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CORRELATION OF BODY MASS INDEX BMI AS A MODIFIABLE RISK FACTOR IN BREAST CANCER DISEASE

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ABSTRACT

Objectives: The aim of the following study is to analyze the role of body mass index (BMI) as a modifiable risk factor in breast cancer disease.

Materials and Methods: This case-control study was conducted in a cross-sectional pattern and data pertaining to all the admitted patients related to breast cancer (cases) and other breast diseases (controls) in the surgical department was collected from July 2024 to December 2024. A total of 252 (126 each for both cases and controls) patients were enrolled in this study either admitted through OPD or emergency. The variables that were included in the study are the following: name, age, contact number, date of admission, medical record number (MR number), type of breast disease and Body Mass index (BMI). Data was collected in a pre-designed proforma, added to Microsoft excel sheet and analyzed through SPSS software version 23.0. The

data was described in the form of description, charts and tables.
Results: For controls, 68 (54%) patients were overweight (BMI 25.0 to 29.9 kg/m²), and 19 (15.1%) patients were obese (BMI 30 and above kg/m²). For cases, 76 (60.3%) patients were overweight (BMI 25.0 to 29.9 kg/m²), and 28 (22.2%) patients were obese (BMI 30 and above kg/m²). Pearson chi square correlation showed positive association between weight gain and the risk of breast cancer progression (p-value <0.05).
Conclusion: Obesity is a potential risk factor for breast cancer in women; therefore, prevention of weight gain and onset of obesity should be avoided to postpone or prevent some kinds of breast cancer.

INTRODUCTION

Statistics and data collected from all over the world have proven on multiple occasions that breast cancer is the most common cancer among women, and it is also the leading cause of death globally. The World Health Organization reports that the number of deaths due to cancer is projected to increase by 45% from 2007 to 2030 (from 7.9 million to 11.5 million deaths)[1]. About 1/3 of the global burden is shared by India, the United States, and China[2]. In Asia, the highest number of cases have been reported in Philippines, where it is the leading cause of death in the country[3]. Pakistan also has one of the highest incidences among Asian countries. Between 1990 and 2019, Pakistan has seen a >300% increase in breast cancer incidence and a 200–300% increase in breast cancer-associated mortality[4]. Obesity has increased at an unprecedented rate in recent decades, and its effects on health are becoming more and more obvious. Nearly 600 million persons were obese (body mass index [BMI] ≥30 kg/m2) in 2014, out of the nearly 1.9 billion adults who were overweight (BMI], 25–29.9 kg/m2). The influence of obesity on cancer incidence, morbidity, and mortality is not well understood, despite the fact that the link between obesity and the risk of diabetes and coronary artery disease is well established. Inflammatory cytokines and mediators are produced by the adipose tissue of obese people, which fosters the invasion and spread of cancer[9]. Since breast cancer is the most prevalent type of cancer and the second most common cause of cancer-related deaths among women in developed nations, it is crucial to comprehend how obesity affects this illness for the sake of public health[10]. Given the increase in the incidence of breast cancer during the past decades, several studies have investigated the effects of variables on breast cancer, especially obesity[5]. Being overweight or obese increases the risk of developing several malignancies and chronic illnesses. By the World Health Organization's (WHO) standard, an individual is deemed obese if their body mass index (BMI) is greater than thirty. The connection between fat and the incidence of cancer and some chronic illnesses has been elucidate[6]. Numerous researchers have looked at the link between obesity or having a high body mass index and getting breast cancer in women, but the results of these studies are not always consistent[7]. The results of some studies show that obesity has a

protective role in developing cancer in the pre-menopause period, while it constitutes a risk factor in the post-menopause period[8].

MATERIALS AND METHODS

After taking the hospital ethical and research committee into confidence and maintaining all the rules and regulations related to conducting a clinical trial, this case-control study began in the surgical department of a tertiary care hospital in Peshawar Khyber Pakhtunkhwa. The study comprised of 126 patients, all females, and belonging to all ages which were added to the study through consecutive non-probability sampling. The study duration was 6 months and data from July 2024 to December 2024 was kept in perspective. Data was collected on a pre-designed Performa from the emergency, elective opd and the wards. The variables that were included in the study are the following: name, age, contact number, date of admission, medical record number (MR number), type of breast disease and the body mass index (calculated through weight and height). Patients with breast cancer were labelled as cases and those with all other breast related pathologies were labelled as controls. Inclusion criteria had patients related to breast cancer and all other breast pathologies with a BMI from under 18.5 kg/m² to 30 kg/m² or greater as the only significant risk factor, all other risk factors related to breast cancer were excluded. The Pearson chi square test was applied to test the correlation between the type of breast pathology and its association with body mass index. The data was entered from proformas into a Microsoft Excel sheet and then transferred to SPSS version 23.0 for analysis. The results were depicted in the form of descriptions, tables and charts.

