabetes in the at-risk population could generate an additional 1,114 billion DZD (≈ €7.32 billion) in costs [5]. Metabolic syndrome, characterized by a cluster of metabolic issues such as abdominal obesity, hypertension, low HDL cholesterol, high triglycerides, and increased glucose, is a significant contributor to cardiovascular disease risk. In urban Oran, the ISOR study revealed a 20% occurrence of metabolic syndrome, with elevated rates in women and particular patterns like decreased HDL-cholesterol and abdominal obesity [6]. A comprehensive national survey utilizing the WHO STEPS methodology indicated that hypertension impacts 31.6% of adults, with prehypertension at 36.2%, and highlighted age, obesity, and abdominal obesity as significant risk factors [7]. Simultaneously, a nationally representative evaluation of the 2016–2017 NCD risk factor survey revealed that around one in three adults in Algeria has metabolic syndrome (34.0%), with a greater prevalence in women (39.1%) compared to men (29.1%). Frequent clusters, such as abdominal obesity, low HDL-cholesterol, and hypertension in females, along with low HDL-cholesterol, hypertension, and hyperglycemia in males, demonstrate gender-specific trends that require customized approaches [8]. These results highlight a crucial role for socio-demographic and behavioral elements. Urbanization, changes in diet, less active lifestyles, and swift socioeconomic transformations contribute to Algeria's increasing metabolic load [4,6]. Low socioeconomic status and lack of education increase these risks by limiting access to nutritious food options and preventive healthcare services [8,9]. In spite of this changing health environment, research examining the joint impact of anthropometry, behavior, and psychosocial elements on chronic disease risk within particular Algerian groups is still scarce. Grasping how these factors interact across various demographic settings, particularly regarding gender, education, and geographic inequalities, is essential for creating effective public health initiatives. To examine characteristics linked to diabetes, hypertension, and hypercholesterolemia, this study sought to describe the anthropometric, lifestyle, nutritional, and socioemotional profiles of people with chronic diseases in Relizane, Algeria. By clarifying the primary adjustable factors of metabolic risk in this context, the study aims to guide customized intervention plans designed to diminish the impact of chronic diseases in Algerian adults.

METHODS

Participants and study design

A cross-sectional, observational study using convenience sampling was conducted between February and April 2023 at Ahmed Francis Hospital in Oued R'hiou, Relizane Province, northwestern Algeria. A total of 262 adults aged ≥18 years were recruited from the study population (Figure 1). Participants of both sexes who met the eligibility criteria and provided informed consent were included in the study.

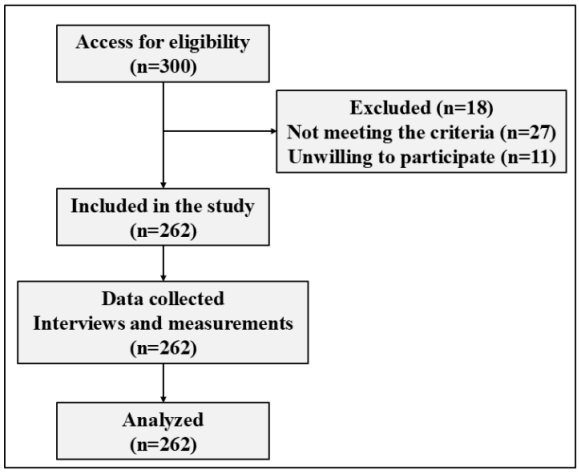


Figure 1: Participant flowchart of the study.

Data collection

The data for our study were collected in full compliance with confidentiality and anonymity requirements and in accordance with the principles of the Declaration of Helsinki. Participants received a clear explanation and were informed in advance about the design and objectives of the study, and they were free to accept or decline participation. Data collection was conducted through face-to-face interviews using a structured questionnaire, which covered general identification (age, sex, educational level, and profession), anthropometric measurements (body weight, height, waist measurement, and hip measurement), sociocultural status, medical conditions, diet, physical activity (duration, frequency, and type of sport), and sleep duration. The survey was administered by master's students from the Department of Nutritional Sciences at the University of Relizane, accompanied by hospital nurses, and under the supervision of experienced researchers in the field. Eligible participants were adults aged 18 years or older, of both sexes, residing in the study area, and willing to provide informed consent. Exclusion criteria included individuals with physical disabilities or mental disorders preventing reliable participation, pregnant women, and those providing incomplete or inconsistent responses. The research team, along with three students, assessed the questionnaire for clarity, validity, and reliability before the inclusion phase and conducted a pilot test.

Anthropometry

Two obesity-related variables were employed in this study, which were BMI and waist circumference. The anthropometric measurements were conducted three times in accordance with WHO guidelines and with a previous study published in 2022 [10–13]. The

standing height was recorded to the nearest millimeter using a stadiometer mounted on the wall. Waist and hip circumferences were recorded using a tape measure, with a range of 0 to 220 cm and an accuracy of 1 mm. Whereas the hip circumference is measured at the widest place around the buttocks, the waist circumference was measured at the middle point between the lower rib and the iliac crest. A stadiometer installed on the wall was used to measure standing height to the closest millimeter. The body mass index, or BMI, was computed by dividing the kilogram weight by the square of the meters. Underweight (BMI < 18.0 kg/m²), normal (BMI = 18.5–24.9 kg/m²), overweight (BMI = 25.0–29.9 kg/m²), and obese (BMI ≥ 30.0 kg/m²) were the definitions of corpulence based on the BMI values [10].

