



## Epidemiological Patterns of Breast Cancer Prevalence in Libya: A Retrospective Descriptive Analysis (2015–2024)

Almabrouk Alhireereq <sup>\*1</sup>, Elkhoully A. R. <sup>2</sup>

<sup>1</sup> Department of Zoology, Faculty of Science-Ojelat, Alzawia University, Libya

<sup>2</sup> Department of Zoology, Faculty of Science-Regdalin, Sabratha University, Libya

معدلات وانماط انتشار الإصابة بسرطان الثدي في ليبيا: دراسة وصفية استرجاعية (2015-2024)

المبروك أحمد الحريري <sup>\*1</sup>، الانصاري رفعت الخولي <sup>2</sup>

<sup>1</sup> قسم علم الحيوان، كلية العلوم-العجيلات، جامعة الزاوية، ليبيا

<sup>2</sup> قسم علم الحيوان، كلية العلوم- رقدالين، جامعة صبراتة، ليبيا

\*Corresponding author: [m.hireereq@zu.edu.ly](mailto:m.hireereq@zu.edu.ly)

Received: December 30, 2025

Accepted: March 13, 2026

Published: March 28, 2026

### Abstract

**Background:** Breast cancer is a significant health concern in Libya, as it is the most common malignancy among Libyan women. The incidence and characteristics of breast cancer in Libya reflect broader regional trends, with unique local factors influencing its epidemiology.

**Aims:** The aim of this research was to present a contemporary analysis regarding the prevalence of breast cancer cases in Libya.

**Methods:** A retrospective descriptive analysis was conducted using data collected from 2,942 confirmed breast cancer cases recorded between 2015 and 2024. Cases were analyzed based on annual incidence, regional distribution across twenty areas, sex, five age groups, and diagnostic categories (right breast lump, left breast mass, and bilateral breast cancer). Descriptive statistics were used to summarize frequencies and percentages.

**Results:** The highest annual incidence was observed in 2024, accounting for 426 cases (14.6%), while the lowest incidence occurred in 2017 (206 cases; 7%). Regionally, Alzawia reported the highest number of cases (577; 19.7%), whereas Misurata recorded the lowest (2 cases; 0.07%). Females constituted the majority of cases (97.5%), compared to males (2.5%). The most affected age group was 47–63 years (40.5%), followed closely by individuals aged 30–46 years (39.6%). Bilateral breast cancer was the most common diagnostic category (39.2%). Age- and diagnosis-specific analyses revealed that unilateral breast lesions were most prevalent in the 30–46-year age group, while bilateral cases peaked among those aged 47–63 years.

**Keywords:** BC cancer, age groups, diagnostic type.

### المخلص

سُجِّل أعلى معدل إصابة سنوي في عام 2024، حيث بلغ 426 حالة (14.6%)، بينما سُجِّل أدنى معدل إصابة في عام 2017 (206 حالات؛ 7%). وعلى الصعيد الإقليمي، سجلت الزاوية أعلى عدد من الحالات (577 حالة؛ 19.7%)، في حين سجلت مصراتة أدنى عدد من الحالات (حالتان؛ 0.07%). وشكَّلت الإناث غالبية الحالات (97.5%)، مقارنةً بالذكور (2.5%). وكانت الفئة العمرية الأكثر تعرضاً للإصابة هي 47-63 عامًا (40.5%)، تليها مباشرةً الفئة العمرية 30-46 عامًا (39.6%). وكان سرطان الثدي الثنائي هو التشخيص الأكثر شيوعاً (39.2%). وكشفت التحليلات الخاصة بالعمر والتشخيص أن آفات الثدي الأحادية كانت الأكثر انتشاراً في الفئة العمرية 30-46 عامًا، بينما بلغت حالات الإصابة الثنائية ذروتها بين الفئة العمرية 47-63 عامًا.

**الكلمات المفتاحية:** سرطان الثدي، فئات عمرية، تشخيص.

### Introduction

Breast cancer (BC) represents the most widespread neoplastic disease among females on a global scale and has concurrently ranked as the fifth predominant cause of mortality attributable to cancer across both genders

internationally during the period spanning from 2005 to 2015 (**Fitzmaurice et al., 2017**). Prior research indicates that BC is anticipated to emerge as a significant contributor to mortality among women of reproductive age in developing nations in the forthcoming years (**Forouzanfar et al., 2011**). The mean age at which women present with BC is notably lower among Asian populations in comparison to their counterparts in Western nations (**Tas and Keskin, 2012**).

In Libya, breast cancer incidence is 37.9 per 100,000, with a low mortality-to-incidence ratio of 0.24. GLOBOCAN 2018 underscores the necessity for heightened awareness and screening to mitigate the breast cancer burden. Libya's data signifies a considerable public health challenge, demanding improved healthcare infrastructure and resources for effective breast cancer management. In Libya, breast cancer incidence is 37.9 per 100,000, with a low mortality-to-incidence ratio of 0.24. GLOBOCAN 2018 underscores the necessity for heightened awareness and screening to mitigate the breast cancer burden. Libya's data signifies a considerable public health challenge, demanding improved healthcare infrastructure and resources for effective breast cancer management (**Sharma, 2020**).

**Abousahmeen et al., (2023)** found that, breast cancer (BC) is the most frequent malignancy among Libyan women, with a mean age of onset at 47.3 years. The majority of patients are premenopausal (59.2%), and a significant proportion (66.1%) of cases are lymph node-positive. Most patients present with advanced disease, as 47.0% are at stage II and 39.5% at stage III. The findings suggest an aggressive phenotype of BC in Libya compared to North African counterparts.