RESULTS:

Out of 252 patients (126 each for both cases and controls) selected for this cross-sectional trial, the mean age of cases was 47.8 ± 11.6 and controls was 43.6 ± 12.7. The following average biomedical parameters were obtained for cases: 27.8 ± 3.3 (body mass index), 1.5 ± 0.1 meters (height) and 144.3 ± 12.3 pounds (weight). The following average biomedical parameters were obtained for controls: 26.5 ± 3.4 (body mass index), 1.55 ± 0.1 meters (height) and 138.1 ± 16.1 pounds (weight). Patients were grouped according to the world health organization (WHO) classification for body mass index (BMI). For controls: 2 (1.6%) patients were underweight (BMI < 18.5 kg/m²), 37 (29.4%) patients had normal weight (BMI 18.5 to 24.9 kg/m²), 68 (54%) patients were overweight (BMI 25.0 to 29.9 kg/m²) and 19 (15.1%) patients were obese (BMI 30 and above kg/m²). For cases: 22 (17.5%) patients had normal weight (BMI 18.5 to 24.9 kg/m²), 76 (60.3%) patients were overweight (BMI 25.0 to 29.9 kg/m²), and 28 (22.2%) patients were obese (BMI 30 and above kg/m²). Pearson chi square correlation showed positive association between weight gain and the risk of breast cancer progression (p-value <0.05) as compared to other breast diseases (p-value =0.994). Complete demographic details for various variables are shared in table 1. For cases and controls details are shared in table 2, table 3, bar chart 1 and bar chart 2.

Table 1: Demographic distribution for cases and controls

Variable	Frequency	Percentage

BMI (cases) 18.5 and under 18.6 to 24.9 25.0 to 29.9 30 and above	 0 22 76 28	 0 17.5 60.3 22.2
BMI (controls) 18.5 and under 18.6 to 24.9 25.0 to 29.9 30 and above	 2 37 68 19	 1.6 29.4 54 15.1
Variable	**Mean**	**Standard deviation**
Weight pounds (cases)	144.3	12.3
Weight in pounds (controls)	138.1	16.1
Height in meters(cases)	1.5	0.1
Height in meters (controls)	1.55	0.1

Table. 2 Type of disease (controls)

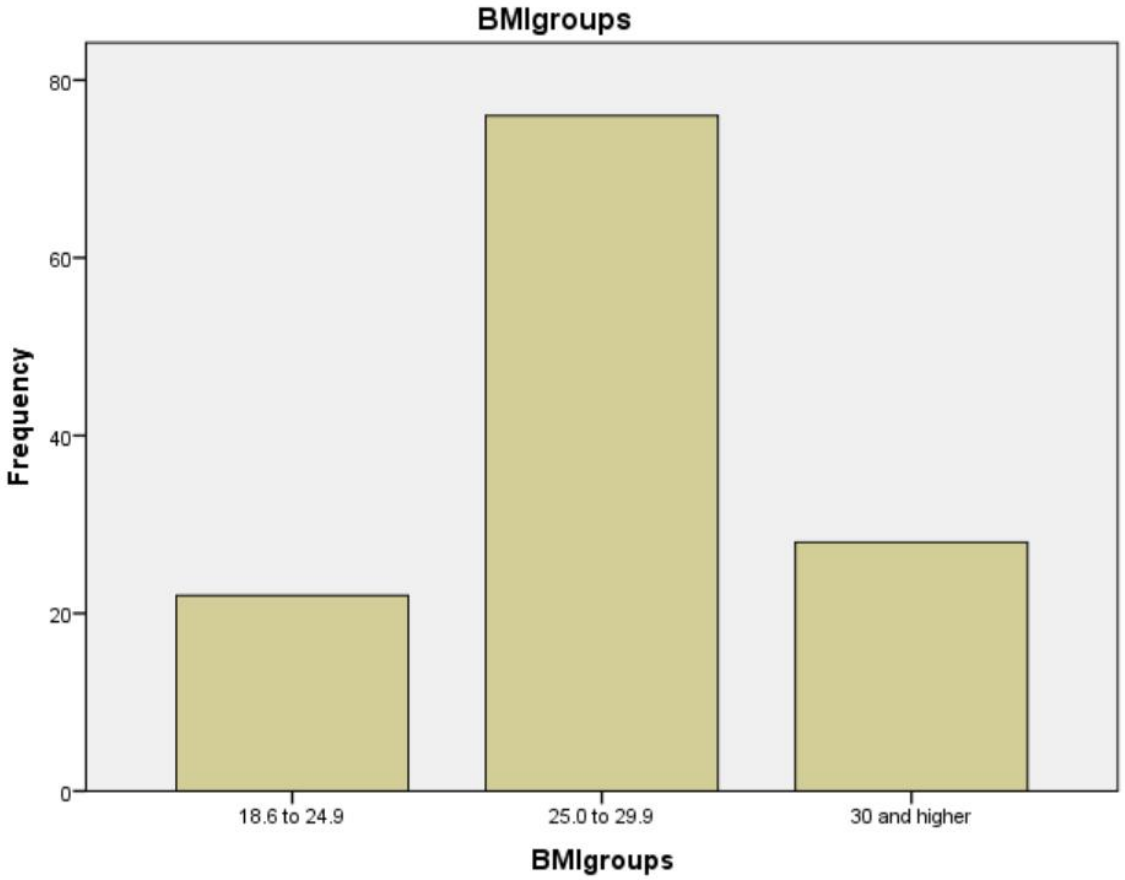
Type of disease (controls)			
Diseases	Frequency	Percentage	P-value
Fibroadenoma	12	9.5	0.94
Galactocele	5	4.0	
Left accessory breast	3	2.4	
Left breast abscess	17	13.5	
Left breast cyst	27	21.4	
Left duct ectasia	9	7.1	
Mammoplasty	1	.8	
Mastitis	4	3.2	
Post MRM DD	4	3.2	
Right accessory breast	2	1.6	
Right breast abscess	19	15.1	
Right breast cyst	18	14.3	
Right duct ectasia	5	4.0	
Total	126	100.0	

