https://doi.org/10.54361/ajmas.269146

Original article

Impact of Obesity on Breast Cancer in Premenopausal and Postmenopausal Women

Lubna Elganimi*, Khawla Stuka

Department of Oncology and Haematology, Tripoli University Hospital, Tripoli/Libya
Correspondence email. lubnaelganimi@gmail.com

Abstract
Breast cancer remains the most prevalent malignancy among women globally and in Libya, where it accounts for about 41% of all female cancers. Obesity, a modifiable risk factor, has shown differential impacts on breast cancer risk and progression depending on menopausal status. This study investigates the prevalence of obesity among breast cancer patients in Libya and explores its associations with menopausal status, disease stage at diagnosis, and hormonal subtypes. A retrospective cross-sectional analysis was conducted on 210 non-metastatic breast cancer patients treated at Tripoli Cancer Center between 2020 and 2022. Data were extracted from medical records and analyzed using SPSS software. BMI classifications followed WHO criteria, and statistical significance was assessed at a 0.05 level. The mean age at diagnosis was 48.7 ± 10.9 years, with 61.4% of patients being premenopausal. A striking 78.1% of patients had elevated BMI, with 43.8% classified as obese. Luminal B was the predominant hormonal subtype (51%), and stage II was the most common stage at diagnosis (52.4%). Higher BMI was associated with more advanced disease stages, although no statistically significant differences were found between BMI and hormonal or menopausal status. Obesity is highly prevalent among Libyan breast cancer patients and appears to correlate with more advanced disease at diagnosis. These findings underscore the need for targeted public health interventions addressing obesity and its role in breast cancer progression.
Keywords. Breast Cancer, Obesity, Body Mass Index, Premenopausal Women.

Introduction

Breast cancer is the most common cancer diagnosed in women and the second most common cause of death from cancer among women worldwide [1]. Globally, 2.3 million new cases and 670,000 deaths from female breast cancer occurred in 2022 [2]. In Libya, according to the first comprehensive report of the national cancer registry 2020 Breast cancer was the most common cancer encountered in all registered cases, 1547 new cases were registered during 2020, accounting for about 23% of all cancer cases and about 41% of all female cancers [3].

While direct causes of breast cancer remain unknown, several well-known risk factors increase the likelihood of its development. Factors such as age, family history, menstrual history, and lifestyle choices (e.g., oral contraceptives, lack of breastfeeding, smoking, obesity, and high-fat diet) play a crucial role and can be addressed through proper health education and awareness. Obesity is defined by an elevated body mass index (BMI) and has emerged as a significant modifiable risk factor for breast cancer. Its impact varies markedly between premenopausal and postmenopausal women, reflecting complex hormonal and metabolic interactions. In postmenopausal women, obesity is consistently associated with increased breast cancer risk, particularly for hormone receptor-positive subtypes, due to elevated peripheral estrogen production from adipose tissue [4]. Conversely, in premenopausal women, obesity may exert a protective effect, potentially mediated by altered progesterone levels and disrupted ovarian function [5]. Overweight and obese patients with breast cancer have a high risk of recurrence compared to healthy-weight patients [6]. Therefore, this study aims to determine the prevalence of obesity among breast cancer patients attending the Tripoli Cancer Center and to explore its associations with disease stage at diagnosis, hormonal subtype, and menopausal status by analyzing data from 210 patients with non-metastatic breast cancer diagnosed between 2020 and 2022.

Methods

Study design and setting

A retrospective cross-sectional study was conducted at the Breast Cancer Clinic at Tripoli Cancer Center, by reviewing the medical records of non-metastatic breast cancer patients who attend outpatient clinic between 2020 and 2022.

Size of study population

Data of 210 patients with non-metastatic breast cancer were extracted from patients' files.

Data collection tool

A specifically designed data collection form was developed by the researcher after an extensive literature review was used for data extraction. Obesity was defined according to the World Health Organization's (WHO) criteria [7].

Received*: 25-11-2025 -* ***Accepted****: 22-01-2026 -* ***Published****: 29-01-2026*

Statistical analyses
Data extracted from patients' files, coded, and entered into SPSS software. Descriptive statistics are used to summarize the outcome variables. Appropriate inferential statistics were done with a 0.05 level of significance.

Ethical considerations
Approval from the Directorate of Tripoli Cancer Center to implement this study has been obtained.