Libya as part of the Eastern Mediterranean Region, where the pooled age standardized rate of breast cancer was estimated at 37.1 per 100,000 person-years during 2011-2019. The study indicates an upward trend in breast cancer incidence in the region from 2005 to 2019, with variations based on data quality. Further investigation into Libya's specific data is recommended (**Zahedi et al., 2020**). According to GLOBOCAN 2020, Libya's age-standardized cancer incidence rate is 185.4 per 100,000. The overall malignancy incidence rate in Libya is 209.8 per 100,000. Predominant cancers in Libyan females include breast (47.3), colorectal (15.6), cervical (14.4), and lung cancer (13.7) per 100,000. In contrast, leading cancers in Libyan males are prostate (30.6), lung (30.0), colorectal (22.4), and gastric cancer (15.0) per 100,000. These rates significantly exceed those documented by the Benghazi Cancer Registry (**El Mistiri et al., 2015**).

According to **Erashdi et al. (2023)**, breast cancer is the leading malignancy at the King Hussein Cancer Center (KHCC) and remains the primary cancer among females. For adult Libyan males with cancer, lung and prostate cancers are the 3rd and 5th most common tumors at KHCC. The low incidence of prostate cancer in our sample may be due to effective hormonal therapies decreasing the need for international referrals. The latest GLOBOCAN data from 2020 indicates that lung cancer is the 2nd most diagnosed cancer overall, being the most frequent in males and the 3rd in females.

breast cancer remains a substantial global public health issue. The incidence, mortality, and disability-adjusted life years (DALYs) related to breast cancer have increased in the past thirty years. Due to early-stage detections via screening and the growing adoption of routine breast screening in developing regions, a short-term increase in incidence is expected. However, the burden of breast cancer varies by nation, influenced by socioeconomic factors. In developed countries, breast cancer mortality and DALYs are decreasing, whereas they continue to rise in developing nations, mainly due to inequities (**Ji et al., 2020**). Over the past decade, Libya has experienced two civil wars, resulting in a persistent struggle among competing factions for military and political dominance, which has not only adversely affected cancer care for Libyan patients but also led to their displacement both internally and externally; additionally, the accurate assessment of cancer's impact in Libya remains elusive due to the absence of a national cancer registry, fluctuating demographics, and incomplete patient records, culminating in skewed epidemiological data (**Zarmouh et al., 2022**).

## Materials and Methods

The current research endeavor meticulously examined and evaluated comprehensive data obtained from the medical records of patients who were formally diagnosed within the esteemed Department of Histopathology at the National Medical Centre over an extensive timeframe spanning from January 1, 2015, to June 30, 2024. This particular department has been designated as the primary facility for the receipt and analysis of all cancer-related cases originating from various regions across the entire geographic landscape of Libya. The diagnostic process for the patients involved the application of advanced histopathology sample confirmation techniques, which are critical for ensuring accuracy and reliability in cancer diagnosis. Comprehensive records were meticulously maintained for each individual patient, encapsulating crucial demographic and clinical information such as age, gender, and the specific type of cancer diagnosed. This systematic collection and analysis of patient data not only facilitates a deeper understanding of cancer trends within the population but also enhances the overall effectiveness of treatment protocols and public health interventions. Ultimately, the findings derived from this extensive study hold significant implications for both clinical practice and future research endeavors within the field of oncology.

### Statistical analysis

The dataset was processed utilizing IBM SPSS version 25.0 (IBM Corp., Armonk, NY, USA). The age of patients was reported as mean  $\pm$  standard deviation. Frequencies and percentages were calculated, and comparisons were performed via chi-square analysis to evaluate the significance of associations among different variables within the dataset. A p-value of less than 0.05 was deemed to denote statistical significance.

### Results and discussion

The empirical data delineated in Table (1) elucidates the prevalence of breast cancer incidence over an extensive timeframe spanning from the year 2015 to 2024, thereby providing a comprehensive overview of this critical public health issue. Upon meticulous examination, it becomes evident that the zenith of breast cancer occurrences has been meticulously documented in the year 2024, wherein a staggering total of 426 cases were identified, constituting approximately 14.6% of the cumulative total of 2,924 documented cases throughout the entire period under review. While the lowest occurrence recorded in 2017 with case incidence 206 (7%). This significant statistic not only highlights the alarming increase in breast cancer incidences, but it also underscores the imperative need for further research and targeted interventions to address and mitigate the escalating burden of this disease within the population. **Ismail et al., (2021)** indicated a significant increase in malignancy cases from 2014 to 2017. This was primarily due to the Department of Histopathology at Tobruk Medical Centre being the only operational facility amidst civil unrest in Benghazi and Derna. Furthermore, it is crucial to consider various constraints in pathology-based cancer registries, such as missing registrations or misclassification, which can stem from data entry errors, ultimately affecting the accuracy of cancer incidence and prevalence assessments.

