



Frequency of Diabetes Mellitus in Females with Breast Cancer

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ARTICLE INFO

Keywords: Breast Cancer, Diabetes Mellitus, HbA1c

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Declaration

Authors' Contribution: All authors equally contributed to the study and approved the final manuscript.

Conflict of Interest: No conflict of interest.

Funding: No funding received by the authors.

Article History

Received: 24-01-2025 Revised: 12-04-2025
Accepted: 19-04-2025 Published: 28-05-2025

ABSTRACT

Objective: To determine the frequency of diabetes in patients with breast cancer. **Study Design:** Cross sectional study. **Place of study and duration:** Department of Medicine, Shaukat Khanum Memorial Cancer Hospital & Research Center Lahore for 6 months from 1st July 2024 to 31st December 2024. **Patients & Methodology:** One hundred and forty patients with breast cancer were enrolled through non-probability consecutive sampling technique. About 3ml blood sample was taken for assessment of HbA1c. Reports were assessed and if HbA1c > 6.5%, then diabetes was labeled. **Results:** In this study the mean age of the participants was 50.84 ± 8.61 years, with a mean BMI of 24.48 ± 3.94 kg/m² and 42 (30%) had hypertension. A family history of breast cancer was reported in 25 (17.9%) participants. among 140 breasts cancer females 27 (19.29%) were diabetics. Diabetes was present in 4 (5.9%) patients aged ≤50 years, while in 23 (31.9%) older than 50 years (p-value < 0.001). Diabetes was more common among overweight and obese patients 17 (26.6%) as compared to patients with normal BMI [10 (13.2%)] (p-value = 0.045). Diabetes was more common in patients with advanced stage cancer [11 (25.0%) in Stage II and 15 (26.8%) in stage III] than stage I [1 (2.5%), p-value = 0.006]. Diabetes was significantly more prevalent in hypertensive patients [24 (57.1%)] than non-hypertensive [3 (3.1%), p-value < 0.001]. Patients receiving chemo- as well as radiotherapy are at more risk of diabetes (100%) as compared to patients receiving only chemotherapy (6%) or radiotherapy (18.5%). **Conclusion:** On the findings of this study, we may conclude that frequency of diabetes mellitus is 19.29% in females presenting with breast cancer.

INTRODUCTION

Age, food, and obesity are significant risk factors for both type 2 diabetes mellitus and breast cancer, which are complicated, chronic, diverse, and multifactorial illnesses. Additionally, they have mutually inclusive phenotypic traits such hormonal abnormalities, hypoxic situations, and metabolic dysregulations brought on by hyperglycemia.^{1,2} Although there has long been conjecture regarding the connection between diabetes and cancer, the precise molecular basis of this relationship has not yet been thoroughly determined. Both illnesses are the world's greatest causes of mortality, and if their causal link is not addressed, it might become a serious global health issue.³

A prior diagnosis of diabetes is linked to a 37% risk of all-cause death among women with breast cancer, and women with diabetes are 23% more likely to acquire breast cancer than those without the disease.⁴ Furthermore, women with diabetes may have symptoms that are similar to those of breast cancer, and diabetes can make the symptoms of breast cancer worse.⁵

The choice of treatment for breast cancer is heavily

influenced by comorbid illnesses. Up to one-third of individuals with breast cancer have diabetes, making it one of the most common comorbidities in these patients.⁶ Preexisting diabetes has a known detrimental effect on breast cancer survival and may lead to less extensive cancer treatment.⁷ Worldwide, diabetes and breast cancer are both grave, potentially fatal illnesses. Diabetes has been linked in several studies to a variety of tumor types, although its relationship to breast cancer is still up for debate.⁸ Although a lot of study has been done in Pakistan in the past to determine the link between type 2 diabetes mellitus and breast cancer, there hasn't been much conclusive proof.⁹

The purpose of this study is to ascertain the prevalence of diabetes in breast cancer patients. Diabetes is a major cause of death and a risk factor for cancer, according to published research. However, there is conflicting information in the literature, and studies have shown that diabetes only occurs in 10–20% of instances of breast cancer. Thus, research must be done and data gathered for the local populace. The risk of diabetes mellitus has skyrocketed in the Pakistani population as a result of

lifestyle changes, which may potentially raise the incidence of breast cancer. As a result, it's critical to address the issue of diabetes in cancer patients and achieve scale for the local community. In order to lower the risk of breast cancer and undertake diabetic prevention measures in the future. This will enhance our practice and allow us to develop plans to shield patients from negative outcomes and the risks of breast cancer and diabetes. Determining the prevalence of diabetes in patients with breast cancer was the aim of this investigation.

