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Anthropometric assessment of the nutritional status of women of childbearing age in the province of Essaouira, Morocco

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Abstract

Low- and middle-income countries are facing a rapid increase in nutritional problems, particularly in Africa, where undernutrition, overweight and micronutrient deficiencies coexist, creating a double burden of malnutrition and a challenge to public health policies. In this context, Morocco stands out for its early nutritional transition, characterized by a moderate prevalence of overweight and undernutrition and elevated levels of micronutrient deficiencies. The aim of this study was to assess the nutritional status of women of childbearing age and identify its determinants to suggest ways to improve it. The study was conducted in the province of Essaouira in Morocco, which is characterized by a predominance of rural areas and multidimensional poverty. We conducted a quantitative cross-sectional survey of 1,466 married women of childbearing age via stratified random sampling. Data were collected via questionnaires and anthropometric measurements. Data entry and statistical processing were performed via SPSS® v. 26. The results show that women's nutritional status is worrisome, with an average BMI of 26.4 kg/m². The prevalence of overweight was 61.6% (BMI ≥ 25 kg/m^2), with 17.9% of women being obese. Bivariate analysis revealed that age, education level, socioprofessional activity, family structure, household income and parity were significantly associated with overweight. Binary logistic regression confirmed that women's age and level of education are major determinants of overweight/obesity. There is a need to strengthen public health policies aimed at reducing overweight and obesity among women of childbearing age in Morocco, with an emphasis on nutrition education and monitoring their nutritional status throughout their reproductive lives.

Background

Low- and middle-income countries are experiencing a rapid increase in nutritional problems; it is no longer undernutrition alone that poses challenges but rather the double burden of deficiency and overweight disorders, which are undeniably linked (1).

Africa faces this double burden of malnutrition (2). The average percentage of overweight or obese women in Africa is 23.8%, ranging from 5.7% in Ethiopia to 50.6% in Switzerland (Eswatini) (WHO, 2019). This leads to a clustering of opposite types of malnutrition, presenting a challenge for public health services (3, 4).

Morocco is classified as a country affected by an early nutritional transition characterized by moderate levels of overweight and undernutrition, with high levels of micronutrient deficiencies (5). The phenomenon of overweight and obesity is clearly increasing in Moroccan society. According to the latest Ministry of Health survey from 2019–2020, overweight and obese women accounted for 29.2% and 28.4%, respectively, or 57.6% excess weight ((6).

This nutritional transition is linked to various factors: the country's economic development, the improvement of health services and the development of other sectors, such as agriculture, education, the agri-food industry and other socioeconomic services. It is also linked to globalization, urbanization and lifestyle changes (7).

Overweight is responsible for a progressive increase in the prevalence of chronic and degenerative nontransmissible diseases, which have extremely high social costs (5). Various forms of malnutrition undermine a country's productivity and economic and social growth and could be obstacles to achieving sustainable development goals (SDGs) (6).

The aim of this study was to assess nutritional status and its determinants among women of childbearing age in Essaouira Province to suggest avenues for improvement.

Materials and methods

This was a cross-sectional, quantitative survey of married women of childbearing age in the province of Essaouira, characterized by a rural predominance of 77.6% (8). The study covered the twenty urban and rural health districts in the province. The sample size was calculated based on the target population, which included 45,818 married women of childbearing age (MWCA) in the province in 2023. The women eligible to participate in this study were married, aged between 18 and 49, resided in the province of Essaouira, and expressed their consent to take part in the study. We excluded women whose state of health did not allow them to take part in the survey and women who were pregnant at the time of the survey so as not to bias the BMI calculation. We recruited a total of 1,466 women via stratified random sampling, with the strata being the health districts.

This research was conducted in accordance with the standards of the Declaration of Helsinki. After authorization from the health authorities and the Marrakech University Hospital Ethics Committee under number 18/21, we conducted questionnaires supplemented with women's health diaries and anthropometric measurements of height and weight.

The questionnaires enabled us to collect sociodemographic and socioeconomic information, such as the woman's age, place of residence, level of education, occupation, household income, number of children, and health status.

The purpose of using the woman's health diary was to complete and verify the information gathered by the questionnaire. After obtaining the woman's consent, we searched her health records for general information (age, address), as well as information on her state of health and parity.

Concerning the socioprofessional category of spouses, inspired by the classification used during the national census in Morocco in 2014 (9), we constituted two socioprofessional categories (SPCs) of spouses according to their activities: the first category (SPCI) included spouses with no profession at the time of the survey, i.e., day laborers, workers, service personnel, and employees; and the second category included (SPCII) civil servants, middle managers, liberal professions, senior managers and large traders.