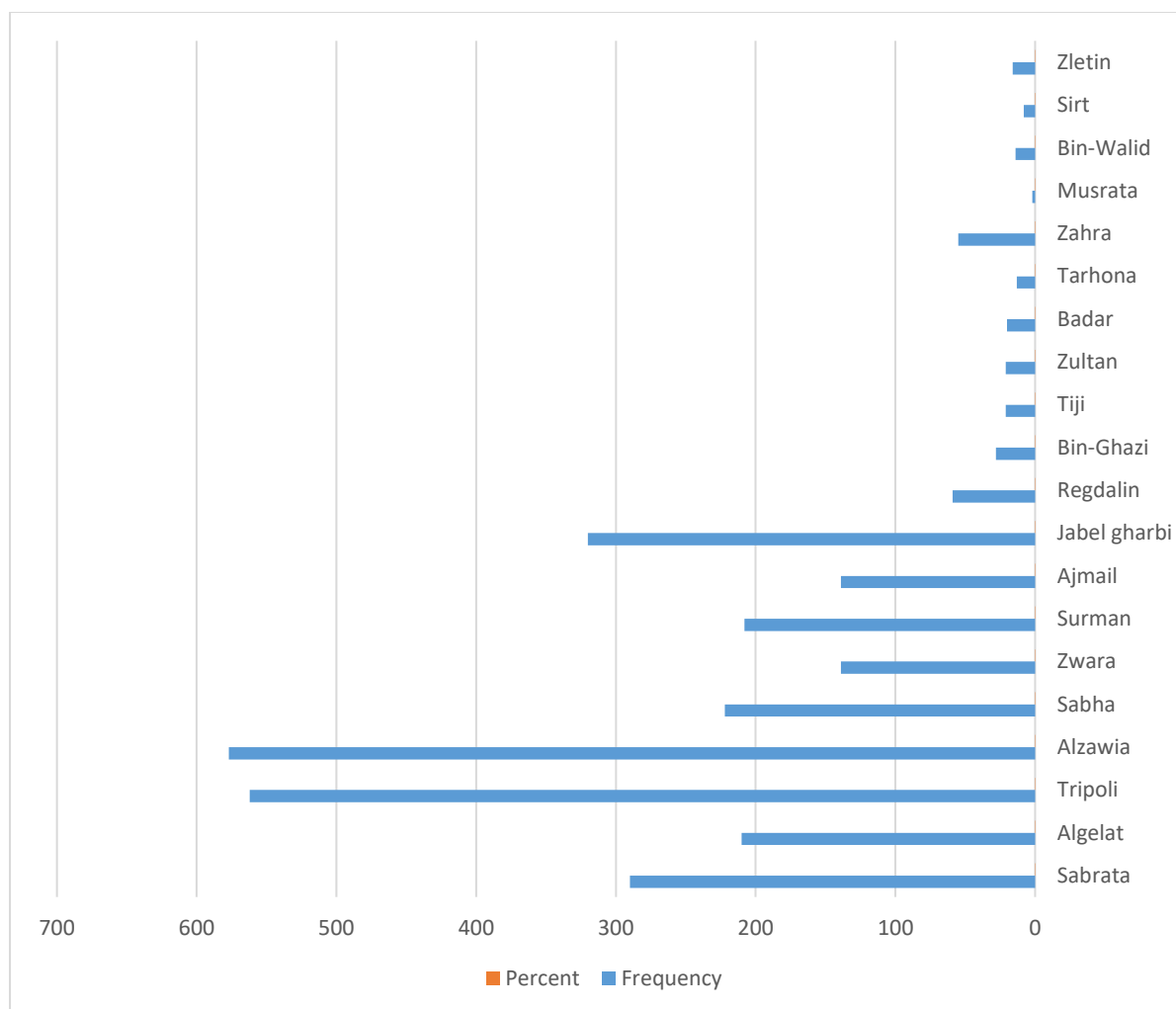
**Table (1)** Number and percentage of sample participants according to year.

Year	Frequency	Percent
2015	335	11.5%
2016	266	9.1%
2017	206	7.0%
2018	267	9.1%
2019	225	7.7%
2020	270	9.2%
2021	308	10.5%
2022	343	11.7%
2023	278	9.5%
2024	426	14.6%
Total	2924	100%

The information delineated in Table (2) meticulously illustrates the distribution of breast cancer incidence across various regions, with a comprehensive analysis conducted on twenty distinct geographical areas to ascertain the prevalence and abundance of breast cancer cases. Among these regions, the Alzawia area emerged as the site with the most significant frequency of reported cases, documenting a remarkable total of 577 instances, which constitutes approximately 19.7% of the overall cases examined, while the Tripoli region closely followed with a count of 562 cases, accounting for around 19.2%. In stark contrast, the Miusrata region exhibited the least prevalence of breast cancer, with a mere two cases recorded, translating to a minuscule percentage of 0.07% within the grand total of 2,942 cases assessed throughout the study. This stark variation in incidence across the regions underscores the necessity for further investigation into the underlying factors contributing to these disparities in breast cancer prevalence. Our results showing a different trend of incidence in some regions which were survived by other authors. for instance, **(Zarmouh et al., 2021)** reported that, in Misurata, that breast cancer accounted for 19.5% of the 430 diagnosed cases during the study period. However, it emphasizes the need for a national or regional cancer registry to better understand cancer distribution and trends across Libya, as the current data is limited and primarily from the Misurata area. On the other hand, **El Mistiri et al., (2007)** surveyed breast cancer incidence in Bengasi and reported that, among females, they were breast cancer (26%), cancer of the colon and rectum (9%), uterus (7%) and non-Hodgkin lymphoma (5%).

**Table (2)** number and percentage of BC cases according to region.

Region	Frequency	Percent
Sabrata	290	9.9%
Algelat	210	7.2%
Tripoli	562	19.2%
Alzawia	577	19.7%
Sabha	222	7.6%
Zwara	139	4.8%
Surman	208	7.1%
Ajmail	139	4.8%
Jabel gharbi	320	10.9%
Regdalin	59	2.0%
Bin-Ghazi	28	1.0%
Tiji	21	0.7%
Zultan	21	0.7%
Badar	20	0.7%
Tarhona	13	0.4%
Zahra	55	1.9%
Musrata	2	0.07%
Bin-Walid	14	0.5%
Sirt	8	0.3%
Zletin	16	0.5%
<b>Total</b>	<b>2924</b>	<b>100%</b>



**Figure (1)** number and percentage of BC cases according to region.

Data conveyed in Table (3) elucidates the distribution of breast cancer incidence in relation to the demographic variable of sex, highlighting a significant disparity between the two genders. Specifically, the data indicate that females exhibited the highest prevalence of this malignant condition, with a staggering total of 2,850 cases documented, which constitutes an overwhelming 97.5% of all recorded instances. In contrast, the male population demonstrated a markedly lower incidence, with only 74 cases identified, representing a mere 2.5% of the total cases, which aggregates to 2,942 across both sexes. This stark contrast in the incidence rates underscores the need for targeted research and intervention strategies that take into account the gender-based differences in breast cancer occurrence.

