

Double Burden of Malnutrition among Reproductive -Age Women in Taiz, Yemen

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Abstract

Introduction: Globalization and urbanization have led to the "double burden of malnutrition" (DBM), where undernutrition and obesity coexist. The WHO defines DBM as the presence of both undernutrition and over nutrition across populations. This study assesses the prevalence of DBM and associated factors among women at childbearing age (15-49 years) by Mid Upper Arm Circumference (MUAC) in Taiz Governorate

Methods: The study involved a secondary data analysis of the 2023 Nutrition and Mortality Standardized Monitoring Assessment for Relief and Transition Method (SMART) survey of 2729 women aged 15-49 years conducted in Taiz Governorate from November 11 to 26, 2023. Data were collected using validated questionnaires, and respondents were selected through a representative two-stage cluster sampling technique. Appropriate descriptive statistical analysis was applied.

Results: The prevalence of underweight, overweight, and obesity in the internally recognized governorates (IRG) areas of Taiz among women of reproductive age was 14.1% (95% CI: 12.8-15.5), and 12.6% (95% CI: 11.4-13.9), 13.9% (95% CI: 12.7-15.3) respectively. Among the lactating, pregnant and not lactating and/or not pregnant women, the prevalence of underweight was 24.6% (95% CI: 21.1-28.5), 32.1% (95% CI: 25.9-38.8) and 9.1% (95% CI: 7.8-10.4) respectively and overweight was 12.5% (95% CI: 9.9-15.6), 9.8% (95% CI: 6.1-14.5) and 12.9% (95% CI: 11.5-14.5) respectively, while the prevalence of obesity among lactating was 11.2% (95% CI: 8.8-14.1), among not lactating and/or not pregnant was 15.2% (95% CI: 13.7-16.9) and among pregnant women was 9.3% (95% CI: 5.8-14.0) .

Conclusion: A double burden of malnutrition was clear and tangible in Taiz with the reported prevalence of all categories of malnutrition among women of reproductive age. A need to address the dual problems of undernutrition and rapidly rising trends of overweight/obesity in an integrated manner, without neglecting either of them.

Keywords: Overweight and obesity, under nutrition, women at reproductive age, Taiz.

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العبء المزدوج لسوء التغذية بين النساء في سن الإنجاب (15-49 سنة) في محافظة تعز - اليمن

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ملخص الدراسة

المقدمة: أدت العولمة والتحضر إلى ظهور "العبء المزدوج لسوء التغذية" (DBM)، حيث يتواجد كل من نقص التغذية والسمنة معاً. وتُعرف منظمة الصحة العالمية العبء المزدوج لسوء التغذية بأنه وجود كل من نقص وفرط التغذية (زيادة الوزن والسمنة) بين السكان في نفس المجتمع. تهدف هذه الدراسة إلى تقييم مدى انتشار العبء المزدوج لسوء التغذية بين النساء في سن الإنجاب (15-49 سنة) باستخدام قياس محيط منتصف العضد (MUAC) في محافظة تعز.

المنهجية: اعتمدت الدراسة على التحليل الثانوي لبيانات مسح التغذية والوفيات باستخدام منهجية التقييم القياسي للمراقبة من أجل الإغاثة والانتقال (SMART) لعام 2023، والذي شمل 2729 امرأة تتراوح أعمارهن بين 15 و49 سنة. تم تنفيذ الدراسة في محافظة تعز خلال الفترة 11-26 نوفمبر 2023. وقد تم جمع البيانات باستخدام استبانات مُعتمدة عن طريق العينة العنقودية ذات المرحلتين والممثلة للمجتمع. أُستخدم التحليل الإحصائي الوصفي المناسب للبيانات.