Results
Results show age of patients ranging from 26 years to 87 years, with a mean age of 48.7± 10.9 years. Also, results show that nearly half of patients are diagnosed at an age ranging from 45 to 59 years, and only 2.9% (n= 6) are diagnosed in older age (75-89 years) as seen in (Table 1).

Table 1. Age group of the participants

Age group	Frequency	Percent	Cumulative Percent
Less than 30	3	1.4	1.4
30-44	70	33.3	34.8
45-59	102	48.6	83.3
60-74	29	13.8	97.1
75-89	6	2.9	100.0
Total	210	100.0	

The right side is the most commonly affected, about 50%of the patients (n=105), the left side is affected in 47.6% (n=100), and bilateral involvement is seen only in 2.4% of patients (n=5), as seen in (Table 2).

Table 2. distribution of patients according to laterality

Laterality	Frequency	Percent
Bilateral	5	2.4
Left	100	47.6
Right	105	50
Total	210	100

Among 210 patients, stage II is the most frequent stage at diagnosis, it accounts 52.4% of cases (stage II a 28.1%, stage II b 24.3%). Stage III accounts 28.2% (stage III c alone 10.5%, which is relatively high for an advanced sub-stage; early stages (Ia and Ib) together account 19.5%. The relatively low proportion of early-stage diagnoses may suggest delayed presentation, indicating a moderate rate of early detection, as seen in (Figure 1).

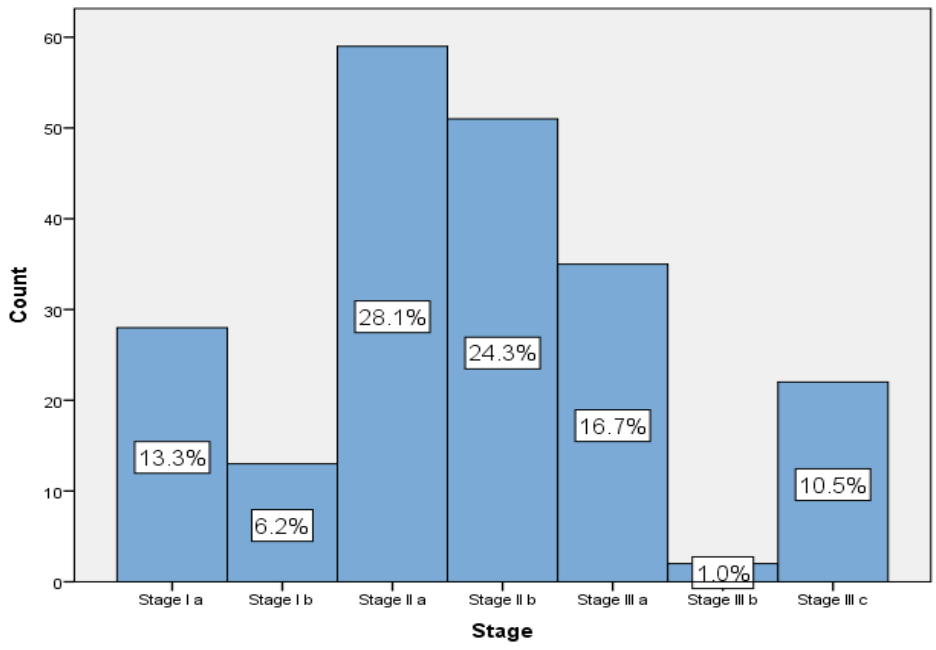

Figure 1. Distribution of patients according to stage of disease

Received*: 25-11-2025 -* ***Accepted****: 22-01-2026 -* ***Published****: 29-01-2026*

Distribution of patients according to Menopausal status is seen in Figure 2. Among 210 patients, the majority are premenopausal 61.4% (n=129), while 38.6% (n=81) are postmenopausal.