For household income, we subdivided the women studied into two groups according to the value of the Guaranteed Interprofessional Minimum Wage (GIMW) in Morocco, which is 2698 Moroccan dirhams per month in 2022 Dh per person, equivalent to 272.68 USD. The first group had a low monthly income below or equal to the GIMW, and the second group had a medium to high income above the GIMW. Household income was the sum of the incomes of the woman and her spouse.

Nutritional status was assessed via body mass index (BMI) (10). The BMI of 1466 female patients was calculated on the basis of the classification of the World Health Organization (WHO), which specifies that a BMI of less than 18.5 kg/m^2 is a sign of underweight, overweight is a BMI equal to or greater than 25 kg/m^2, and obesity is a BMI equal to or greater than 30 kg/m2 (11, 12). In our study, we measured the weight and height of the women surveyed after they provided their consent. Height in cm was measured via a vertical measuring tape, which was graduated in 0.1 cm increments, with shoes removed, feet parallel and head held normally. We measured weight in kg on a tared scale (Terraillon type).

Data entry was performed via SPSS-PC 26 software. Statistical processing involved the calculation of frequencies, means and standard deviations, the chi-square test to capture associations between qualitative variables, and binary logistic regression to eliminate confounding factors and capture the weight of variables associated with nutritional status. Statistical significance was set at the 5% threshold.

Study results

Sociodemographic and economic characteristics

We recruited a total of 1466 women. Sociodemographic, socioeconomic and sociocultural characteristics are shown in Table I. The women were aged between 18 and 46, with an average age of 29.4 years (σ = 6.5). Their first marriage was mostly between the ages of 18 and 34 (83%). Rural women accounted for 65.1% of the sample. Literate women accounted for 52.6% less of the sample than their spouses did (75%). Only 11.3% of the women had engaged in socioprofessional activity at the time of the survey. The percentage of spouses who exercised activities belonging to socioprofessional category I (SPCI) was 91.5%, which included spouses with no profession at the time of the survey, day laborers, manual workers, service personnel, and employees. The number of children per woman ranged from 1–10, with an average of 2.3 (σ = 1.3). Women belonging to low socioeconomic households accounted for 52.7%, and those belonging to nuclear households accounted for 79.6%. The prevalence of contraceptive methods in our sample was 80.7%, of which 74.4% used modern contraceptive methods.

Anthropometric measurements and nutritional status of the women studied.

The women's height ranged from 144 cm to 190 cm, with a mean of 160 cm and a standard deviation of 5.91 cm. Their weights ranged from 40 kg to 110 kg, with a mean of 69.22 kg and a standard deviation of 11.38 kg. We used these measurements to calculate the BMI and thus determine the nutritional status of the women.

These results revealed that BMI ranged from 15.12 to 44.59, with a mean of 26.4 (σ = 4.25). Table 2 shows that 61.6% of the women were overweight, 17.9% of whom were obese. The proportion of women with a normal BMI was 36.5%.

Table 1
Socioeconomic and demographic characteristics of the women surveyed

Variables	Terms and conditions	n	%
Age of women	18–24	375	25.6
	25–34	758	51.7
	35–49	333	22.7
Age at first marriage	> 18 years	240	16.3
	18–34 years old	1217	83
	35 and over	9	0.6
Place of residence	Urban	511	34.9
	Rural	955	65.1
Level of education	Illiterate	695	47.4
	Literate	771	52.6
Spouse's level of education	Illiterate	366	25
	Literate	1100	75
Wife's occupation	Active	166	11.3
	Inactive	1300	88.7
Spouse’s socioprofessional category	SPC I	1342	91.5
	SPC II	124	8.5
Parity	≤ 2 children	926	63.2
	> 2 children	540	36.8
Household income	Low	733	52.7
	Medium to high	693	47.3
Family structure	Nuclear	1167	79.6
	Compound and extended	299	20.4
Contraception	Modern	1091	74.4
	Traditional	93	6.3
	None	282	19.2

Table 2
Nutritional status of women of childbearing age by BMI.

BMI classification	n	%
Underweight (< 18.5 kg/m2)	28	1.9
Normal BMI (18.5–24.99 kg/m2)	535	36.5
Overweight (≥ 25 kg/m2)	641	43.7
Obese (≥ 30 kg/m2)	262	17.9
Total	1466	100

Nutritional status and sociodemographic and economic characteristics of the women

Few studies in Morocco have attempted to analyze separately the impact of sociodemographic factors on the onset and evolution of excess weight. For our further analyses of the relationship between current nutritional status and determining factors, we subdivided our sample of women into two groups: the first group included women who were underweight or had a normal nutritional status, and the second group included women who were overweight or obese. These numbers were 563 (38.4%) and 903 (71.6%), respectively. The results in Table 3 show that the covariables significantly associated with overweight were, in order of importance, women's age, their level of education, the woman's activity, family structure, household income, and parity.