**Table (3) number and percentage of samples according to Sex.**

Sex	Frequency	Percent
Male	74	2.5%
Female	2850	97.5%
Total	2924	100%

The data as presented in Table (4) provides a comprehensive overview of the distribution of breast cancer incidence relative to various age groups, whereby the total number of recorded cases has been meticulously categorized into five distinct age brackets for analytical purposes. Within this dataset, the age group encompassing individuals aged between 47 and 63 years exhibited the highest prevalence, with a total of 1,185 diagnosed cases, which signifies a substantial 40.5% of the overall incidence, thereby indicating a pronounced vulnerability within this demographic. Following closely, the subsequent age category, which includes individuals aged 30 to 46 years, reported a total of 1,159 cases, reflecting a notable prevalence rate of 39.6%, thereby underscoring the significance of early detection and intervention strategies within these age ranges. Conversely, the age group consisting of individuals aged 81 years and above demonstrated the least prevalence, with only 73 recorded cases, corresponding to a mere 2.5% of the total, which may suggest a range of factors influencing this low incidence rate among the elderly. In contrast, the younger demographic, specifically individuals aged between 13 and 29 years, accounted for 208 cases, which represents 7.1% of the cumulative total of 2,942 cases, thus highlighting the importance of raising awareness and promoting preventive measures even among younger populations. Collectively, these statistics not only illuminate the varying incidence rates across different age demographics but also emphasize the critical need for targeted public health initiatives aimed at addressing breast cancer awareness, prevention, and treatment across all age groups. **Mukherjee et al (2023)** reported that, the incidence rate of breast cancer (BC) in males is approximately 1 in 1000, while in females, it is roughly 1 in 8, indicating a significantly higher risk for women. Additionally, the overall BC rates in both genders increase progressively with age, but the mean age of initial diagnosis is higher in men, averaging 67 years compared to 62 years for women. This highlights the distinct epidemiological patterns of BC between the two sexes. On the other hand, **Rocha et al (2024)** highlights that breast cancer in men is more prevalent in the 60–70 age group, contrasting with the broader age range seen in female breast cancer cases.

The observed percentage in our study showing high ratio of BC incidence in males compared with the global survey (2.5%), this finding should be tracked in the future studies to find out the possible risk factors behind the Libyan case of BC male incidence. **Igci et al., (2016)** concluded that Breast cancer is observed in men 100-fold less often than in women, with world-standardized incidence rates of 66.7 per 100,000 person-years in women compared to 0.40 per 100,000 person-years in men. The risk of breast cancer for men is approximately 1 in 1,000 throughout life. Additionally, women are diagnosed at a younger median age (61.7 years) than men (69.6 years), highlighting significant differences in incidence and age of diagnosis between the sexes.

**Table (4) Frequency and percentage of sample members according to Age groups.**

Age group	Frequency	Percent
13-29	208	%7.1
30-46	1159	%39.6
47-63	1185	%40.5
64-80	299	%10.2
≤81	73	2.5%
Total	2924	100%

The data presented in table (5) illustrates the distribution of breast cancer incidences with particular regard to various diagnostic categories; this comprehensive dataset has been systematically categorized into three distinct types of diagnoses. Among these categories, the most substantial occurrence was noted in the bilateral breast cancer cases, which amounted to a remarkable total of 1,145 instances, constituting 39.2% of the overall recorded cases, thereby highlighting its prominence within the dataset. This was closely followed by the diagnosis of the right breast lump, which accounted for a significant 892 cases, representing 30.5% of the total, thus indicating a noteworthy prevalence of this particular type of diagnosis. In addition to these findings, the left breast mass diagnosis recorded a total of 887 cases, which corresponds to 30.3% of the overall cases, further contributing to the understanding of the distribution of breast cancer incidences. Collectively, these statistics derive from a comprehensive total of 2,942 cases, which serves as the foundational dataset for this analysis. Consequently, the intricate details of these figures provide valuable insights into the varying prevalence of breast cancer diagnoses, underscoring the necessity for ongoing research in this critical area of public health. Breast cancer (BC) incidence varies significantly across different age groups and regions globally. The disease is the most frequently diagnosed cancer among women worldwide, with notable differences in incidence and mortality rates influenced by factors such as age, geographic location, and socioeconomic status. The incidence of breast cancer is increasing globally, with variations in trends observed across different age groups and regions. This overview will explore the incidence of breast cancer among different age groups and its global variation. Our results are in agreement with those of **Safiri et al (2022)** who concluded that, In the year 2019, the frequency of incidence cases exhibited an upward trend correlated with the aging of the population, attaining its zenith within the 45–49 age cohort, followed by a decline in subsequent age brackets. The incidence rate per 100,000 females demonstrated a steady increase from younger age groups into older demographics, with the exception of the 70–74 age cohort, which experienced a reduction, prior to a resurgence that culminated in a peak within the 80–84 age group, before once again declining. Furthermore, **Priyadarshini and Panda, (2024)** reported that, the overall incidence of breast cancer increased significantly from 1990 to 2021, with an average annual percent change (AAPC) of 1.6%. The 15–49 years' age group experienced the highest increase (AAPC: 1.3%), while the 70+ years group showed the lowest increase (AAPC: 0.2%). This trend indicates a rising incidence across all age groups globally, particularly among younger women, highlighting the need for targeted public health interventions and enhanced screening practices. This finding also supported our study.