Physical activity and sleeping data

Physical activity among adults was assessed using a modified version of the Global Physical Activity Questionnaire (GPAQ) developed by the World Health Organization (WHO) [11]. The adapted tool consisted of eight items rated on a 5-point Likert scale, designed to capture the frequency and intensity of physical activity during the previous seven days. The questionnaire covered a wide range of domains, including structured sports activities (e.g., running, jogging, football, volleyball, basketball, handball, cycling, swimming, and karate), as well as unstructured or recreational activities. In addition, it considered active behaviors during breaks or recess, daily movement patterns that contribute to energy expenditure, and sedentary behaviors such as watching television or prolonged use of electronic devices. This multidimensional approach allowed for a comprehensive assessment of participants' activity profiles, ranging from vigorous physical activity to sedentary lifestyles, and provided a more accurate picture of the overall balance [13] between activity and inactivity. Furthermore, sleep quality and duration were evaluated using selected items from the Pittsburgh Sleep Quality Index (PSQI) questionnaire [13]. These items assessed key components of sleep patterns, including average sleep duration, sleep latency, disturbances during the night, and subjective sleep quality. Participants were asked to recall their sleep habits over the previous month, and responses were rated on a standardized Likert scale, allowing for the classification of sleep quality from satisfactory to poor.

Ethical considerations

The research was authorized by the Ethical Committee of the Faculty of Natural and Life Sciences at Relizane University (Algeria) and the Data Protection Board (DPB) on January 16th, 2023, under the code D04N01UN480120230001.

Statistical analysis

Statistical analyses were conducted using IBM SPSS Statistics version 23.0 (IBM Corp., Armonk, NY, USA). The normality of continuous variables was tested by the Shapiro–Wilk test and is expressed as mean ± standard deviation (SD). Continuous variables were compared between male and female participants using a Student's t-test if variables were normally distributed or a Mann-Whitney U test if variables were not normally distributed. Categorical variables were presented as frequencies and percentages. Appropriate univariate tests were used to assess differences in the distribution of categorical variables between sexes (Pearson chi-square ($\chi 2$) test). Multivariable logistic regression analyses were performed to identify independent factors associated with diabetes, hypertension, and hypercholesterolemia. Results are given as adjusted odds ratios (OR) with their 95% confidence intervals (CI). The regression models included the following variables: sex, age, body mass index (BMI), waist circumference, hip circumference, waist-to-hip ratio, sport, sleep, malnutrition, stress, and body weight. Additional logistic regression analyzes were conducted to examine the associations of hypertension and hypercholesterolemia with diabetes for the analysis of factors associated with diabetes. An OR > 1 indicated higher odds of the outcome and an OR < 1 indicated lower odds relative to the reference category. All statistical tests were two-sided, and $p<0.05$ was considered statistically significant.

RESULTS

Table 1 shows the sociodemographic and anthropometric characteristics of the 262 participants (176 women and 86 men). The average age of the study population was 52.92 ± 19.14 years, with no statistically significant difference between women and men (54.26 ± 19.80 *vs*. 53.76 ± 17.84 years, respectively; $p= 0.294$). This indicates that the two sex groups were generally similar in age. Significant sex-related differences were present in several anthropometric parameters. Body weight was significantly higher in men than in women (78.74 ± 11.08 *vs*. 75.42 ± 16.66 kg; $p= 0.008$). As expected, men were taller than women (1.75 ± 0.06 *vs*. 1.64 ± 0.07 m; $p< 0.001$). Mean BMI was significantly lower (25.85 ± 3.63 *vs*. 27.95 ± 6.00 kg/m²; $p< 0.001$) in men, who were taller and more obese than women, suggesting a higher burden of excess body weight in women in this study population. The distribution of BMI categories corroborates this observation. The most common nutritional status was overweight with 129 participants (49.24%), followed by normal weight (85 participants; 32.44%) and obesity (46 participants; 17.56%). In total, only two participants (0.76%) were categorized as underweight. Obesity was significantly higher among women than men, with 42 women and only 4 men being classified as obese. Distribution of BMI categories was significantly different by sex ($p< 0.01$). The results show the high prevalence of excessive body weight in the study women. Differences were also found in body circumferences. The mean waist circumference was significantly higher in men than women (92.14 ± 14.55 *vs*. 89.86 ± 20.20 cm; $p= 0.049$) but women had a significantly greater mean hip circumference (96.62 ± 21.71 *vs*. 91.71 ±

14.86 cm; p= 0.035). Thus, men had a significantly higher waist-to-hip ratio than women (1.01 ± 0.08 *vs*. 0.96 ± 0.34; p< 0.001). This pattern is indicative of sex-specific differences in body fat distribution, with men exhibiting a relatively greater waist-to-hip ratio while women showed greater hip circumference.