Table 3
Nutritional status and sociodemographic and economic characteristics of the women

Variables	Terms and condition	N	BMI < 24.99		BMI > = 25		Khi 2
			n	%	n	%	
Age of women	18–24	375	173	46.1	202	53.9	14.56**
	25–34	758	281	37.1	477	62.9	
	35–49	333	109	32.7	224	67.3	
Age at first marriage	> 18 years	240	90	37.5	150	62.5	0.22 ns
	18–34 years old	1217	468	38.5	749	61.5	
	35 and over	9	4	44.4	5	55.6	
Place of residence	Urban	511	196	38.4	315	61.6	0.001 ns
	Rural	955	367	38.4	588	61.6	
Level of education	Illiterate	695	298	42.9	397	57.1	11.18**
	Literate	771	265	34.4	506	65.6	
Spouse's level of education	Illiterate	366	154	42.1	212	57.9	2.78 ns
	Literate	1100	409	37.2	691	62.8	
Wife's occupation	Active	166	49	29.5	117	70.5	6.24*
	Inactive	1300	514	39.5	786	60.5	
Socioprofessional category	SPC I	1342	512	38.2	830	61.8	0.42 ns
	SPC II	124	51	41.1	73	58.9	
Parity	≤ 2 children	926	375	40.5	551	59.5	4.65*
	> 2 children	540	188	34.8	352	65.2	
Household income	Low	773	319	41.3	454	58.7	5.67*
	Medium to high	693	244	35.3	449	64.8	
Family structure	Nuclear	1167	430	36.8	737	63.2	5.86*
	Compound and extended	299	133	44.5	166	55.5	
Contraception	Modern	1091	408	37.4	683	62.6	2.18 ns
	Traditional	93	36	38.7	57	61.3	
	None	282	119	42.2	163	57.8	

*BMI = Body mass index in kg/m2; * p < 0.05; ** p < 0.01; *** p < 0.001*

To eliminate confounding factors. we used binary logistic regression. The dependent variable corresponds to the two BMI classes (underweight/normal weight and overweight/obesity). The independent variables are related to the

sociodemographic and health variables studied above. The results of this analysis (Table 4) revealed a relationship between women being overweight and their level of education. as well as with their age.

Table 4
Odds ratios adjusted for nutritional status and sociodemographic and economic factors (reference modality: BMI > = 25)

Variables	A	χ2	OR	CI
Age of women	0.27	9.43**	1.32	(1.1–1.58)
Level of education	0.4	11.4**	1.49	(1.18–1.89)
Female activity	-0.19	0.97 ns	0.82	(0.56–1.2)
Parity	0.17	1.85 ns	1.19	(0.92–1.54)
Household income	0.09	1.55 ns	1.09	(0.94–1.26)
Small family structure	-0.21	2.54 ns	0.8	(0.62- 1.05)
*A: Constante. χ2: Khi2 value. OR: odds ratio. CI: 95% confidence interval; **p < 0.01; ns: no significant*				

Discussion

Nutritional status of the women studied

Our results show that 61.6% of women are overweight, 17.9% of whom are obese. Women with a normal BMI accounted for 36.5% of the sample. These anthropometric data show that the women surveyed present far more problems with overweight than with protein-caloric malnutrition. We can explain this result by the type of eating habits prevalent in the province. As in most of Morocco's poorer regions. this province is known for its traditional wheat-based diet and high consumption of sweetened beverages (teas) (13, 14). This type of diet can lead to an excess of protein and energy, accentuated by the considerable sedentary lifestyle in this predominantly rural province. Furthermore, the WHO indicates that overweight/obesity is the result of sedentary lifestyles and the consumption of foods rich in fat and energy (15). Moreover, in North African countries, overweight women are considered a sign of social status and a cultural symbol of beauty, fertility and prosperity (16).