**Table (5) Frequency and percentage of sample members according to diagnosis.**

Diagnosis	Frequency	Percent
RT.Breast lump	892	%30.5
LT.BREAST MASS	887	%30.3
B/L Ca breast	1145	%39.2
Total	2924	100%

The data presented in table (6) provides an extensive overview of the distribution of breast cancer incidence, particularly in relation to both diagnosis types and various age groups, wherein the recorded cases have been systematically categorized into three distinct types of diagnosis and five specific age brackets. Notably, the highest prevalence of RT Breast lump was astonishingly observed within the age group ranging from 30 to 46 years, where a total of 364 cases were documented, accounting for an impressive 40.8% of the total instances reported. Conversely, the diagnosis of LT BREAST MASS exhibited its peak prevalence within the same age demographic of 30 to 46 years, with an equally significant tally of 364 cases, representing 41.0% of the total breast cancer cases analyzed. Meanwhile, the diagnosis of B/L Ca breast demonstrated a marked increase in occurrence, with its highest frequency recorded within the older age group of 47 to 63 years, where a total of 511 cases were identified, constituting 44.6% of the overall cases derived from a grand total of 2,942 cases examined in this study. Bilateral breast carcinoma (B/L Ca breast) presents unique challenges in treatment options and patient outcomes. synchronous carcinoma is associated with worse survival rates (63.3% at 5 years) compared to metachronous carcinoma (94.6% at 5 years) and unilateral carcinoma (85.9% at 5 years). The Chi-square analysis revealed a highly statistically significant correlation between age categories and the classification of breast conditions ( $\chi^2 = 47.974$ ,  $p < 0.001$ ). This suggests that the prevalence of right breast neoplasms, left breast tumors, and bilateral breast malignancies exhibits notable variation across various age strata and cannot be ascribed to random fluctuations. Consequently, age emerges as a critical determinant affecting the epidemiological pattern of breast diseases, with distinct conditions exhibiting unique age-dependent distributions. The risk of developing

contralateral carcinoma is 0.9% per year, emphasizing the need for tailored follow-up and preventive strategies to improve outcomes for patients with bilateral disease (Vuoto *et al.*, 2010).

**Table (6) Types of diagnostic incidence, respect to age groups.**

Age group	RT.Breast lamp		LT.BREST MASS		B/L Ca breast	
	Frequency	Percent	Frequency	Percent	Frequency	Percent
13-29	89	10%	78	8.8%	41	3.6%
30-46	364	40.8%	364	41%	431	37.6%
47-63	340	38.1%	334	37.7%	511	44.6%
64-80	78	8.7%	92	10.4%	129	11.3%
≤81	21	2.4%	19	2.1%	33	2.9%
Total	892	100%	887	100%	1145	100%
$X^2 = 47.974$				Sig=0.000		

The empirical data delineated in table (7) meticulously illustrates the distribution of breast cancer incidence, taking into account both the year of the survey and the various age cohorts that were studied, with the documented cases being systematically categorized into a decade-long period of survey and segmented into five distinct age groups. It is noteworthy that the age group of individuals ranging from 13 - 29 years witnessed the highest recorded incidence rate in the year 2015, with an alarming prevalence rate of 22.6%, thus highlighting a significant concern for this particular demographic. Conversely, for the age group spanning 30 to 46 years, the peak incidence was observed in the year 2024, where a total of 144 cases were reported, translating to a prevalence rate of 12.4%, which underscores the rising trends of breast cancer within this middle-aged cohort. Furthermore, it is of particular interest to note that among the individuals aged 47 to 63 years, the highest frequency of cases was also registered in 2024, with a substantial count of 200 cases, resulting in a notable prevalence rate of 16.9%, thereby indicating a critical area of focus for healthcare interventions. Additionally, for the older demographic aged between 64 and 80 years, the most significant concentration of breast cancer cases was documented in the same year, 2024, with a total of 51 cases, reflecting a prevalence rate of 17.1%, which merits further investigation into the risk factors affecting this age group. Lastly, the age group categorized as 81 years and older recorded its peak incidence in 2016, where 12 cases were noted, culminating in a prevalence rate of 16.4%, thereby highlighting the imperative need for targeted screening and preventive measures within this elderly population. The Chi-square test demonstrated a highly statistically significant correlation between the distribution of years and age groups ( $\chi^2 = 123.075$ ,  $p < 0.001$ ). This finding suggests that the distribution of cases among various age groups has undergone substantial alterations over time, which cannot be attributed to random chance. In summary, these results indicate a temporal evolution in age demographics, with a notable increase in representation within the middle and older age cohorts (30–63 and above) during more recent years. prognosis for bilateral simultaneous breast cancer is relatively poor compared to unilateral disease and bilateral nonsimultaneous disease. The presence of axillary metastases significantly influences outcomes, with a 10-year survival rate of only 5.4% for those with metastases, compared to 44.4% for those without. Therefore, the presence of masses in both breasts adversely affects treatment success, emphasizing the need for careful evaluation and management in such cases (Carroll and Shields, 1955). Furthermore, occurrence of bilateral breast cancer does not significantly impact overall survival rates, with 10-year survival at 56% for bilateral cases compared to 54% for unilateral cases. However, local failures and metastases were more frequent in bilateral patients, with local failure rates of 19.4% for the first tumor and 11.1% for the second. Therefore, while survival rates are similar, the likelihood of successful treatment outcomes may be affected by increased local failures in bilateral cases (Mose *et al.*, 1997). Our results are on line with those of Freitas-Junior *et al.*, 2010 who concluded that, the breast cancer incidence in women under 39 in Goiânia from 1988 to 2003, comparing it to other age demographics. A retrospective analysis utilized data from the Population-based Cancer Registry of Goiânia, Brazil. Incidence rates were stratified by age: under 39, 40-59, and 60 and over. Average annual percentage changes (AAPCs) were computed using Poisson regression for each age cohort. A total of 3,310 new breast cancer cases were documented during this time frame. The standardized incidence for women under 39 rose from 2.89/100,000 in 1988 to 6.37/100,000 in 2003 ( $R^2 = 0.52$ ;  $p < 0.003$ ). For the 40 to 59 age group, incidence increased from 14.39/100,000 in 1988 to 41.70/100,000 in 2003 ( $R^2 = 0.85$ ;  $p < 0.001$ ). In the 60 and over cohort, incidence increased from 17.62/100,000 to 28.49/100,000 during the same period ( $R^2 = 0.67$ ;  $p < 0.001$ ). The AAPCs were calculated at 5.22%, 5.53%, and 4.54% for the respective age groups. The findings indicate a significant rise in breast cancer incidence among young women in Goiânia, paralleling trends observed in older populations.