Table 1: Anthropometric and sociodemographic characteristics of participants

Variable	Total (n=262)	Female (n=176)	Male (n=86)	p-value
Anthropometric parameters				
Age (year)	52.92±19.14	54.26±19.8	53.76±17.84	0.294
Weight (kg)	76.51±15.12	75.42 ±16.66	78.74±11.08	0.008
Height (m)	1.68±0.08	1.64±0.07	1.75±0.06*	<0.001
BMI (kg/m^2)	27.26±5.42	27.95±6.0*	25.85±3.63	<0.001
Waist circumference (cm)	90.61±18.54	89.86±20.2	92.14±14.55*	0.049
Hip circumference (cm)	95.01±19.83	96.62±21.71*	91.71±14.86	0.035
Waist -to-hip ratio	0.98±0.28	0.96±0.34	1.01±0.08*	<0.001
BMI-category percentages				
Underweight	2(0.76)	2(0.76)	0	<0.01[#]
Normal weight	85(32.44)	54(17.52)	31(14.92)	
Overweight	129(49.24)	78(29.77)	51(19.47)	
Obese	46(17.56)	42(16.03)	4(1.53)	
Level of education				
Literate	121(46.18)	91(34.73)	30(11.45)	0.004*
Primary	18(6.87)	13(4.96)	5(1.91)	
Intermediate	52(19.85)	29(11.07)	23(8.78)	
Secondary	27(10.31)	12(4.58)	15(5.73)	
University	44(16.79)	31(11.83)	13(4.96)	
Profession				
Director	5(1.91)	1(0.38)	4(1.53)	<0.001*
Employee	74(28.24)	33(12.59)	41(15.65)	
Retiree	29(11.07)	3(1.15)	26(9.92)	
Unemployed	154(58.78)	139(53.05)	15(5.73)	

Values are presented as frequency, percentage, and mean±SD. *: Significant differences between males and females (p<0.05; Mann–Whitney U test). [#]: Significant differences between females and males (Pearson chi-squared test, p<0.05).

In terms of educational attainment, a statistically significant difference between women and men was identified (p= 0.004). The literacy level of almost half of the participants was 46.18%, intermediate education 19.85%, university-level education 16.79%, secondary education 10.31%, and primary education 6.87%. Women had a higher representation in the literate category, primary, intermediate, and university education, while men were relatively more represented in the category of participants with secondary education. The difference observed shows that the educational characteristics were not equally distributed among the two sexes. Only 17.6% of people reported playing sports, and there was a significant gender discrepancy (p< 0.001) (Table 2), with men (41 out of 86) being much more active than women (5 out of 176).

Table 2: Physical activity, walking, and sleep patterns of participants according to sex

Behavioral characteristic	Category	Female	Male	Total	p-value*
Sport activity	No	171(65.26)	45(17.18)	216(82.44)	<0.001
	Yes	5(1.91)	41(15.65)	46(17.56)	
	Total	176(67.17)	86(32.83)	262(100)	
Frequency of sport activity	1 time/week	2(4.35)	19(41.3)	21 (45.65)	>0,05
	2 times/week	2(4.35)	17(36.95)	19(41.30)	
	>2 times/week	1.0(2.17)	5(10.88)	6(13.05)	
	Total	5(10.87)	41(89.13)	46(100)	
Duration of sport activity	30 min	1.0(2.17)	6(13.05)	7(15.22)	>0.05
	1 h	2(4.35)	25(54.35)	27(58.7)	
	1 h 30	2(4.35)	8(17.39)	10 (21.74)	
	2 h	0(0.0)	1.0(2.17)	1.0(2.17)	
	>2 h	0(0.0)	1.0(2.17)	1.0(2.17)	
	Total	5(10.87)	41(89.13)	46(100)	
Walking	No	29(11.07)	5(1.91)	34(12.98)	<0.016
	Yes	147(56.10)	81(30.92)	228(87.02)	
	Total	176(67.17)	86(32.83)	262(100)	
Duration of walking	<30 min	27(11.84)	8(3.51)	35(15.35)	<0.001
	30 min	53(23.24)	15(6.58)	68(29.82)	
	1 h	37(16.23)	19(8.33)	56(24.56)	
	1 h 30	10(4.39)	14(6.14)	24(10.53)	
	2 h	2(0.88)	5(2.19)	7(3.07)	
	>2 h	18(7.9)	20(8.77)	38(16.67)	
	Total	147(64.8)	81(35.52)	228(100)	
Sleep pattern	6 h or less	71(27.1)	29(11.07)	100(38.17)	0.057
	7 h	35(13.36)	29(11.07)	64(24.43)	
	8 h	42(16.03)	19(7.25)	61(23.28)	
	9 h	28(10.68)	9(3.44)	37(14.12)	
	Total	176(67.18)	86(32.82)	262(100)	

Values are presented as numbers (percentage). *: Pearson chi-square test (p< 0.05).

These low levels of physical activity were troubling. Football was the most popular sport, with 41 players; the other five played volleyball or basketball. Additionally, women walked for longer amounts of time than men did, even though 87% of respondents reported walking (p< 0.001). The sleep data showed that most individuals slept 6–8 hours, with a non-significant trend (p= 0.057) that may indicate gender differences (Table 2). Women reported shorter sleep durations more frequently than men did. Chronic conditions include hypertension (145 people), diabetes (192 people), and hypercholesterolemia (73 people),

which affected a sizable portion of the participants. The majority of chronic conditions first appeared in participants at 40 years of age or older (Figure 2).