Table 3: Type of disease (cases)

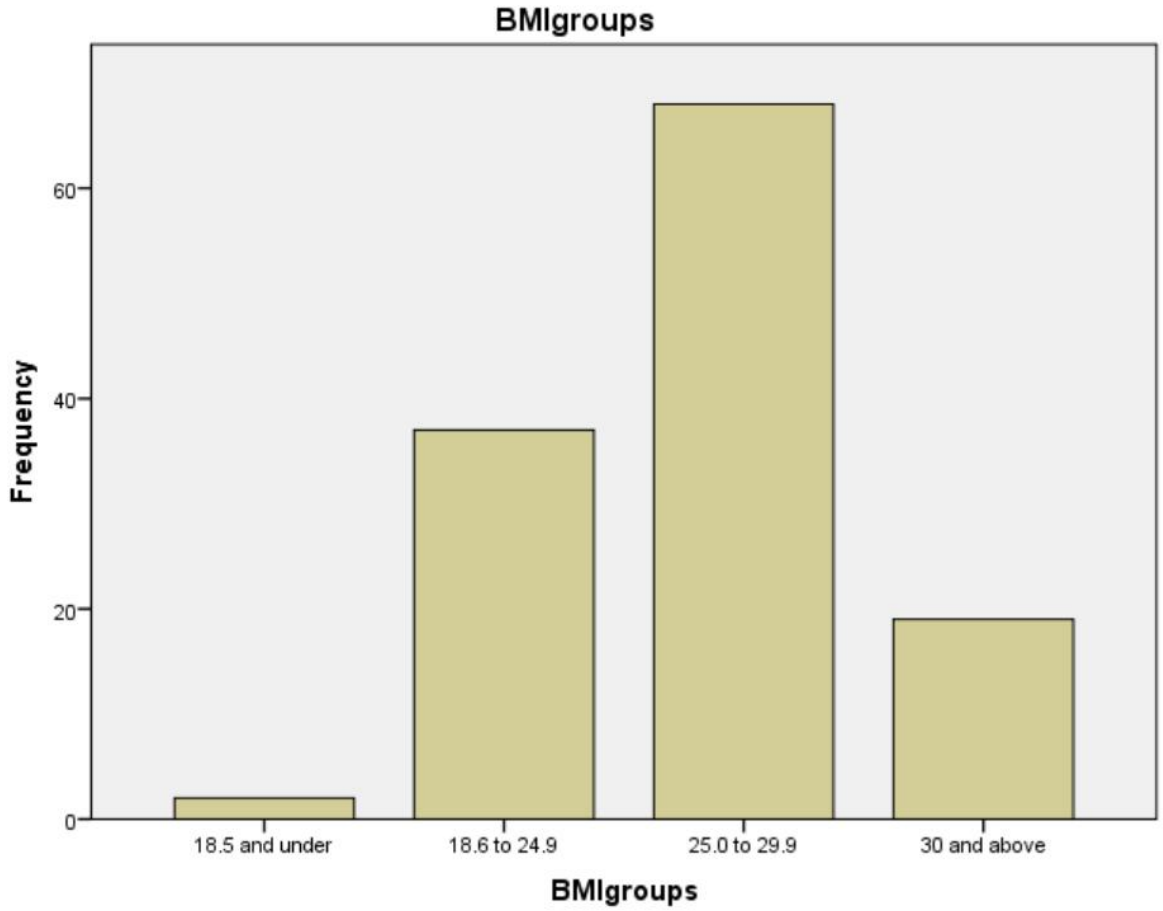
Type of disease (cases)			
Disease	Frequency	Percentage	p-value
Left breast carcinoma	72	57.1	0.05