النتائج: بلغ معدل انتشار نقص الوزن بين النساء في سن الإنجاب في مناطق الحكومة المعترف بها دولياً بمحافظة تعز 14.1%، بينما بلغ معدل انتشار زيادة الوزن والسمنة 12.6% و13.9% على التوالي. أما بين المرضعات والحوامل وغير المرضعات وغير الحوامل، فقد بلغ معدل انتشار نقص الوزن 24.6% و32.1% و9.1% على التوالي، ومعدل زيادة الوزن 12.5% و9.8% و12.9% على التوالي، بينما بلغ معدل انتشار السمنة بين المرضعات 11.2%، وبين غير المرضعات وغير الحوامل 15.2%، وبين الحوامل 9.3%.

الاستنتاج: يُظهر العبء المزدوج لسوء التغذية بوضوح في محافظة تعز من خلال انتشار جميع أشكال سوء التغذية بين النساء في سن الإنجاب، مما يبرز الحاجة الماسة إلى معالجة مشكلتي نقص التغذية وزيادة المتسارعة في معدلات زيادة الوزن والسمنة بشكل متكامل دون إغفال أي منهما.

كلمات مفتاحية: زيادة الوزن والسمنة، نقص التغذية، النساء في سن الإنجاب، تعز.

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Introduction

The double burden of malnutrition (DBM) remains a significant global public health concern. It is characterized by the simultaneous presence of undernutrition and overnutrition within the same population throughout various stages of life [1, 2]. Worldwide, approximately one-third of the population experiences at least one form of malnutrition [3]. Evidently, the prevalence of DBM is increasing globally, with a particularly notable increase in low- and middle-income countries (LMICs).

Over the past three decades, global obesity rates have doubled, while in LMICs, obesity has tripled within the last 20 years [4]. Although underweight among women has long been a major public health issue in LMICs, a notable epidemiological shift toward overweight and obesity has emerged as an increasing concern. This nutritional transition is largely driven by factors such as population aging and a growing prevalence of risk factors, including unhealthy dietary habits, physical inactivity, and the use of substances like alcohol and tobacco [5,6].

The DBM is devastating and higher among women than men [4,5]. Women's nutritional status has significant implications for both their own health and that of their children. Overweight and obesity in women are linked to a higher risk of pregnancy and childbirth complications, including gestational diabetes, pre-eclampsia, gestational hypertension, postpartum hemorrhage, instrumental

or cesarean delivery, low birth weight, preterm birth, congenital anomalies, large-for-gestational-age infants, and perinatal mortality [7-9]. Similarly, underweight women are also at increased risk of adverse maternal and neonatal outcomes, such as low birth weight, small-for-gestational-age infants, preterm delivery, and neonatal death [7,8,10,11].

Yemen, one of the poorest nations in the Middle East and North Africa (MENA) region, continues to experience prolonged conflict that has significantly disrupted agricultural production, destroyed vital infrastructure, and displaced millions. These factors have collectively contributed to the deterioration of the population's nutritional status [3,4]. The national prevalence of global acute malnutrition among women at childbearing age (15-49 years) was 13.9%, while the overall prevalence of obesity and overweight among female adults aged 18 years and older was 10.7% and 20.6% respectively. At the level of the internationally recognized governorates (IRG) areas in Taiz, prevalence of global acute malnutrition was 14.2% (13.1-15.4) [12]. Therefore, this study aimed to assess the prevalence of DBM and associated factors among women at childbearing age (15-49 years) by Mid Upper Arm Circumference (MUAC) in Taiz Governorate

Methods

Study design

A secondary data analysis of the 2023 Nutrition and Mortality SMART Survey datasets of child bearing aged women in Taiz Governorate was conducted in this study. The SMART

is a representative, cross-sectional survey.

Taiz Governorate is the most popular Governorate in Yemen. An estimated population of the IRG area of Taiz Governorate was 2,378,237 inhabitants and categorized into three

strata (Taiz City, Taiz Highland and Taiz Lowland) including 17 districts as illustrated in Table (1). This classification was based on livelihood variation. [13]

Table 1: Districts in Each Stratum Included in the survey

Stratum	Districts	No. of districts
Taiz City	Al-Muzaffar, Al Kahira, and Salah	3
Taiz Highland	Al-Maafer, Al-Mawaset, Sami', Al-Shamaytain, Jabal Habashi, Sabr Al-Mawadim, Al-Misrakh, Al-Silw, Mashray'ah and Hadnan, part of Maqbanah	10
Taiz Lowland	Al-Wazi'iyah, Dhubab, Al-Mukha, Mawza	4

Target population

The target population in this secondary analysis was all child bearing aged women (women of reproductive age 15 – 49 years) in the IRG area of Taiz Governorate irrespective of their residential status, either host communities or Internally Displaced Peoples (IDPs).