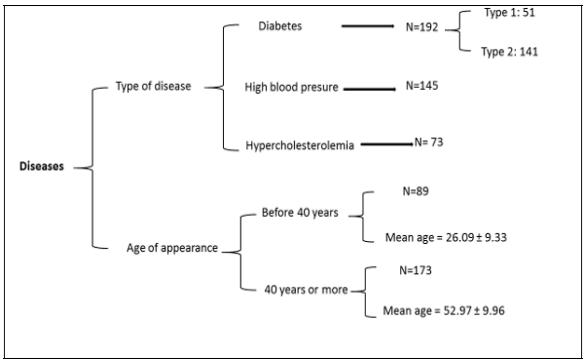


Figure 2: Chronic diseases appearance according to age of participants.

Sex, age, and body weight were significant independent predictors of cholesterol status in multivariable logistic regression analysis (Table 3). After controlling for the other variables included in the model, sex was significantly associated with cholesterol (OR= 4.965, 95% CI: 1.748–14.100, *p*= 0.003), suggesting that females had about fivefold higher odds of having cholesterol compared with males. Age was independently associated with cholesterol (OR= 1.031, 95% CI: 1.012–1.050, *p*= 0.001), which means that with each year of age, there was an approximate 3.1% increase in the odds of cholesterol. The other important predictor was body weight (OR= 1.064, 95% CI: 1.007–1.124, *p*= 0.028). Thus, each additional kilogram of body weight was associated with an estimated 6.4% increase in the odds of cholesterol regardless of sex, age, BMI, waist and hip circumference, physical activity, sleep, unhealthy dietary habits, and stress. By contrast, BMI, waist circumference, hip circumference, waist-to-hip ratio, sport participation, sleep, unhealthy dietary habits, and emotional stress were not significantly associated with cholesterol in the adjusted model (all *p*> 0.05). By means of regression analysis, sex and age were the only variables independently associated with hypertension (Table 3).

Table 3: Independent factors associated with chronic diseases: multivariable logistic regression analysis

Variables	Cholesterol OR (95% CI)	*p*-value	Hypertension OR (95% CI)	*p*-value	Diabetes OR (95% CI)	*p*-value
Females	4.965 (1.748–14.100)	0.003	4.181 (1.700–10.282)	0.002	0.290 (0.110–0.760)	0.012
Age	1.031 (1.012–1.050)	0.001	1.063 (1.043–1.084)	<0.001	0.987 (0.970–1.005)	0.148
BMI (kg/m²)	0.914 (0.801–1.043)	0.183	0.962 (0.842–1.099)	0.569	1.039 (0.914–1.181)	0.557
Waist circumference	1.114 (0.964–1.288)	0.145	0.980 (0.929–1.034)	0.464	0.991 (0.936–1.050)	0.770
Hip circumference	0.895 (0.781–1.026)	0.112	1.019 (0.966–1.074)	0.495	1.005 (0.957–1.056)	0.842
Waist-to-hip ratio	0 (0–11.705)	0.102	0.493 (0.008–29.883)	0.735	2.574 (0.014–473.823)	0.722
Sport participation	1.197 (0.354–4.051)	0.772	1.347 (0.528–3.440)	0.533	2.763 (0.775–9.852)	0.117
Sleep	1.144 (0.852–1.536)	0.370	0.779 (0.580–1.048)	0.099	1.041 (0.778–1.393)	0.787
Unhealthy dietary habits	1.785 (0.821–3.881)	0.143	0.917 (0.469–1.792)	0.800	1.931 (0.962–3.875)	0.064
Emotional stress	1.127 (0.564–2.249)	0.735	0.958 (0.499–1.839)	0.898	2.614 (1.372–4.981)	0.003
Body weight (kg)	1.064 (1.007–1.124)	0.028	1.013 (0.961–1.067)	0.630	0.968 (0.918–1.021)	0.230

OR: odds ratio; CI: confidence interval; BMI: body mass index. ORs are adjusted for all variables included in the corresponding multivariable logistic regression model. Bold values indicate statistically significant associations (*p*< 0.05).

Sex was significantly associated with hypertension (OR= 4.181, 95% CI: 1.700–10.282, *p*= 0.002). Controlling for all other variables in the model, the odds of hypertension among female participants were about 4.2 times higher than males. Hypertension was more significantly associated with age (OR=1.063, 95% CI: 1.043–1.084, *p*< 0.001). This implies that for each additional year of age, the odds of having hypertension increased by about 6.3%, independent of sex, anthropometric characteristics, physical activity, sleep, unhealthy dietary habits, emotional stress, and body weight. Associations of BMI (*p*= 0.569), waist circumference (*p*= 0.464), hip circumference (*p*= 0.495), waist-hip ratio (p = 0.735), sport participation (*p*= 0.533), sleep (*p*= 0.099), malnutrition (*p*= 0.800), stress (*p*= 0.898), and body weight (*p*= 0.630) were not significant. In the multivariable logistic regression model sex and stress were significant independent factors associated with diabetes (Table 3). Sex was significantly associated with diabetes (OR= 0.290, 95% 95%CI: 0.110-0.760, *p*= 0.012). Because the OR is below 1, females had about 71% lower odds of diabetes compared with males after adjusting for the other variables. The exact substantive interpretation depends on which sex was coded as 1 and which was used as the reference category. Diabetes was also significantly associated with emotional stress (OR= 2.614, 95% CI: 1.372–4.981, *p*= 0.003). After adjusting for sex, age, anthropometric characteristics, physical activity, sleep, unhealthy dietary habits, and body weight, participants who experienced stress had about 2.6 times higher odds of developing diabetes compared with those in the reference stress category. Unhealthy dietary habits were borderline associated with diabetes (OR= 1.931, 95% CI= 0.962 to 3.875, *p*= 0.064), but this did not reach any conventional statistical significance. Similarly, age (p = 0.148), BMI (*p*= 0.557), waist circumference (*p*= 0.770), hip circumference (*p*= 0.842), waist-to-hip ratio (p= 0.722), sport participation (*p*= 0.117), sleep (*p*= 0.787), and body weight (*p*= 0.230) were not statistically significant independent predictors of diabetes in the adjusted model. Of the participants with valid data, 54.6% (n= 143) had one comorbidity and 34.4% (n= 90) had two comorbidities. A smaller proportion (11.1%, n= 29) had three comorbidities. Overall, 45.5% of participants had two or more co-morbidities, indicating a substantial burden of multimorbidity in the study population. Logistic regression analysis was used to identify the significant factors associated with diabetes, and hypertension and hypercholesterolemia were found to be significant factors associated with diabetes (Table 4). Participants with hypertension were significantly more likely to have diabetes than those with normal blood pressure (OR= 3.02, 95% CI: 1.59–5.75, *p*= 0.001). Similarly, hypercholesterolemia was