METHODOLOGY

This was cross sectional study that was carried out at department of Medicine, Shaukat Khanum Memorial Cancer Hospital & Research Center Lahore. The duration of the study was 06 months from 1st July 2024 to 31st December 2024. Breast cancer was labelled in this study if presence of squamous cell carcinoma in breast, diagnosed on histopathology and patients having HbA1c >6.5% were labeled as diabetic. If patients died during the treatment, then mortality was labeled. Total 140 patients of breast cancer were enrolled in this study. The sample size was calculated by using percentage of diabetes as 10% in breast cancer patients taking 95% confidence interval and 5% margin of error. All the patients were included in this study by applying non-probability consecutive sampling technique. Females of age 25-65 years diagnosed with breast cancer with stage I-III receiving radiotherapy or chemotherapy were fall in the inclusion criteria. Patients with distant metastasis, type I diabetes, (on medical record), females with nodular involvement and patients with cancer of other organ and metastasized breast lesions (on medical record) were fall in exclusion criteria. After meeting the selection criteria 140 patients were included. Informed consent and demographic details like age, BMI, duration of cancer, lateral side, history of smoking (>5 pack years), hypertension (BP≥140/90mmHg), f/h breast cancer, breast feeding, oral contraceptive use, occupation, life style, stage of cancer and treatment receiving for cancer) was taken. After that 3 ml blood sample was taken from each patient and then sent to laboratory of the hospital for assessment of HbA1c. Reports were assessed and HBA1c level was noted if HBA1c>6.5%, then diabetes was labeled. Patients were managed as per standard protocol. All the data was recorded on a Performa. All the collected data was entered and analyzed on SPSS version 26. The qualitative variable like lateral side, history of smoking, hypertension, f/h breast cancer, breast feeding, oral contraceptive use, occupation, life style, stage of cancer, treatment receiving for cancer, and diabetes were presented as frequency and percentage. Data was stratified for age, BMI, duration of cancer, lateral side, history of smoking, hypertension, f/h breast cancer, breast feeding, oral contraceptive use, occupation, life style, stage of cancer and treatment receiving for cancer. Chi-square test was applied to compare diabetes in stratified groups. P-value≤0.05 was considered as significant.

RESULTS

In this study, a total of 140 females with breast cancer participated. The mean age of the participants was 50.84±8.61 years, with a mean BMI of 24.48±3.94 kg/m².

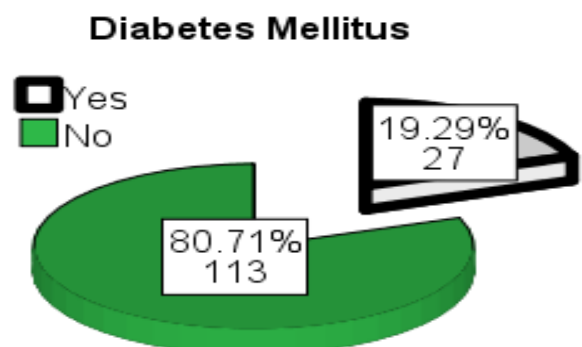
The average duration of cancer was 8.43±2.16 months, and the mean HbA1c level was 6.07±0.96. Among the 140 participants, cancer was found on the left lateral side in 73 (52.1%) females, while 67 (47.9%) had right-sided involvement. Stage I cancer was observed in 40 (28.6%) participants, whereas Stage II and III were noted in 44 (31.4%) and 56 (40%), respectively. According to the study, only 3 (2.1%) females were smokers and 42 (30%) had hypertension. A family history of breast cancer was reported in 25 (17.9%) participants, while 25 (17.9%) were using oral contraceptives. Regarding occupation, 98 (70%) participants were housewives and 42 (30%) was employed. An active lifestyle was observed in 33 (23.6%) females, whereas a sedentary lifestyle was noted in 107 (76.4%). In terms of treatment, the majority of participants, 74 (52.9%), were undergoing radiotherapy, followed by 53 (37.9%) receiving chemotherapy, while 13 (9.3%) were on a combination of both treatments. (Table 1)

Table 1
Descriptive Statistics of Demographic and Life Style Factors of the Patients