**Table (7) Breast cancer distribution of incidence respect to the year of survey and age groups**

	13-29		30-46		47-63		64-80		≤81	
	Frequency	Percent	Frequency	Percent	Frequency	Percent	Frequency	Percent	Frequency	Percent
2015	47	22.6%	144	12.4%	100	8.4%	33	11%	11	15.1%
2016	34	16.3%	114	9.8%	86	7.3%	20	6.7%	12	16.4%
2017	20	9.6%	85	7.3%	77	6.5%	21	7%	03	4.1%
2018	31	14.9%	109	9.4%	93	7.8%	26	8.7%	08	11%
2019	13	6.3%	96	8.3%	88	7.4%	24	8%	04	5.5%
2020	12	5.8%	112	9.7%	114	9.6%	24	8%	08	11%
2021	15	7.2%	110	9.5%	144	12.2%	31	10.4%	08	11%
2022	14	6.7%	142	12.3%	147	12.4%	33	11%	07	9.6%
2023	11	5.3%	91	7.9%	136	11.5%	36	12%	04	5.5%
2024	11	5.3%	156	13.5%	200	16.9%	51	17.1%	8	11%
Total	208	100%	1159	100%	1185	100%	299	100%	73	100%
X <sup>2</sup> =123.075						Sig=0.000				

The data presented in Table 8 serves to elucidate the distribution of breast cancer incidence by taking into consideration the year in which the survey was conducted as well as the gender of the individuals, wherein the documented cases have been systematically categorized across a span of ten years and segregated into two distinct sex-based groups. Notably, the year 2021 witnessed the peak incidence among males, with a recorded total of 14 cases, which equates to 4.5% of the male population, while in stark contrast, the lowest incidence was documented in the year 2022, during which only 4 cases, representing a mere 1.2%, were recorded. Conversely, in the female demographic, the year 2022 marked the highest incidence of breast cancer, with a staggering total of 339 cases, accounting for an overwhelming 98.8% of the female cohort, whereas the year 2015 represented the nadir of recorded cases, with only 321 instances, which corresponds to 95.8% of the female population surveyed during that time frame. This detailed exploration of breast cancer incidence across both genders and over the specified years underscores the significance of temporal and sex-based variations in the prevalence of this critical health concern, warranting further investigation and analysis to better understand the underlying factors contributing to these disparities in incidence rates. The Chi-square test showed no statistically significant association between year and gender distribution ( $\chi^2 = 15.294$ ,  $p = 0.08$ ). Since the p-value is greater than 0.05, the variation in male and female cases across the years is not statistically significant and may be due to chance. Overall, this indicates that the gender distribution remained relatively stable over time, with females consistently representing the vast majority of cases.

The Global Burden of Disease 2017 database provides incidence data for breast cancer across genders. Temporal trends in breast cancer incidence were quantified using average annual percentage change. The newly diagnosed female breast cancer (FBC) cases rose from 870.2 thousand in 1990 to 1937.6 thousand in 2017, with a significant age-standardized incidence rate (ASR) increase from 39.2/100,000 to 45.9/100,000. A significant increase in FBC-ASR was observed in 166 countries, predominantly in developing nations. Conversely, a decline in incidence was noted in several developed countries, including the USA and the UK. Male breast cancer (MBC), a rare carcinoma, exhibited no distinct geographical clustering globally. The number of newly diagnosed MBC cases increased from 8.5 thousand in 1990 to 23.1 thousand in 2017, with a significant ASR rise from 0.46/100,000 to 0.61/100,000. A significant upward trend in MBC-ASR was identified in 123 countries. **(Chen *et al.*, 2020).** The incidence of breast cancer is on the rise in Africa. A latent mixture model identified five clusters as optimal based on fit indices, with linear growth trajectories assigned to each. Nigeria exhibited a unique negative slope cluster, reflecting a decline in breast cancer rates, while Seychelles demonstrated a significant increase. Thirty-one countries were classified in a cluster with a slope of 0.08, suggesting stable breast cancer incidence over time. Cluster 3, comprising Algeria, Angola, Botswana, Central African Republic, Cote d'Ivoire, Equatorial Guinea, Lesotho, Libya, Namibia, Somalia, Sudan, Swaziland, Uganda, and Zimbabwe, displayed a gradual increase in incidence, whereas cluster 2, including Gabon, Mauritius, Morocco, South Africa, Tunisia, and Congo, indicated a moderate rise. **(Saberian *et al.*, 2021).**

**Table (8) Breast cancer distribution of incidence respect to the year of survey and sex.**

Year	Male		Female		Total
	Frequency	Percent	Frequency	Percent	
2015	14	4.2%	321	95.8%	335
2016	07	2.6%	259	97.4%	266
2017	06	2.9%	200	97.1%	206
2018	07	2.6%	260	97.4%	267
2019	04	1.8%	221	98.2%	225
2020	06	2.2%	264	97.8%	270
2021	14	4.5%	294	95.5%	308
2022	04	1.2%	339	98.8%	343
2023	07	2.5%	271	97.5%	278
2024	05	1.2	421	98.8%	426
X <sup>2</sup> = 15.294			NS.=0.08		