significantly associated with diabetes, with odds of diabetes about 2.88-fold higher in participants with hypercholesterolemia compared to those with normal cholesterol (OR= 2.88, 95% CI: 1.55–5.34; *p*= 0.001).

Table 4: Logistic regression analysis of factors associated with diabetes among Algerian adults

Variables	OR	95% CI	*p*-value
Hypertension	3.02	1.59–5.75	0.001
Hypercholesterolemia	2.88	1.55–5.34	0.001

OR: odds ratio; CI: confidence interval.

Approximately 50.7% of participants reported that a chronic condition required them to adhere to a particular diet. 42 people avoided sugar, while 39 participants abstained from both salt and sugar, demonstrating diabetes control (Figure 3). Just 24 people followed the doctors' instructions and cut out sugar, fat, and salt.

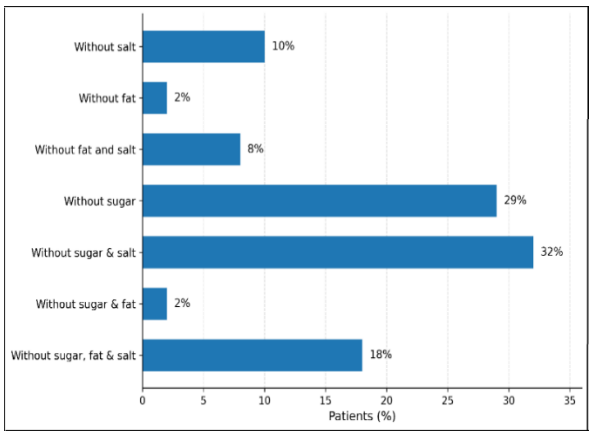


Figure 3: Therapeutic diets prescribed for illnesses.

DISCUSSION

This study provides a comprehensive analysis of the population of Relizane, Algeria, affected by chronic diseases such as diabetes, hypertension, and hypercholesterolemia. It examines anthropometric parameters, associated risk factors, and dietary management practices, while also highlighting the importance of physical activity and sleep quality. The study found that 49.24% of participants were overweight and 17.56% were obese, with women disproportionately affected compared to men. These results are higher than those previously reported among the student community, where the prevalence of obesity was 6.34%, while the number of overweight students was significant, accounting for 80 individuals (22.04%) in the western region of Algeria [12]. Obesity is recognized as a chronic disease by the American Medical Association House of Delegates, given its associated health complications that necessitate both treatment and preventive strategies [14]. Recent evidence shows that obesity significantly contributes to various chronic illnesses and is closely associated with fatal complications and premature mortality. For instance, a relative risk of 1.72 for coronary heart disease is associated with a body mass index (BMI) of 25–28.9 kg/m² [15]. Furthermore, obesity constitutes a major risk factor for several chronic conditions, including type 2 diabetes, cardiovascular disease, hyperlipidemia, hypertension, stroke, breast and colon cancer, sleep apnea, and degenerative arthritis [16]. Educational level is recognized as a key factor in the fight against overweight and obesity. Our results indicated that 46.18% of participants were literate, whereas merely 16.79% had achieved a university-level education. In 2021, Witkam and colleagues found a strong association between lower educational attainment and obesity in both men and women [17]. Similarly, a study in Korea found that highly educated women had a significantly lower prevalence of obesity (16%) compared with their less educated counterparts (34.3%) [18]. The collected data revealed that 58.78% of participants were unemployed, possibly due to their lower educational attainment. Family income emerged as a key determinant of food choices. Conversely, limited income and socioeconomic deprivation can substantially restrict access to healthy foods, as these are often pricier or less readily available to individuals with lower incomes [19]. This study recorded and analyzed low levels of physical activity. Only 17% of individuals reported engaging in sports, with men more likely to participate in such activities, whereas women were more likely to engage in walking, which is in accordance with data collected in previous studies [20,21]. In contrast, Japanese men and women reported nearly equal rates of participation in exercise and daily physical activity [22]. Furthermore, the findings of this study revealed significant correlations between metabolic disorders (diabetes and hypercholesterolemia) and lower levels of physical activity. Consistent with the work of Park *et al*., a higher risk of metabolic syndrome is associated with reduced physical activity, whereas increased walking time is linked to a lower risk [23]. This study highlighted the sleep patterns of participants, showing that sleep duration ranged from less than 6 hours to 9 hours. Hormonal influences, caregiving responsibilities, or psychological stress may explain why a high proportion of women reported sleeping 6 hours or less. In 2021, it was reported that individuals sleeping 7 to 7.5 hours per night had the lowest risk of developing metabolic syndrome [24]. Reis et al. found that the prevalence of short sleep duration (≤5 hours) was 20.7%, and it was associated with diabetes, cardiovascular diseases, and multimorbidity. Conversely, long sleep duration (≥9 hours) was associated with diabetes in the Portuguese population [25]. Another study, published in 2020, reported that both very short and very long sleep durations were more strongly associated with cancer, diabetes, obesity, asthma, chronic obstructive pulmonary disease, kidney disease, coronary heart disease, stroke, and diabetes, particularly among women and individuals aged 18–64 years [26]. Diabetes was the most prevalent chronic disease among participants, followed by hypertension and hypercholesterolemia. Our data identified four main factors that contribute to the onset of chronic diseases: age, low physical activity, unhealthy dietary habits, and emotional stress. Age was particularly significant, as nearly 63% of participants aged 40 years or older had developed chronic conditions. In 2023, it was reported that chronic diseases are closely linked to aging; however, their burden can be reduced through