Our results are perfectly in line with those observed in Morocco. the latest Ministry of Health survey in 2019–2020. The anthropometric characteristics of women of childbearing age show that 57.6% of overweight women (BMI ≥ 25) were overweight, 28.4% were obese, and 40.1% had a normal build (6). A study of women in Morocco revealed that the overall prevalence rates of overweight and obesity were 38.78% and 30.61%, respectively (17). The prevalence of overweight and obesity is increasing rapidly throughout the world. In the countries of the WHO Eastern Mediterranean Region (EMRO), the latest data from national surveys between 2017 and 2019 revealed adult overweight prevalence rates of 35.5% in Bahrain, 36.4% in Kuwait and 38% in Lebanon (1). Stepwise survey data reported prevalences of 60.7% in Jordan (2019), 57.8% in Palestine (2010–2011) and 74.6% in Kuwait (2020) (1).

Overweight/obesity is a major determinant of noncommunicable diseases, particularly noninsulin-dependent diabetes mellitus (NIDDM), coronary heart disease and stroke. It increases the risk of cancer (several types), cholecystopathy, osteoarticular disorders and respiratory symptoms. It is costly not only in terms of premature death and healthcare but also in terms of disability and reduced quality of life (15). Moreover, one study indicated that overweight or obese women have later access to antenatal care than women with a normal BMI, putting them

at increased risk of maternal and fetal morbidity, and need help to address inequalities in access to antenatal care (18).

In Morocco, according to the McKinsey Global Institute, 24 billion Dirhams a year is the annual cost of combating obesity, particularly for Moroccan public finances, representing approximately 3% of the Kingdom's GDP, or twice the budget of the Ministry of Health (19). These estimates are based on direct costs (treatments for hypertension. Diabetes, myocardial infarction. Hospitalization, hypertriglyceridemia. etc.) and indirect costs, which include lost productivity due to obesity and related illnesses (20). Obesity is not only a health problem but also a major economic and commercial challenge (6, 21).

Determinants of the nutritional status of the women studied.

Binary logistic regression revealed a significant relationship between women's overweight/obesity status. level of education and age. Thus, we note that the risk of being overweight/obese was 1.5 times greater among literate women than among illiterate women and 1.3 times greater among older women.

With respect to educational attainment, similar results have been reported globally in Zimbabwe, Bangladesh, India and Ethiopia, indicating that women with higher education levels are more likely to be overweight or obese (22–27). Other studies reported different results in Côte d'Ivoire, Iran and Nepal, overweight was observed, particularly among illiterate women or those with only primary education (28–31). Similarly, a multicenter study in North Africa, West/Central Asia and Latin America revealed that a low level of education was associated with a higher prevalence of overweight. In all regions, there was a consistent trend toward increased overweight across all education groups (32).

Our results also diverge from those observed in Morocco. A national anthropometry survey in 2011 revealed that the prevalence of obesity among adults with a low level of education is twice as high as that among adults with a high level of education (33). The latest national nutrition survey in Morocco from 2019–2020 reaffirmed that overweight and obesity predominated among women with a low level of education (Ministry of Health. 2020b). In the city of Smara in southern Morocco, a low rate of obesity was observed among women with medium to high levels of education, and more than half of illiterate women were obese (34). On the other hand, according to another study in eastern Morocco, women's level of education is not associated with obesity (17).

Our results can probably be explained by the highly significant relationship observed between a woman's place of residence, her level of education, her standard of living and her professional activity. In this study, the best-educated urban women had an average to high standard of living (60.4%) and were professionally active in 80.4% of the cases. These favorable social conditions, especially for urban households and wealthier classes, favor their adoption of a modern lifestyle. The authors reported that high household wealth was associated with an increased likelihood of being overweight and obese in adult women (35). Ready-to-eat foods and out-of-home food are becoming more common in urban areas, favoring the consumption of foods rich in sugar and fat (7). Morocco's 2011–2019 national nutrition strategy indicated an overall increase in Moroccans' energy intake from 2202 kcal in 1970 to 3031 kcal in 2001 in urban areas, accentuated by sedentary behaviors, which expose overweight individuals. Like many developing countries, Morocco is undergoing a nutritional transition from a diet rich in starch and fiber, low in fat and physically active, to a more diversified diet rich in sugars, saturated animal fats and processed foods, low in fruit, vegetables and fiber, and a sedentary lifestyle (7). Analysis of eating behaviors in Essaouira Province is therefore necessary to complete these observations.

This study revealed a statistically positive association between women's age and overweight/obesity. The age group most affected by overweight/obesity was the 35–49 years age group (67.3%), compared with the 18–24 and 24–34 years age groups. Indeed, national surveys have shown that the average BMI of women increases significantly with age (33, 36). This result has been demonstrated by studies in southern and eastern Morocco (17, 34).

Numerous studies in developing countries have highlighted the linear relationship between age and nutritional status in women of childbearing age. Advanced age was a significant predictor of overweight/obesity in Côte d'Ivoire, Kenya, India, Nepal, Ethiopia. Zimbabwe, Tanzania, and Bangladesh (23–25, 25, 27, 28, 31, 37–40).