Sampling

The SMART dataset of all child bearing aged women (women of reproductive age 15 – 49 years) in the three surveyed strata at Taiz Governorate were included.

Sampling technique

Dataset analysed in this study was gathered through a representative two-stage cluster sampling technique. In the first stage, the random selection of proportional clusters/enumeration areas was performed in each stratum. In the second stage, a selection of households from the newly created

cluster was performed using simple random sampling. By using Emergency Nutrition Assessment (ENA) for SMART 2020 software (Jan 11th, 2020), 48, 41 and 31 clusters were selected in Taiz city, Taiz Highland and Taiz Lowland respectively. The household was used as the basic sampling unit in each selected cluster, 15 households were randomly visited and assessed. A total of 1,787 selected households and 2,729 women of reproductive age were interviewed and assessed. Table (2) illustrates the number of selected households and interviewed women of reproductive age (15–49 years) within each stratum.

Table 2: The Number of Selected Households and Interviewed Women of Reproductive Age Within Each Stratum

Stratum	No. of households	No. of women of reproductive age
Taiz City	718	1193
Taiz Highland	606	907
Taiz Lowland	463	629
Taiz governorate	1,787	2,729

Data collection

Data used in this study was already collected from 11 to 26 Nov 2023 by trained teams following standardized protocols. It was a finding of representative survey carried out by the Ministry of Public Health and Population (MoPHP) in Taiz governorate as part of the SMART survey in the IRGs area with the support of the United Nations International Children's Emergency Fund (UNICEF). Validated questionnaires based on the SMART survey methodology were adapted to reflect the characteristics of target population and their nutritional status relevant to IRGs of Yemen and used for many surveys conducted previously in the country.

Collected data about the eligible women physiological status, marital status, educational level and their nutritional status were retrieved from this survey dataset. The nutritional status of women at childbearing age including pregnant and lactating women was assessed using MUAC measurements.

Statistical analysis

The presented data in this study was a part of the 2023 SMART survey statistical analysis that follow all necessary procedures to ensure data quality during collection and entry. The collected data were entered into

an Excel spread sheet created for the purpose of this survey. The anthropometrical data then were copied to ENA for SMART to create the final plausibility check report and results of nutritional anthropometry status tables and curves.

Women variables were analysed using EpiInfoTM 7.2.5.0. Women nutritional status was classified based on the findings of MUAC measurements based on the strong correlation between MUAC and BMI, MUAC cut-offs for nutritional status calculated by linear regression and BMI values, (14-18) was divided into the following four categories as:

- Underweight: <18.5 BMI, <25 cm-MUAC
- Normal 18.5– 24.9 BMI, 25 cm-<29 cm MUAC
- Overweight: ≥ 25 BMI, ≥ 29 cm MUAC
- Obesity: ≥ 30 BMI, ≥ 31.5 cm (MUAC).

Ethical consideration

As secondary data analysis, there were no ethical issues involved in the conduct of this study. Informed consent was not necessary because only anonymized routine record-based data were analysed retrospectively.

Results

Physiological status, marital status and educational level of study women

In Table 3; out of 2729 assessed women, 72.6% were not pregnant and/or lactating, 19.5% were lactating and 7.9% were pregnant. Table 3 also shows that, 28.6%, 19.6% and 14.5% of assessed women from Taiz Lowland, Taiz Highland and Taiz city respectively were lactating women and 8.7%, 9.7% and 6.1% respectively were pregnant.

Most of the assessed women in Taiz Governorate (63.2%) were currently married and 31.5% were single.