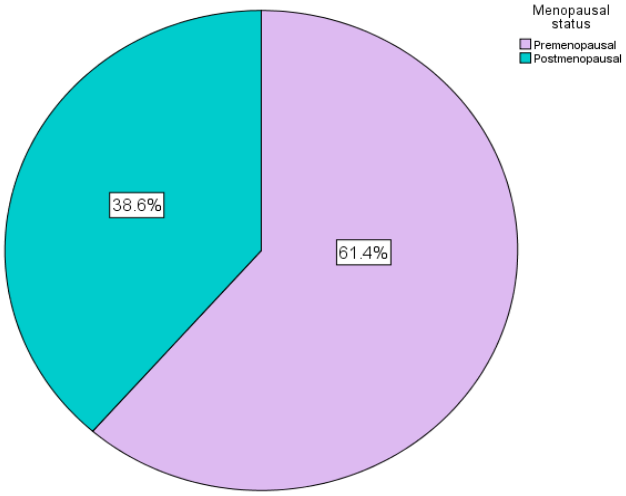

Figure 2. Distribution of patients according to Menopausal status

Luminal B is the most common subtype, accounting for 51% of cases. Luminal A is the second most frequent (28.1%), indicating a significant presence of hormone receptor-positive cases. HER2 overexpression and triple-negative subtypes are equally represented, each comprising 10.5% of the cases. The distribution of patients according to Hormonal status is shown in (Table 3).

Table 3. Hormonal status

Hormonal status	Frequency	Percent
Luminal A	59	28.1
Luminal B	107	51.0
Her2 over expression	22	10.5
Triple negative	22	10.5

The weight of patients ranged from 42.6 kg to 110 kg, with a mean weight of 74.7 ±12.7 kg SD. The distribution of patients according to weight is demonstrated in Figure 3.

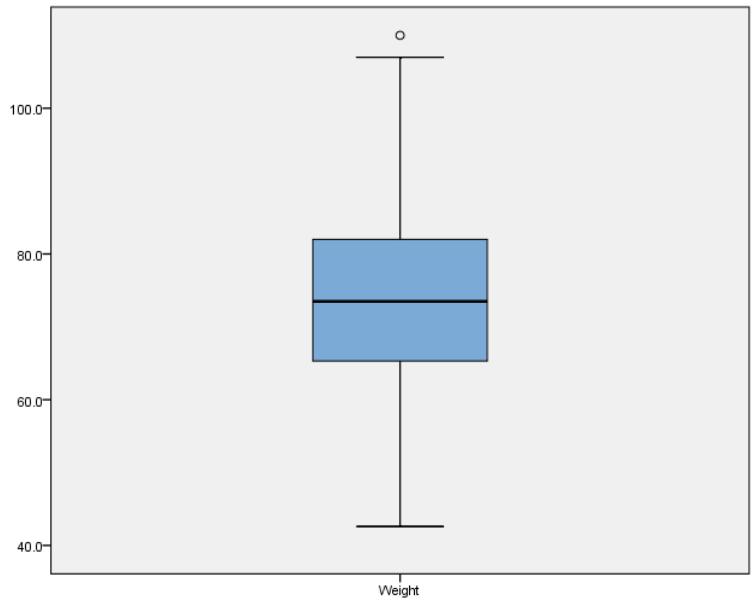

Figure 3. Distribution of patients according to weight

The BMI of patients ranges from 17.8kg/m2 to 43.8kg/m² with a mean BMI of 29.2kg/m²±5kg/m² SD as seen in (Figure 4).

Received*: 25-11-2025 -* ***Accepted****: 22-01-2026 -* ***Published****: 29-01-2026*

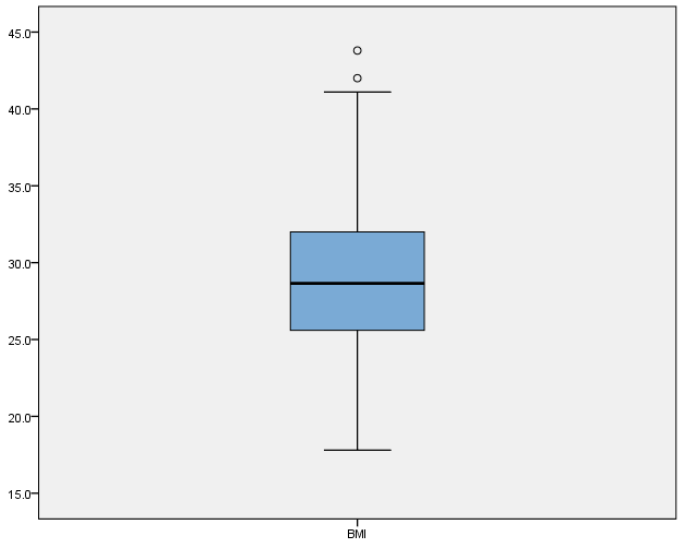

Figure 4. distribution of patients according to their BMI

Body weight categories based on body mass index

As seen in Table 4, 78.1% of patients have abnormally high BMI and are considered overweight or obese (overweight 34.3% and obese 43.8%). Obesity distribution: class I accounts 29%, class II 12.4%, and class III 2.4%. Only 21.4% of the patients have a normal BMI. Underweight individuals are extremely rare (0.5%).