Variables	Frequency	Percent	
Lateral Side	Left	73	52.1
	Right	67	47.9
Stage of cancer	I	40	28.6
	II	44	31.4
	III	56	40.0
Smoking	Yes	3	2.1
	No	137	97.9
Hypertension	Yes	42	30.0
	No	98	70.0
FH of Breast Cancer	Yes	25	17.9
	No	115	82.1
Oral Contraceptives	Yes	25	17.9
	No	115	82.1
Occupation	HW	98	70.0
	Working	42	30.0
Life Style	Active	33	23.6
	Sedentary	107	76.4
	Chemotherapy	53	37.9
Treatment	Radiotherapy	74	52.9
	Combination	13	9.3
Age (Years)	50.84±8.61 (28.0-65.0)		
BMI (Kg/m ²)	24.48±3.94 (18.0-30.0)		
Duration of cancer (months)	8.43±2.16 (5.0-12.0)		
HbA1c	6.07±0.96 (4.70-8.99)		

In this study among 140 breasts cancer females 27(19.29%) were diabetics. (Fig 1)

Figure 1
Frequency Distribution of Presence of DM among Breast Cancer Females



Among patients aged ≤ 50 years, 4 (5.9%) had diabetes, whereas in those older than 50 years, 23 (31.9%) were diabetic (p -value < 0.001). Diabetes was observed in 10 (13.2%) patients with a BMI ≤ 25 kg/m², while in those with a BMI > 25 kg/m², it was noted in 17 (26.6%) patients (p -value = 0.045). Among patients with left lateral involvement, 10 (13.7%) had diabetes, whereas in those with right-sided involvement, 17 (25.4%) were diabetic (p -value = 0.080). Regarding cancer duration, diabetes was present in 13 (17.8%) patients with a duration of ≤ 8 months and in 14 (20.9%) patients with a duration of > 8 months (p -value = 0.644). Among those with stage I cancer, 1 (2.5%) had diabetes, while in patients with stage II and III, diabetes was found in 11 (25.0%) and 15 (26.8%) patients, respectively (p -value = 0.006). Diabetes was significantly more prevalent in hypertensive patients, with 24 (57.1%) affected, compared to only 3 (3.1%) in the non-hypertensive group (p -value < 0.001). A significant association was also observed in patients with a family history of breast cancer, where 10 (40%) had diabetes, compared to 17 (14.8%) in those without a family history (p -value = 0.004). Similarly, the use of oral contraceptives and occupation showed statistically significant differences. Among patients with an active lifestyle, 4 (12.1%) had diabetes, whereas in those with a sedentary lifestyle, it was observed in 23 (21.5%) (p -value = 0.233). Regarding treatment modalities, diabetes was noted in 3 (6.0%) patients receiving chemotherapy, 15 (18.5%) patients undergoing radiotherapy, and all 9 (100%) patients receiving a combination of treatments (p -value < 0.001). (Table 2)

Table 2
Comparison of Presence of Dm among Breast Cancer Females between Demographic, Clinical and Life Style Related Variables

Variables		DM		Total	p-value
		Yes	No		
Age Groups	≤ 50	4 (5.9%)	64 (94.1%)	68 (100%)	< 0.001
	> 50	23 (31.9%)	49 (68.1%)	72 (100%)	
BMI Groups	≤ 25	10 (13.2%)	66 (86.8%)	76 (100%)	0.045
	> 25	17 (26.6%)	47 (73.4%)	64 (100%)	
Lateral Side	Left	10 (13.7%)	63 (86.3%)	73 (100%)	0.080
	Right	17 (25.4%)	50 (74.6%)	67 (100%)	
Duration of cancer	≤ 8	13 (17.8%)	60 (82.2%)	73 (100%)	0.644
	> 8	14 (20.9%)	53 (79.1%)	67 (100%)	
Stage	I	1 (2.5%)	39 (97.5%)	40 (100%)	0.006
	II	11 (25.0%)	33 (75.0%)	44 (100%)	
	III	15 (26.8%)	41 (73.2%)	56 (100%)	
Smoking	Yes	2 (66.7%)	1 (33.3%)	3 (100%)	0.095
	No	25 (18.2%)	112 (81.8%)	137 (100%)	
Hypertension	Yes	24 (57.1%)	18 (42.9%)	42 (100%)	< 0.001
	No	3 (3.1%)	95 (96.9%)	98 (100%)	