Within strata, Table (3) also shows that, the percentage of currently married women in Taiz Lowland was the highest (68.8%) and the lowest one (57.8%) was in Taiz city.

It is also clear from the same table that, more than three quarters (77.3%), around half (47.4%) and 28.8% of assessed women in Taiz Lowland, Taiz Highland and Taiz city respectively without any formal basic education (illiterate or only just able to read and write) and the minority (10.8%) of all assessed women in Taiz Governorate had level of education higher than the secondary grade.

Table 3: Physiological Status, Marital Status and Educational Level of Surveyed Child Bearing Aged Women in Taiz

Variable	Taiz City (n=189)		Taiz Highland (n=909)		Taiz Lowland (n=631)		Taiz Governorate (n=2729)	
	No.	%	No.	%	No.	%	No.	%
Physiological status								
Lactating women	173	14.5	178	19.6	180	28.6	531	19.5
Not lactating and/or pregnant	947	79.4	641	70.7	394	62.6	1982	72.6
Pregnant women	73	6.1	88	9.7	55	8.7	216	7.9
Marital Status								
Divorced	39	3.3	20	2.2	5	0.8	64	2.3
Currently married	690	57.8	586	64.6	433	68.8	1709	62.6
Currently unmarried	10	0.8	6	0.7	6	1.0	22	0.8
Single	422	35.4	273	30.1	164	26.1	859	31.5
Widowed	32	2.7	22	2.4	21	3.3	75	2.7
Educational level								
Illiterate	136	11.4	202	22.2	323	51.2	661	24.2
Read and write	208	17.4	229	25.2	164	26.1	601	22.0
Basic	274	23.1	237	26.1	78	12.4	589	21.6
Secondary	344	29.0	184	20.2	55	8.6	583	21.4
Higher education	227	19.1	57	6.3	11	1.7	295	10.8

Prevalence of underweight, overweight and obesity among study women

The overall prevalence of **underweight** in Taiz Governorate

among women of reproductive age was 14.1% (95% CI: 12.8-15.5), ranging from 10.3% (95% CI: 8.7-12.2) in Taiz City to 22.0% (95% CI: 18.9-25.5) in Taiz Lowland and the overall prevalence of **overweight** in

Taiz Governorate among women of reproductive age was 12.6% (95% CI: 11.4-13.9), ranging from 9.5% (95% CI: 7.8-11.7) in Taiz Highland to 16.4% (95% CI: 14.3-18.7) in Taiz City, while the overall prevalence of **obesity** in Taiz Governorate among

women of reproductive age was 13.9% (95% CI: 12.7-15.3) and it ranged from 9.1% (95% CI: 7.1-11.6) in Taiz Lowland to 16.7% (95% CI: 14.6-18.9) in Taiz City (Table 4).

Table 4: Prevalence of Underweight, Overweight and Obesity among Surveyed Child Bearing Aged Women by areas in Taiz

Area	Underweight		Overweight		Obesity	
	No.	% (95% CI)	No.	% (95% CI)	No.	% (95% CI)
Taiz City (1189)	116	10.3 (8.7-12.2)	184	16.4 (14.3-18.7)	187	16.7 (14.6-18.9)
Taiz Highland (909)	117	13.3 (11.2-15.7)	84	9.5% (7.8-11.7)	122	13.9 (11.7-16.3)
Taiz Lowland (631)	136	22.0 (18.9-25.5)	62	10.0 (7.9-12.7)	56	9.1 (7.1-11.6)
Taiz Gov. (2729)	369	14.1 (12.8-15.5)	330	12.6 (11.4-13.9)	365	13.9 (12.7-15.3)

Prevalence of underweight, overweight and obesity among surveyed lactating, not lactating and/or pregnant and pregnant women in Taiz

The survey findings of Taiz Governorate illustrated in Table 5 reveal that 24.6% (95% CI:21.1-28.5) of lactating women, 9.1% (95% CI: 7.8-10.4) of not lactating and/or not pregnant women and 32.1% (95% CI: 25.9-38.8) of pregnant women had underweight. The table also shows that 12.5% (95% CI: 9.9-15.6) of lactating women, 12.9% (95% CI: 11.5-14.5) of not lactating and/or not pregnant women and 9.8% (95% CI: 6.1-14.5) of pregnant women had overweight while the obesity was found among 11.2% (95% CI: 8.8-14.1) of lactating women, 15.2% (95% CI: 13.7-16.9) of not lactating and/or not pregnant women and 9.3% (95% CI: 5.8-14.0) of pregnant women.