Table 4 Body weight categories based on body mass index

BMI	Frequency	%	Cumulative %
Underweight	1	0.5	0.5
Normal	45	21.4	21.9
Over weight	72	34.3	56.2
Obesity class 1	61	29	85.2
Obesity class 2	26	12.4	97.6
Obesity class 3	5	2.4	100.0

Table 5 shows comparison of means of BMI in patients with different stages of breast cancer although patients with stage IV is excluded from this study the results shows Mean BMI rises from Stage I a (28.475) to Stage III a (30.169), suggesting a trend of increasing BMI with advancing cancer stage up to III a but Stage III b shows a marked decrease in mean BMI to 27.100, the lowest among all stages.

Table 5. BMI and stage at diagnosis

Stage	Mean BMI	Std. Deviation
Stage I a	28.475	5.0807
Stage I b	28.938	5.1608
Stage II a	29.415	4.8801
Stage II b	29.304	5.6876
Stage III a	30.169	4.8441
Stage III b	27.100	4.5255
Stage III c	28.086	4.0246

Results show patients with HER2 overexpression have a higher mean BMI (31.1 kg/m²), followed by patients with luminal A breast cancer (29.7 kg/m²), patients with luminal B and triple negative have nearly the same mean BMI (28.6 kg/m² and 28.7 kg/m², respectively) as seen in (Figure 5). Analysis by ANOVA test, there is no statistical significance found in the mean BMI of the four groups *(P=0.145).*

Received*: 25-11-2025 -* ***Accepted****: 22-01-2026 -* ***Published****: 29-01-2026*

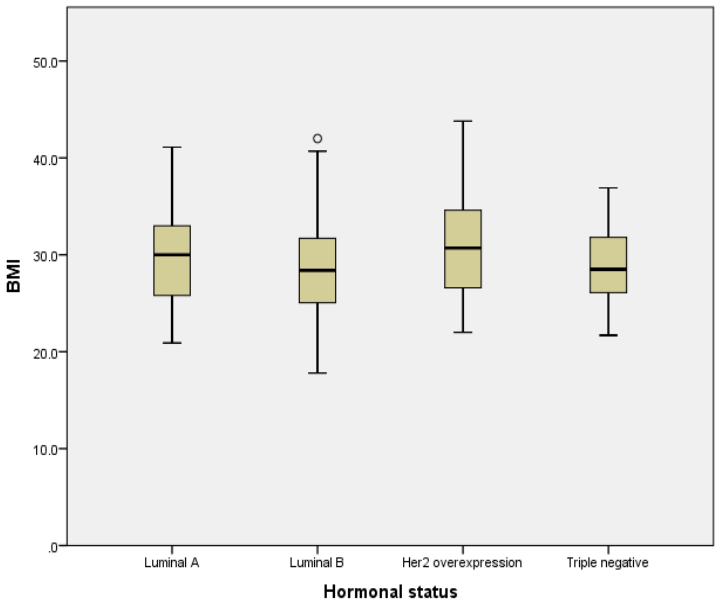

Figure 5. BMI and hormonal status

As seen in (Figure 6) mean BMI of Premenopausal patients (29.2 kg/m²) is slightly higher than that of postmenopausal patients (29.1 kg/m²), this slight difference is statistically insignificant by T-test *(P=0.855).*