preventive strategies such as maintaining a healthy diet and engaging in regular physical activity [27]. Furthermore, metabolic disorders increase cardiovascular risk in older individuals, contributing to conditions such as cardiomyopathy and myocarditis, as highlighted by the Global Burden of Disease 2019 data [28]. In 2024, Algerian researchers found that diabetes, joint illnesses, cardiovascular diseases, and respiratory disorders are the next most common causes of healthy years lost in both men and women, after hypertension [29]. Additionally, diabetes was connected positively with hypertension and hypercholesterolemia appearance [30–33], which is in agreement with our results. Nutritional habits play a crucial role in the management of chronic diseases. In this study, a borderline was observed between diabetes and unhealthy dietary habits, but no statistically significant result was reached. Furthermore, 50.7% of participants reported following a specific diet to manage their chronic conditions. Medical nutrition therapy has been shown to reduce BMI, systolic and diastolic blood pressure, total cholesterol, LDL cholesterol, triglycerides, and fasting blood glucose, while simultaneously increasing HDL cholesterol levels [34]. Both the quality and quantity of dietary fat strongly influence blood cholesterol levels. Inadequate vegetable intake, along with excessive consumption of salt and saturated fats, were key contributors to elevated blood pressure and hypercholesterolemia [35]. A positive correlation has been remarked between diabetes and emotional stress. One of the main contributing factors of psychosomatic disorders has been identified as psychological stress. It's interesting to note that stress has significant influence on the onset of diabetes through a variety of behavioral and physiological mechanisms [36]. Compared to the control group, Saya *et al*. discovered that individuals with a diagnosis of type 2 diabetes had more stressful events in their personal histories [37]. According to Centers for Disease Control and Prevention (CDC), stress hormones cause blood sugar levels to fluctuate. Stress from illness or injury can raise blood sugar levels. Long-term stress can either cause or exacerbate existing health issues [38]. Recently, it has been reported that metabolic outcomes are improved by lifestyle therapies that involve a reduction in caloric intake and an increase in physical activity. Exercise at an early age improves lipid profiles, glycemic management, and physical fitness. Systematic physical activity enhances insulin sensitivity, leads to further weight loss, lessens its negative effects on bone mass, and improves body composition. It is also linked to a higher quality of life [39]. Additionally, a cross-sectional study conducted in Nigeria with 270 university employees found that people who were physically active were less likely to acquire metabolic syndrome [40], and similar results were reported among middle-aged adults in Germany [41].

Study Limitations

It is important to recognize the limitations of this study. First, its demographic scope was restricted to the wilaya of Relizane, which may not accurately reflect the socioeconomic, lifestyle, and health characteristics of individuals in other regions of Algeria. Second, although valuable, the sample size of 262 participants remains relatively small and does not fully capture the broader diversity of the national population. Furthermore, participants were recruited from a hospital setting, which may have introduced selection bias, as individuals seeking medical care could differ in behavior and health status from the general population. These factors may limit the generalizability of the findings to the Algerian population as a whole.

Prospects

Looking ahead, future research should broaden the geographic and demographic scope of investigations to better capture the diversity of the Algerian population and to account for regional variations in risk factors. Longitudinal and intervention-based studies will be critical for establishing causal relationships and evaluating the effectiveness of prevention strategies. Moreover, the integration of biomarker analysis, socioeconomic indicators, and digital health tools could provide a more holistic understanding of obesity and metabolic health dynamics. Such efforts would advance scientific understanding of metabolic disorders and generate actionable evidence to guide policymakers in developing sustainable, culturally adapted programs for the prevention and management of obesity and related metabolic conditions.