Within strata, Table 5 also shows that, the prevalence of underweight in Taiz Lowland women was the highest among lactating 31.7% (95% CI: 24.9-39.0), not lactating and/or not

pregnant 14.7% (95% CI: 11.5-18.6) and pregnant 41.8% (95% CI: 28.7-55.9). The lowest prevalence was found among women in Taiz city as 19.9% (95% CI: 14.2-26.7), 7.6% (6.0-9.6) and 20.8% (95% CI: 12.2-32.0) of their lactating, not lactating and/or not pregnant and pregnant had underweight respectively.

Regarding the prevalence of overweight and obesity, Table 5 also reveals that Taiz city lactating women had higher level 14.6% (95% CI: 9.7-20.8) and 14.0% (95% CI: 9.2-20.2) of overweight and obesity respectively than those from Taiz Lowland 12.8% (95% CI: 8.3-18.6) and 8.3% (95% CI: 4.7-13.4) as well as than those from Taiz Highland 10.2% (95% CI: 6.1-15.6) and 11.3% (95% CI: 7.0-16.9). Among pregnant women, those from Taiz Lowland had the lowest prevalence of overweight 5.5% (95% CI: 1.1-15.1) and those from Taiz Highland had the lowest prevalence of obesity 8.0% (95% CI: 3.3-15.7).

Table 5: Prevalence of Underweight, Overweight and Obesity among Surveyed Child Bearing Aged Women by Physiological Status in Taiz

Physiological Status	Underweight		Overweight		Obesity	
	No.	% (95% CI)	No.	% (95% CI)	No.	% (95% CI)
Taiz City (1189)						
Lactating	34	19.9 (14.2-26.7)	25	14.6 (9.7-20.8)	24	14.0 (9.2-20.2)
Not lactating and/or pregnant	67	7.6 (6.0-9.6)	152	17.3 (14.9-19.9)	155	17.6 (15.2-20.3)
Pregnant	15	20.8 (12.2-32.0)	7	9.7% (4.0-19.0)	8	11.1 (4.9-20.7)
Taiz Highland (909)						
Lactating	39	22.0 (16.2-28.9)	18	10.2 (6.1-15.6)	20	11.3 (7.0-16.9)
Not lactating and/or pregnant	47	7.6 (5.8-10.0)	55	8.9% (6.9-11.5)	95	15.4 (12.8-18.5)
Pregnant	31	35.2 (25.3-46.1)	11	12.5 (6.4-21.3)	7	8.0 (3.3-15.7)
Taiz Lowland (631)						
Lactating	57	31.7 (24.9-39.0)	23	12.8 (8.3-18.6)	15	8.3 (4.7-13.4)
Not lactating and/or pregnant	56	14.7 (11.5-18.6)	36	9.4 (6.9-12.8)	36	9.4 (6.9-12.8)
Pregnant	23	41.8 (28.7-55.9)	3	5.5 (1.1-15.1)	5	9.1 (3.0-20.0)
Taiz Governorate (2729)						
Lactating	130	24.6 (21.1-28.5)	66	12.5 (9.9-15.6)	59	11.2 (8.8-14.1)
Not lactating and/or pregnant	170	9.1 (7.8-10.4)	243	12.9 (11.5-14.5)	286	15.2 (13.7-16.9)
Pregnant	69	32.1 (25.9-38.8)	21	9.8 (6.1-14.5)	20	9.3 (5.8-14.0)

Discussion

This study is the first (up to the knowledge of researcher) to provide evidence of the coexistence of double burden of malnutrition among women of reproductive age in Taiz governorate.