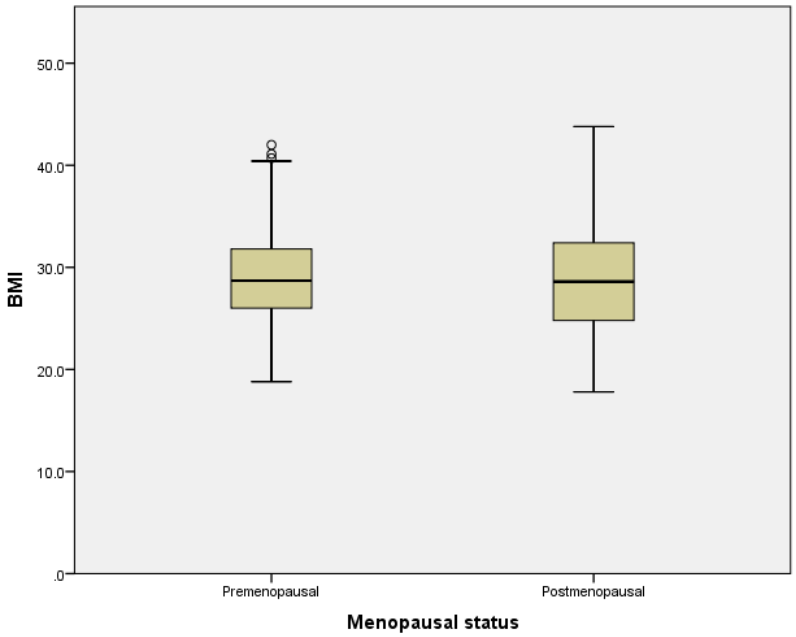

Figure 6. BMI and menopausal status

BMI and hormonal status in pre- and postmenopausal status

The distribution of hormonal subtypes among breast cancer patients demonstrates notable variation across menopausal status, as illustrated in Table 6. Overall, Luminal B emerged as the most prevalent subtype in both premenopausal and postmenopausal groups, underscoring its dominant role in the clinical profile of these patients.

In the premenopausal cohort, Luminal B was identified as the most common subtype, accounting for 73 cases, with a mean body mass index (BMI) of 29.06 kg/m². Luminal A followed, observed in 29 patients, with a mean BMI of 28.94 kg/m². Interestingly, HER2 overexpression was detected in 11 patients and was associated with the highest mean BMI in this group, reaching 31.41 kg/m². The triple-negative subtype was present in 16 patients, with a mean BMI of 29.2 kg/m², reflecting a relatively moderate distribution compared to the other categories.

Among postmenopausal women, Luminal B again represented the most frequent subtype, with 34 cases and a mean BMI of 27.64 kg/m². Luminal A was nearly as common, observed in 30 patients, though it was associated with a higher mean BMI of 30.49 kg/m². HER2 overexpression was present in 11 patients, with

Received*: 25-11-2025 -* ***Accepted****: 22-01-2026 -* ***Published****: 29-01-2026*

a mean BMI of 30.74 kg/m², closely resembling the BMI profile of Luminal A in this group. The triple-negative subtype was the least frequent, identified in only six patients, with a mean BMI of 27.63 kg/m².

Table 6. BMI and hormonal status in pre and postmenopausal status

Menopausal status	Hormonal status	Number	Mean BMI	SD
Premenopausal	Luminal A	29	28.94	4.85
	Luminal B	73	29.06	4.88
	Her2 overexpression	11	31.41	4.93
	Triple negative	16	29.20	3.82
	Total	129	29.25	4.75
Postmenopausal	Luminal A	30	30.49	5.04
	Luminal B	34	27.64	5.09
	Her2 overexpression	11	30.74	7.13
	Triple negative	6	27.63	4.25
		81	29.12	5.43

Discussion

The study revealed that the mean age at diagnosis was 48.7± 10.9 years, which is much lower than in Western countries [8], and it is similar to Arab countries (48 years) [9]. The explanation could be related to the fact that Arab nations have a younger population compared to Western countries.

The study revealed that mean BMI 29.2kg/m²±5kg/m² SD which is higher than Mean BMI of Libyan females according to Libya STEPS Survey 2022- 2023 (28.1kg/m²) [10] indicating obesity is common in patient of breast cancer than general population, and aligns with findings from large-scale studies indicating that elevated BMI is common among breast cancer patients, particularly in postmenopausal populations [11]. About 78.1% of breast cancer patients had an abnormally high BMI, with 43.8% classified as obese and 34.3% as overweight. This prevalence is notably higher than global averages reported in a similar study [12], suggesting a significant burden of obesity among Libyan breast cancer patients.

The high main BMI in advanced stages indicating obesity is associated with more advanced disease at diagnosis. Prior studies have shown that obesity is associated with more advanced disease at diagnosis, possibly due to reduced screening efficacy and tumor biology [13]. The relatively low BMI in patients with Stage III b highlights the importance of targeted nutritional interventions in advanced stages. Interestingly, the mean BMI was slightly higher in premenopausal women (29.2 kg/m²) compared to postmenopausal women (29.1 kg/m²). This contrasts with broader literature, where postmenopausal women typically exhibit higher BMI [14], which may reflect regional lifestyle or dietary patterns.