These unanimous results show that overweight tends to accumulate over time. potentially increasing the risk of chronic diseases associated with overweight/obesity.

BMI is a reliable and easy-to-calculate tool, yet it is notorious for its limitations in quantifying and correctly distributing body fat. Various approaches to measuring fat are now available, allowing us to distinguish between android and gynecoid obesity. In the former, fat accumulates in the abdomen, and in the latter, fat accumulates in the gluteal region. A greater distribution is associated with a greater risk of cardiovascular disease. Anthropometric measures of fat distribution include the ratio between waist circumference measured at the navel and hip circumference measured at the greater trochanters (41). which we do not have the opportunity to measure during surveys. In addition, the assessment of body fat could also be achieved via new, complex methods such as bioelectrical impedance analysis (BIA), dual-energy X-ray absorptiometry (DXA) and total body electrical conductivity (TOBEC), which can be complemented by approaches to differentiate obese people via classification and scoring systems (20). Another limitation was the inability to know the BMI before the last pregnancy due to insufficient traceability of women's health diaries. Pre-pregnancy BMI is recognized as a key factor in the parity–overweight/obesity relationship; postpartum weight gain may be greater in women with a high pre-pregnancy BMI, and the effect of breastfeeding may be involved in BMI modification (42). Additionally, we were unable to obtain sufficient usable information on the lifestyle of the women surveyed, such as diet and physical activity. which are implicated in the increase in overweight/obesity (43).

Considering these results, it seems necessary to raise awareness of a healthy lifestyle among women, especially those who are more educated. by adopting good eating habits and engaging in regular physical activity. The WHO recommends reducing fat intake (20–25%) to minimize energy imbalance and weight gain (15). Overweight and obesity are accompanied by an increase in chronic diseases and NCDs, indicating the need for the earliest possible prevention, from adulthood onward. Overweight/obesity prevention programs linked to parity should target all women (44).

The WHO has consistently called on member countries to adopt nutrition strategies to alleviate these problems. Indeed, aware of the decisive role of nutrition in helping reduce maternal and infant mortality. and in line with WHO recommendations, a National Nutrition Strategy 2011–2019 has been put in place in Morocco to improve the nutritional status of the population by acting on one of its major determinants, namely, nutrition, particularly among women of childbearing age. In addition, a national nutrition survey was carried out from 2019–2020 covering all of Morocco to provide recent data to enable the monitoring and evaluation of actions included in the national nutrition program already in place in Morocco since 2011 and in the operational plan for the prevention of overweight and obesity, which targets both women of childbearing age and other vulnerable population categories (6).

Despite the progress made in Morocco, efforts need to be made to generalize prevention as part of the continuum of care, to create healthy environments and to ensure that healthier food options for the population are affordable and easily accessible (6).

Conclusion

The prevalence rates of overweight/obesity reached very high levels among the women surveyed, at 61.6%, including 17.9% who were obese. These figures confirm that overweight is a real public health and social problem in Essaouira Province. This is all the truer given that the present study focuses only on women of childbearing age. the restricted 18–49 age group, thus excluding older women, children and teenagers. The multivariate analysis revealed that women's high level of education and advanced age are factors that favor overweight/obesity among women in Essaouira Province. This highlights the need for the earliest possible prevention, through the adoption of a healthy lifestyle; a balanced diet. particularly among the most educated women and from an early age among young women; and weight monitoring throughout a woman's reproductive life to maintain a normal BMI.

Abbreviations

BMI
Body Mass Index
EMRO
Eastern Mediterranean Region
GIMW
Guaranteed Interprofessional Minimum Wage
SPC
Socio professional category
WHO
World Health organisation

Declarations

Ethics approval and consent to participate: We obtained free and informed consent from all participants in the study. Their autonomy was respected; they had the right to freely withdraw from the study at any time. Authorizations were obtained from the University Hospital Ethics Committee of Marrakech (Num 18/2021) and the Marrakech-Safi Regional Health Directorate.

Consent for publication : Not applicable

Availability of data and materials : All data generated or analysed during this study are included in this published article.

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Authors' contributions : AM designed the study. collected and analyzed the data. and drafted the manuscript. **NN** and **IK** collected and entered the data and prepared the first draft of the manuscript. **AB** reviewed the data collected and interpreted the results and their discussion. **HA** validated the collected data and supervised the work. **NO**

designed the work methodology. corrected the manuscript and supervised the study. All authors have read and approved the final manuscript.

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