To ensure the optimum generalizability of our findings, the study used representative data from the Taiz SMART Survey of 2023. [19] Specifically, this study determined the prevalence of underweight, overweight and obesity among women of

reproductive age in Taiz governorate, with underweight at 14.1%, overweight at 12.6% and obesity at 13.9%. A similar prevalence of underweight among women of reproductive age at 14.0% was reported in Taiz by SMART Survey of 2021 [12]. A higher prevalence of underweight (20.6%) among female adult aged ≥ 18 years was reported by Ibrahim *et al* in a national cross-sectional survey that carried (2020) within four Yemeni governorates randomly selected [14] and among women of reproductive age in Bangladesh at 30.4% [20]. Lower prevalence of underweight among

women of reproductive was reported by studies conducted in Sierra Leone at 6.7% [21], Kenya at 9.0%, [22] Tanzania at 10.0% [23] and Indonesia at 11.2% [24].

Prevalence of underweight in the present study showed considerable variation across Taiz three strata with the largest prevalence (22.0% and 13.3%) found among women of reproductive age in rural strata (Taiz Lowland and Taiz Highland respectively) compared to 10.3% of women in the urban stratum (Taiz city). A similar variation was reported by Ibrahim *et al.* national survey [13] and other studies from LIMIC as well [25, 26].

The overall prevalence of overweight and obesity in Taiz was 12.6% and 13.9% respectively and it was 20.6% for overweight and 10.7% for obesity among adult female aged ≥ 18 years in Ibrahim *et al.* national survey [14]. Furthermore, the prevalence of overweight in the present study (12.6%) was lower than that estimated by the WHO globally in 2016, which was 39.0% [27] while the prevalence of obesity in women of reproductive age (in Taiz was more or less similar (13.9%) to that estimated by the WHO which was 13.0% [27]. On the other hand, the prevalence of underweight in this study (14.1%) was higher than that estimated by the WHO worldwide in 2016 [27], which was approximately 9.0%, and also higher than the WHO estimation for Yemeni adult female aged ≥ 18 years in 2016, which was 9.3% [28].

Across strata, the prevalence of overweight and obesity was higher

(16.4% and 16.7%, respectively) in urban area (Taiz city) than in rural areas (10.0% and 9.1%) respectively; a finding that was consistent with other studies in the LMICs [29,30]. Similarly, a study in China demonstrated that urban women were more likely to be overweight and obese [31]. Possible reasons for the association between urban dwellers and overweight and obesity may be that urban dwellers are more likely to consume processed, packaged and refrigerated foods, and to be physically inactive. Besides, women who reside in rural areas may be engaged in occupational physical activities such as agricultural occupations subject them to labor-intensive activities and therefore, unlikely to gain as much weight as urban women could be a possible explanation for the negative relationship between rural residents and overweight and obesity.

The findings from this study revealed that overall (in Taiz), 12.5% and 11.2% of lactating women were overweight and obese respectively, while 9.8% and 9.3% of pregnant women were overweight and obese respectively. These findings show that risk of being overweight and obese was less likely among lactating and pregnant women. Consistent with our findings, Amugsi *et al.* indicated that the risk of being overweight and obese was less likely among lactating women [32], and an Indian survey revealed lower prevalence among pregnant women [33].

One of the limitations of this study, that it is based on the secondary data analysis of the 2023 nutrition and mortality SMART survey datasets of the childbearing aged women in Taiz governorate only. Furthermore, the lack of inferential analysis is also among the limitation of this study.

Conclusion

The reported overall prevalence of all categories of malnutrition among women of reproductive age in Taiz Governorate confirms the presence of a double burden of malnutrition on community level.

Overweight and obesity were more among women in urban communities. Therefore, an urgent need to design comprehensive educational programs to sensitize, engage, and mobilize women in the reproductive age group on healthy lifestyles and the dangers of being underweight or over nourished is an ultimate and a need to address the dual problems of undernutrition and rapidly rising trends of overweight/obesity in an integrated manner, without neglecting either of them.

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