The data meticulously delineated in Table (9) serves to elucidate the distribution of breast cancer incidence, which is specifically contextualized with reference to the year during which both the survey was executed and the diagnosis was established; the documented instances of breast cancer have been systematically classified into ten-year intervals of survey data and are further differentiated into three distinct categories of breast cancer. Notably, the year 2016 is distinguished as the year in which the highest prevalence of right-sided breast tumors was recorded, with a total of 122 cases, corresponding to a percentage of 13.7% of the aggregate documented incidences. Conversely, it is imperative to underscore that the year 2015 experienced the zenith in recorded instances of left-sided breast masses, where an impressive total of 154 cases was identified, representing 17.4% of the comprehensive breast cancer data amassed during that period. Furthermore, in a remarkable development, the year 2024 is anticipated to manifest the highest recorded incidence of bilateral breast cancer cases, with a projected total of 300 cases, thereby constituting a significant 26.2% of the overarching incidence statistics. This exhaustive analysis of data not only furnishes critical insights into the temporal trends associated with breast cancer incidences but also accentuates the significance of longitudinal studies in comprehending the epidemiological patterns of this ailment. The Chi-square test demonstrated a highly statistically significant association between year and type of breast condition ( $\chi^2 = 621.559$ ,  $p < 0.001$ ). This indicates that the distribution of right breast lumps, left breast masses, and bilateral breast cancer changed significantly over time and is not due to chance. Furthermore, the positive correlation ( $R = 0.378^{**}$ ) suggests a moderate relationship, indicating a notable temporal shift in disease patterns, particularly with an increasing trend in bilateral breast cancer in recent years. The incidence of female breast cancer has been increasing globally, with significant rises observed in developing countries. Between 1990 and 2017, the age-standardized incidence rate (ASR) for females increased from 39.2 to 45.9 per 100,000, with 166 countries showing significant increases. The ASR for males rose from 0.46 to 0.61 per 100,000, with 123 countries showing significant increases (Chen *et al.*, 2020). In the United States, breast cancer incidence rates increased by 0.3% per year from 2004 to 2018 (Bazzi *et al.*, 2023). In the UK, the incidence rate for males was 1.16 per 100,000 person-years from 2000 to 2021 (Barclay *et al.*, 2023).

**Table (9) Breast cancer distribution of incidence respect to the year of survey and diagnosis**

Year	RT.Breast lamp		LT.BREAST MASS		B/L Ca breast	
	Frequency	Percent	Frequency	Percent	Frequency	Percent
2015	121	13.6%	154	17.4%	60	5.2%
2016	122	13.7%	117	13.2%	27	2.4%
2017	105	11.8%	81	9.1%	20	1.7%
2018	110	12.3%	111	12.5%	46	4%
2019	75	8.4%	71	8%	79	6.9%
2020	89	10.0%	96	10.8%	85	7.4%
2021	81	9.1%	81	9.1%	146	12.8%
2022	74	8.3%	62	7%	207	18.1%
2023	58	6.5%	45	5.1%	175	15.3%
2024	57	6.4%	69	7.8	300	26.2%
X <sup>2</sup> =621.559			Sig=0.000		R=0.378**	

**Conclusion:**

The incidence of breast cancer has exhibited a distinctly upward trajectory throughout the duration of the study, illustrating significant fluctuations that correlate with various demographic factors such as age, sex, geographical region, and the type of diagnostic categorization employed to identify the disease. The overwhelming prevalence of breast cancer cases among women of middle age, coupled with an alarming increase in the burden of the disease in more recent years, underscores the pressing necessity for the enhancement and fortification of screening initiatives, tailored interventions that are specific to different regions, and the implementation of effective early detection strategies aimed at mitigating the impact of this formidable disease and ultimately improving patient outcomes. It is crucial to recognize that addressing these disparities and challenges not only requires a comprehensive understanding of the epidemiological trends but also calls for a concerted effort to develop and promote targeted health policies that can effectively respond to the evolving landscape of breast cancer incidence across diverse populations.

---

### Compliance with ethical standards

#### *Disclosure of conflict of interest*

The author(s) declare that they have no conflict of interest.