Conclusion

This study reveals that complex interactions between anthropometric, behavioral, and socioemotional factors influence metabolic health in Algerian adults. The high prevalence of obesity, unhealthy eating patterns, emotional distress, and insufficient physical activity, particularly among women, are some of the primary modifiable risk factors. Public health initiatives should prioritize targeted interventions that promote physical activity and mental health support and strengthen nutritional education, with particular focus on vulnerable groups such as women and the elderly.

ACKNOWLEDGMENTS

The authors gratefully acknowledged the participants and hospital authorities for their consent and active participation in this study.

Conflict of interests

The authors declared no conflict of interest.

Funding source

The authors did not receive any source of funds.

Data sharing statement

The data that supports the findings of this study are available from the corresponding author upon a reasonable request.

REFERENCES

1. Meetoo D. Chronic diseases: the silent global epidemic. *Br J Nurs*. 2008;17(21):1320-1325. doi: 10.12968/bjon.2008.17.21.31731.
2. Hacker K. The burden of chronic disease. *Mayo Clin Proc Innov Qual Outcomes*. 2024;8(1):112–119. doi: 10.1016/j.mayocpiqo.2023.08.005.
3. Niohuru I. Healthcare and disease burden in Africa: The impact of socioeconomic factors on public health. Briefs in Economics. Springer Nature Switzerland; 2023. P. 136.
4. Mammeri A, Tebaibia A. Cardiometabolic risk in Algeria: past and present. *Intern Emerg Med*. 2020;15(4):531–535. doi: 10.1007/s11739-019-02207-z.
5. Yala KZ, Yahia Cherif BN, Yousfi A. Estimation des coûts des complications macrovasculaires du diabète. *J Algérien Pharm*. 2024;5(3):1–8. https://asjp.cerist.dz/en/article/239329.
6. Houti L, Hamani-Medjaoui I, Lardjam-Hetraf SA, Ouhaibi-Djellouli H, Chougrani S, Goumidi L, et al. Prevalence of metabolic syndrome and its related risk factors in the city of Oran, Algeria: The ISOR study. *Ethn Dis*. 2016;26(1):99–106.
7. Moussouni A, Sidi-yakhlef A, Hamdaoui H, Aouar A, Belkhatir D. Prevalence and risk factors of prehypertension and hypertension in Algeria. *BMC Public Health*. 2022;22(1):1–17. doi: 10.1186/s12889-022-13942-y.
8. Ngwasiri C, Kinoré M, Samadoulougou S, Kirakoya-Samadoulougou F. Sex-specific-evaluation of metabolic syndrome prevalence in Algeria: insights from the 2016–2017 non-communicable diseases risk factors survey. *Sci Rep*. 2023;13(1):1–10. doi: 10.1038/s41598-023-45625-y.
9. Belhadj M, Malek R, Baghous H, Boukheloua M, Arbouche Z, Nouri N, et al. Perspectives of type 2 diabetes mellitus management in Algeria: a comprehensive expert review. *Front Clin Diabetes Healthc*. 2025;6:1495849. doi: 10.3389/fcdhc.2025.1495849.
10. WHO. Physical status: the use and interpretation of anthropometry. Report of a WHO Expert Committee. Geneva. Ser. WHOTR, editor. 1995.
11. WHO. Obesity: preventing and managing the global epidemic. [Internet]. Geneva; 2000. Available from: https://apps.who.int/iris/handle/10665/42330
12. Hadri Z, Benada M, Djellouli M, Boudalia S, Rahali A, Araf A. Prevalence of obesity and effect of sport activity on university students in Algeria. *Sci African*. 2022;17:e01319. doi: 10.1016/j.sciaf.2022.e01319.
13. Hadri Z, Boudalia S, Mhamed B, Boumaaza B, Kirdi R, Subih H. Impact of the COVID-19 lockdown on food habits, body weight, and physical activity in school-aged students. *Int J Disabil Sports Health Sci*. 2025;8(2):192-200. doi: 10.33438/ijdshs.1566118.
14. AlArab N, Antoun J. Patients' acceptance of obesity as a chronic disease: a qualitative study in Lebanon. *BMJ Open*. 2022;12(3):e059366. doi: 10.1136/bmjopen-2021-059366.
15. Afolabi HA, Zakaria Z, Salleh MS, Ch'ng ES, Nafi SNM, Bin Abdul Aziz AA, et al. Obesity: A prerequisite for major chronic illnesses. In: Obesity - Recent Insights and Therapeutic Options. 2023. p. 1–21. Available from: https://www.intechopen.com/chapters/87639
16. Wells JC. The evolution of human adiposity and obesity: where did it all go wrong? *Dis Model Mech*. 2012;5(5):595-607. doi: 10.1242/dmm.009613.
17. Witkam R, Gwinnutt JM, Humphreys J, Gandrup J, Cooper R, Verstappen SMM. Do associations between education and obesity vary depending on the measure of obesity used? A systematic literature review and meta-analysis. *SSM Popul Health*. 2021;15:100884. doi: 10.1016/j.ssmph.2021.100884.