FH of breast cancer	Yes	10 (40.0%)	15 (60.0%)	25 (100%)	0.004
	No	17 (14.8%)	98 (85.2%)	115 (100%)	
Oral Contraceptive	Yes	0 (0.0%)	25 (100%)	25 (100%)	0.004
	No	27 (23.5%)	88 (76.5%)	115 (100%)	
Occupation	HW	14 (14.3%)	84 (85.7%)	98 (100%)	0.022
	Working	13 (31.0%)	29 (69.0%)	42 (100%)	
Life Style	Active	4 (12.1%)	29 (87.9%)	33 (100%)	0.233
	Sedentary	23 (21.5%)	84 (78.5%)	107 (100%)	
Treatment Taken	Chemo	3 (6.0%)	47 (94.0%)	50 (100%)	< 0.001
	Radio	15 (18.5%)	66 (81.5%)	81 (100%)	
	Combination	9 (100%)	0 (0.0%)	9 (100%)	

DISCUSSION

Globally, diabetes mellitus is becoming more and more common. According to estimates, 463 million persons between the ages of 20 and 79 had diabetes in 2019, and that figure is expected to rise significantly over the next several decades. There are two main disease mechanisms that lead to diabetes. Approximately 90% of instances of diabetes worldwide are caused by type 2 diabetes mellitus (T2D). It is typified by reduced insulin release and/or diminished hepatic and extrahepatic insulin sensitivity. The hallmark of type 1 diabetes mellitus (T1D) is the autoimmune destruction of pancreatic β cells that produce insulin, which leads to insufficient insulin production. It is conceivable that diabetes-related metabolic diseases, hormonal predisposing factors, and its management might influence cancer risk^{10, 11}.

Of the 140 breast cancer patients in our research, 27 (19.29%) had diabetes. More than 7% of persons in developed nations suffer from type 2 diabetes, and up to 10% to 20% of patients with breast cancer also have the illness. Obesity and advanced age are major risk factors for type 2 diabetes, which is also a risk factor for breast cancer.¹² In comparison to women without diabetes, 15% of women with diabetes had a higher chance of developing an advanced stage of breast cancer, according to studies including 38,000 women.¹³ According to other research, those with diabetes had a 20% higher chance of developing breast cancer than people without the disease.^{14, 15} According to one study by Nasab et al., the prevalence of diabetes was 12.7% among patients with breast cancer. Notably, the median five-year survival was 13 and the mean was 9.95. The survival rate for individuals with and without diabetes did not differ significantly (95% CI: 0.431-1.334; hazard ratio [HR]: 0.758; P=0.34). Patients on metformin as part of their treatment regimen had longer survival times (95% CI: 0.226-0.950; HR: 0.5; P=0.04)¹⁶.

Xiong et al., showed that there was no overall correlation between breast cancer risk and diabetes (aHR = 1.02, 95% CI = 0.92–1.14). Women with T1D had a greater risk of breast cancer than women without diabetes when the diabetes subtype was taken into consideration (aHR = 1.52, 95% CI = 1.03–2.23). Overall, T2D was not linked to

breast cancer risk (aHR = 1.00, 95% CI = 0.90–1.12). However, the brief period after a T2D diagnosis was associated with a markedly elevated incidence of breast cancer¹⁷.

Ren et al.,¹⁸ comprised seventeen investigations, compared patients without diabetes, breast cancer patients with diabetes had a pooled adjusted HR of 1.28 (95% CI 1.09–1.50) for DFS and 1.51 (95% CI 1.34–1.70) for OS, according to a meta-analysis. Patients with and without diabetes did not, however, vary substantially in RFP (HR 1.42; 95% CI 0.90–2.23). According to this meta-analysis, individuals with breast cancer who already had diabetes had a 28% shorter DFS and a 51% shorter overall survival duration than their counterparts without diabetes¹⁸. Ferroni et al., found a strong association between insulin and illness stage as a poor prognostic

factor that may lower the survival rate, which is consistent with the results of our investigation¹⁹. According to recent estimates, women in Europe have a 9.1% prevalence of diabetes and a 9.7% lifetime risk of breast cancer²⁰.

CONCLUSION

On the findings of this study, we may conclude that frequency of diabetes mellitus is 19.29% in females presenting with breast cancer. Now in future, we will screen patients for prevention and management of diabetes to lessen down the hyperglycemic levels that would deteriorate the condition of cancer patients. This will enhance our practice and allow us to develop plans to shield patients from negative outcomes and the risks of breast cancer and diabetes.

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