---

### References

- Abousahmeen, A., Ben Saud, M. A., Elrais, S., Kashbour, M., Abuhlaiga, M., AL-Aqmar, D. M., and AL-Shareef, J. M. (2023).** Molecular subtypes and clinicopathological features of breast cancer in Libya: a first glance. *Therapeutic Radiology and Oncology*. <https://doi.org/10.21037/tro-23-1>.
- Barclay, N. L., Burn, E., Delmestri, A., Duarte-Salles, T., Golozar, A., Man, W. D., Tan, E. H., Tietzova, I., Prieto-Alhambra, D., & Newby, D. (2023).** Incidence, prevalence, and survival of breast cancer in the United Kingdom from 2000-2021: a population-based cohort study. <https://doi.org/10.1101/2023.11.29.23299179>
- Bazzi, T., Al-Husseini, M. J., Saravolatz, L. D., & Kafri, Z. (2023).** Trends in Breast Cancer Incidence and Mortality in the United States From 2004-2018: A Surveillance, Epidemiology, and End Results (SEER)-Based Study. *Cureus*, 15. <https://doi.org/10.7759/cureus.37982>
- Carroll, W. W., & Shields, T. W. (1955).** Bilateral simultaneous breast cancer. *A.M.A. Archives of Surgery*, 70(5), 672–679. <https://doi.org/10.1001/ARCHSURG.1955.01270110044007>
- Chen, Z., Xu, L., Shi, W., Zeng, F., Zhuo, R., Hao, X., Hao, X., & Fan, P. (2020).** Trends of female and male breast cancer incidence at the global, regional, and national levels, 1990–2017. *Breast Cancer Research and Treatment*, 180(2), 481–490. <https://doi.org/10.1007/S10549-020-05561-1>
- El Mistiri M, Salati M, Marcheselli L, Attia A, Habil S, Alhomri F, et al (2015).** Cancer incidence, mortality, and survival in Eastern Libya: Updated report from the Benghazi cancer registry. *Ann Epidemiol* (2015) 25:564–8. doi: 10.1016/j.annepidem.2015.03.012
- El Mistiri, M., Verdecchia, A., Rashid, I., El Sahli, N., El Mangush, M., & Federico, M. (2007).** Cancer incidence in eastern Libya: the first report from the Benghazi Cancer Registry, 2003. *International Journal of Cancer*, 120(2), 392–397. <https://doi.org/10.1002/IJC.22273>
- Erashdi M, Al-Ani A, Mansour A and Al-Hussaini M (2023)** Libyan cancer patients at King Hussein Cancer Center for more than a decade, the current situation, and a future vision. *Front. Oncol.* 12:1025757. doi: 10.3389/fonc.2022.1025757
- Fitzmaurice C, Allen C, Barber RM, Barregard L, Bhutta ZA, Brenner H, et al (2017).** Global, regional, and national cancer incidence, mortality, years of life lost, years lived with disability, and disability-adjusted life-years for 32 cancer groups, 1990 to 2015: a systematic analysis for the global burden of disease study. *JAMA Oncol*;3(4):524–48.
- Forouzanfar MH, Foreman KJ, Delossantos AM, Lozano R, Lopez AD, Murray CJ, et al (2011).** Breast and cervical cancer in 187 countries between 1980 and 2010: a systematic analysis. *Lancet*. 2011;378(9801):1461–84.
- Igci, A., Tukenmez, M., & Ozkurt, E. (2016).** *Male Breast Cancer* (pp. 389–403). Springer, Cham. [https://doi.org/10.1007/978-3-319-26012-9\\_23](https://doi.org/10.1007/978-3-319-26012-9_23)
- Freitas-Junior, R., Freitas, N. M. A., Curado, M. P., Martins, E., Silva, C. M. B. e, Rahal, R. M. S., & Queiroz, G. S. (2010).** Incidence trend for breast cancer among young women in Goiânia, Brazil. *Sao Paulo Medical Journal*, 128(2), 81–84. <https://doi.org/10.1590/S1516-31802010000200007>
- Ismail, F., Elsayed, A. G., El-Garawani, I., & Abdelsameea, E. (2021).** Cancer incidence in the Tobruk area, eastern Libya: first results from Tobruk Medical Centre. *Epidemiology and Health*, 43. <https://doi.org/10.4178/EPIH.E2021050>
- Ji P, Gong Y, Jin M-L, Hu X, Di G-H and Shao Z-M (2020)** The Burden and Trends of Breast Cancer From 1990 to 2017 at the Global, Regional, and National Levels: Results From the Global Burden of Disease Study 2017. *Front. Oncol.* 10:650. doi: 10.3389/fonc.2020.00650.

- Mose, S., Adamietz, I. A., Thilmann, C., Saran, F., Bernhard, M., Pahnke, R., & Böttcher, H. D. (1997). Bilateral breast carcinoma versus unilateral disease. Review of 498 patients. *American Journal of Clinical Oncology*, 20(6), 541–545. <https://doi.org/10.1097/00000421-199712000-00001>
- Mukherjee, A. G., Gopalakrishnan, A. V., Jayaraj, R., Renu, K., Dey, A., Vellingiri, B., & Malik, T. (2023). The incidence of male breast cancer: from fiction to reality- correspondence. *International Journal of Surgery*. <https://doi.org/10.1097/JS9.0000000000000512>
- Priyadarshini, S., & Panda, K. B. (2024). Trends in age-specific incidence, mortality, and DALYs of female breast cancer from 1990 to 2021. *Aging Medicine*, 7(6), 770–780. <https://doi.org/10.1002/agm2.12382>
- Rocha, M. E., Santos, J., Oliveira, E. D. T. A. de, & Machado, G. C. (2024). Male breast cancer. *Mastology*, 101. <https://doi.org/10.29289/259453942024v34s1101>
- Saberian, M., Mehrabani, K., & Raeisi Shahraki, H. (2021). Clustering time trends of breast cancer incidence in Africa: a 27-year longitudinal study in 53 countries. *African Health Sciences*, 21(1), 47–53. <https://doi.org/10.4314/AHS.V21I1.8>
- Sharma, R. (2020). Breast cancer burden in Africa: evidence from GLOBOCAN 2018. *Journal of Public Health*. <https://doi.org/10.1093/PUBMED/FDAA099>
- Tas F and Keskin S (2012). Age-specific incidence ratios of breast cancer (BC) in Turkey: BC in older people is increasing. *Arch Gerontol Geriatr*. 55(1):112–5
- Vuoto, H. D., García, A., Candás, G., González Zimmermann, A., Uriburu, J. L., Isetta, J., Cogorno, L., Khoury, M., & Bernabó, O. L. (2010). Bilateral Breast Carcinoma: Clinical Characteristics and Its Impact on Survival. *Breast Journal*, 16(6), 625–632. <https://doi.org/10.1111/J.1524-4741.2010.00976.X>
- Zahedi, R., Molavi Vardanjani, H., Baneshi, M. R., Haghdoost, A. A., Afshar, R., Ershad Sarabi, R., Tavakoli, F., and Zolala, F. (2020). Incidence trend of breast Cancer in women of eastern Mediterranean region countries from 1998 to 2019: A systematic review and meta-analysis. *BMC Women's Health*, 20(1), 53. <https://doi.org/10.1186/S12905-020-00903-Z>
- Zarmouh A, Almalti A, Alzedam A, Hamad M, Elmughrabi H, Alnajjar L, et al (2022). Cancer incidence in the middle region of Libya: Data from the cancer epidemiology study in Misurata. *Cancer Rep (Hoboken)* (2022) 5:e1448. doi: 10.1002/cnr2.1448.

---

**Disclaimer/Publisher's Note:** The statements, opinions, and data contained in all publications are solely those of the individual author(s) and contributor(s) and not of AJAPAS and/or the editor(s). AJAPAS and/or the editor(s) disclaim responsibility for any injury to people or property resulting from any ideas, methods, instructions, or products referred to in the content.