18. Chung W, Lim S. Factors contributing to educational differences in obesity among women: Evidence from South Korea. *BMC Public Health*. 2020;20(1):1–11. doi: 10.1186/s12889-020-09221-3.
19. Griffith R. Obesity , poverty and public policy. *Econ J*. 2022;132(644):1235–1258. doi: 10.1093/ej/ueac013.
20. Leskova IV, Dali MR, Barieva NY, Maksimova EV, Peredelsky AA. Physical education and sports in arab countries: Social aspect. *Teor i Prakt Fiz Kult*. 2020;2020(8):68–70.
21. Latreche A, Bouguettoucha I. The culture of sport among women in Algerian society—a field study in the city of Constantine. *Wisdom J Stud Res*. 2024;4(18):558–575.
22. Kudo N, Nishide R, Mizutani M, Ogawa S, Tanimura S. Association between the type of physical activity and metabolic syndrome in middle-aged and older adult residents of a semi-mountainous area in Japan. *Environ Health Prev Med*. 2021;26(1):1–9. doi: 10.1186/s12199-021-00949-x.
23. Park DY, Lee O, Lee YH, Lee CG, Kim YS. Relationship between change in physical activity and risk of metabolic syndrome: A prospective cohort study. *J Obes Metab Syndr*. 2024;33(2):121–132. doi: 10.7570/jomes24007.
24. Chasens ER, Imes CC, Kariuki JK, Luyster FS, Morris JL, DiNardo MM, et al. Sleep and metabolic syndrome. *Nurs Clin North Am*. 2021;56(2):203-217. doi: 10.1016/j.cnur.2020.10.012.
25. Reis C, Dias S, Rodrigues AM, Sousa RD, Gregório MJ, Branco J, et al. Sleep duration, lifestyles and chronic diseases: A cross-sectional population-based study. *Sleep Sci*. 2018;11(4):217–230. doi: 10.5935/1984-0063.20180036.
26. Lu C, Liao B, Nie J, Wang W, Wang Y. The association between sleep duration and chronic diseases: a population-based cross-sectional study. *Sleep Med*. 2020;73:217–222. doi: 10.1016/j.sleep.2020.05.005.
27. Ye J. Effect of chronic disease on the aging population. *Highlights Sci Eng Technol*. 2023;36:1393–1397.
28. Xiaodong S, Xuan L. Editorial: Aging and chronic disease: public health challenge and education reform. *Front Public Heal*. 2023;11:1175898. doi: 10.3389/fpubh.2023.1175898.
29. Chinoune M, Flici F. Which chronic diseases contribute the most to healthy life years lost in Algeria? *Chronic Illn*. 2024;20(3):395–404. doi: 10.1177/17423953241264875.
30. Hezam AAM, Shaghdar HBM, Chen L. The connection between hypertension and diabetes and their role in heart and kidney disease development. *J Res Med Sci*. 2024;29(1):1–8. doi: 10.4103/jrms.jrms_470_23.
31. Hamzah Al-Rubaye AA. The correlation between type 2 diabetes mellitus and hypertension in Iraqi Patients. *J Med Chem Sci*. 2023;6(4):778–788. doi: 10.26655/JMCHEMSCI.2023.4.9.
32. Abbas SN, Alwan TS, Hassan SM. Correlation between diabetes mellitus and dyslipidemia incidence in Center of Iraq. *Azerbaijan Pharm Pharmacother J*. 2023;22(1):38–40. doi: 10.61336/appj/22-1-09.
33. Peng J, Zhao F, Yang X, Pan X, Xin J, Wu M, et al. Association between dyslipidemia and risk of type 2 diabetes mellitus in middle-aged and older Chinese adults: A secondary analysis of a nationwide cohort. *BMJ Open*. 2021;11(5):1–8. doi: 10.1136/bmjopen-2020-042821.
34. Soetedjo NNM. The role of nutrition in various endocrine and metabolic diseases. *Clin Nutr Open Sci*. 2025;62(38):164–188. doi: 10.1016/j.nutos.2025.05.015.
35. Rao GH. Diet and nutrition: Metabolic diseases. *Glob J Nutr Food Sci*. 2018;1(1):1–5. doi: 10.33552/GJNFS.2018.01.000504.
36. Kalra S, Jena BN, Yeravdekar R. Emotional and psychological needs of people with diabetes. *Indian J Endocrinol Metab*. 2018;22(5):696–704. doi: 10.4103/ijem.IJEM_579_17.
37. Saya A, Proietti L, Lisi G, Ribolsi M, Uccioli L, Niolu C, et al. Traumatic experiences and type 2 diabetes mellitus. *Riv Psichiatr*. 2020;55(6):349–354. doi: 10.1708/3503.34893.
38. CDC. Diabetes and Mental Health [Internet]. 2024 [cited 2025 Aug 25]. Available from: https://www.cdc.gov/diabetes/living-with/mental-health.html
39. Chomiuk T, Niezgoda N, Mamcarz A, Śliż D. Physical activity in metabolic syndrome. *Front Physiol*. 2024;15:1365761. doi: 10.3389/fphys.2024.1365761.
40. Chukwuemeka UM, Chukwu PO, Anakor AC, Ukachi PN, Ayara D, Maruf FA. Prevalence of metabolic syndrome and its associations with stress and physical activity levels: a cross-sectional study involving university staff in Nigeria. *Bull Fac Phys Ther*. 2025;30:28. doi: 10.1186/s43161-025-00287-x.
41. Cleven L, Krell-Roesch J, Schmidt SCE, Dziuba A, Bös K, Jekauc D, et al. Longitudinal association between physical activity and the risk of incident metabolic syndrome in middle-aged adults in Germany. *Sci Rep*. 2022;12(1):1–9. doi: 10.1038/s41598-022-24052-5.