Luminal B was the most prevalent subtype (51%), followed by Luminal A (28.1%), with HER2 and triple-negative subtypes each comprising 10.5%. Patients with HER2 overexpression had the highest mean BMI (31.1 kg/m²); this finding is partially compatible with meta-analyses indicating that obesity may be associated with increased risk of HER2-positive and Luminal B subtypes [15].

Weight management may be particularly critical for young women to reduce aggressive breast cancer risk. Subtype distribution in postmenopausal women shows a less aggressive pattern despite obesity.

Conclusion

This study confirms that BMI and menopausal status jointly influence breast cancer subtype, with obesity increasing the likelihood of aggressive subtypes in premenopausal women and hormone receptor-positive subtypes in postmenopausal women. These findings emphasize the importance of weight management in breast cancer prevention and highlight the need for tailored prevention strategies in different menopausal groups.

Conflict of interest. Nil

References

1. Watkins EJ. Overview of breast cancer. JAAPA. 2019;32(10):13–17.
2. Kim J, Harper A, McCormack V, Sung H, Houssami N, Morgan E, et al. Global patterns and trends in breast cancer incidence and mortality across 185 countries. Nat Med. 2025;31:1–9.
3. National Cancer Control Program. National Cancer Registry. The first comprehensive report of cancer incidence in Libya 2020. State of Libya: National Cancer Registry; 2020.
4. Fortner RT, Katzke V, Kühn T, Kaaks R. Obesity and breast cancer. In: Obesity and Cancer. Cham: Springer; 2016. p. 43–65.
5. Dowsett M, Folkerd E. Reduced progesterone levels explain the reduced risk of breast cancer in obese premenopausal women: a new hypothesis. Breast Cancer Res Treat. 2015;149(1):1–4.
6. Møller AL, Borgquist S, Skarping I. Overweight and risk of recurrence following neoadjuvant chemotherapy in breast cancer. Clin Breast Cancer. 2025.

Received*: 25-11-2025 -* ***Accepted****: 22-01-2026 -* ***Published****: 29-01-2026*

7. World Health Organization. Obesity [Internet]. Geneva: WHO; c2024 [cited 2026 Jan 18]. Available from: https://www.who.int/health-topics/obesity
8. Abdulrahman GO Jr, Rahman GA. Epidemiology of breast cancer in Europe and Africa. J Cancer Epidemiol. 2012;2012:915610.
9. Najjar H, Easson A. Age at diagnosis of breast cancer in Arab nations. Int J Surg. 2010;8(6):448–52.
10. World Health Organization. STEPS survey Libya 2023 factsheet [Internet]. Geneva: WHO; 2023 [cited 2026 Jan 18]. Available from: https://cdn.who.int/media/docs/default-source/2021-dha-docs/libya_2023_steps-_factsheet.pdf
11. Cao S, Zhou J, Zhu Z, Wei F, Li W, Lu S, et al. Adult weight change and the risk of pre- and postmenopausal breast cancer in the Chinese Wuxi Exposure and Breast Cancer Study. Breast Cancer Res Treat. 2019;173(3):647–55.
12. Park JW, Han K, Shin DW, Yeo Y, Chang JW, Yoo JE, et al. Obesity and breast cancer risk for pre- and postmenopausal women among over 6 million Korean women. Breast Cancer Res Treat. 2021;185(2):495–506.
13. Kong Y, Huang J, Ding Y, et al. The effect of BMI on survival outcome of breast cancer patients: a systematic review and meta-analysis. Clin Transl Oncol. 2025;27:403–16.
14. Brouckaert O, Van Asten K, Laenen A, et al. Body mass index, age at breast cancer diagnosis, and breast cancer subtype: a cross-sectional study. Breast Cancer Res Treat. 2017;168(1):189–96.
15. Li X, Li J, Hu Q, et al. Association of physical weight statuses defined by body mass index with molecular subtypes of premenopausal breast cancer: a systematic review and meta-analysis. Breast Cancer Res Treat. 2023.

Received*: 25-11-2025 -* ***Accepted****: 22-01-2026 -* ***Published****: 29-01-2026*