Right breast carcinoma	54	42.9	
Total	126	100.0	

Bar chart 1: BMI groups for cases



Bar chart 2: BMI groups for controls



DISCUSSION:

To our knowledge, data on the effects of obesity on breast cancer in overweight women is scarce. From this, the present study was conducted to answer whether the association between obesity and breast cancer in women differs from women with a relatively normal stature. The findings of this study could have a significant impact on the health of women. In order to promote the best prognosis with weight maintenance following a breast cancer diagnosis, primary care physicians should start focusing health education on obesity as a risk factor[11]. Furthermore, due to the increasing prevalence of obesity globally, it is essential to prioritize the creation of safe and effective interventions that are both acceptable and accessible to all women in order to mitigate the impact of obesity on breast cancer. Out of 252 patients (126 each for both cases and controls) selected for this cross-sectional trial, the mean age of cases was 47.8 ± 11.6 and controls was 43.6 ± 12.7. This is similar to a study done in Karachi where the mean age was 48[12]. However, this contrasts with that of patients in the United States where the mean age at diagnosis has increased to 61 years[13] and another study has depicted 56 years as the mean age for diagnosis in

Asian patients[14]. This relatively lower mean age at diagnosis is alarming and highlights the importance of a well-organized screening initiative to quickly identify as many patients as possible as well as educate them on the risk factors that might further aggravate this disease.

In terms of body mass index BMI, for cases, 22 (17.5%) patients had normal weight (BMI 18.5 to 24.9 kg/m²), 76 (60.3%) patients were overweight (BMI 25.0 to 29.9 kg/m²), and 28 (22.2%) patients were obese (BMI 30 and above kg/m²) and for controls, 68 (54%) patients were overweight (BMI 25.0 to 29.9 kg/m²) and 19 (15.1%) patients were obese (BMI 30 and above kg/m²). Therefore, a relatively higher number of patients with breast cancer had more BMIs as compared to those with diseases other than breast cancer. A study by Gravena et.al[15] identified a risk of developing breast cancer of 1.50 (95% CI 1.06-2.13) and 1.56 (95% CI 1.11-2.21) among women with BMI ≥ 30 kg/m2 at the time of pre-diagnosis and in the recent measurement, respectively. Renehan and colleagues[16] showed breast cancer risk to be reduced by approximately 8% per 5 kg/m^2 BMI increase in premenopausal women [RR: 0.92; 95% CI: 0.88-0.97; p=0.001]. In contrast, the risk was increased in postmenopausal women [RR: 1.12; 95% CI: 1.08-1.16; p<0.0001]. An analysis[17] by revealed a significant 4.2-fold increased risk of breast cancer in underweight women versus women with obesity under 24 years, and a 1.9- to 2.5-fold increased risk in older patients. Preventing weight gain is essential for reducing the risk of serious diseases in contemporary society. Weight management can be achieved by enhancing physical activity and decreasing energy intake, particularly the consumption of high sugar foods[18]. Furthermore, the benefits of physical activity extend beyond weight management. It is beneficial to exercise or walk for 30 minutes every day, and to keep a calorie count. Obese people should try to alter their sedentary lifestyles[19]. Because estrogen cues drive the development of hormone-positive breast tumors in postmenopausal women, it is evident that weight loss and a concurrent fall in estrogen levels should produce a decrease in breast tumor formation[20].

CONCLUSION:

This study established that there is an association between obesity and breast cancer risk in overweight women. Obese women are at a high risk of developing hormone-sensitive tumors, because of high level of estrogen in serum as well as peripheral site generation of this hormone. Understanding the interaction and processes that link inflammation, obesity, and the risk of cancer is crucial not only for understanding the pathogenesis of breast cancer but, from the clinical point of view, targets for efficient therapies for patients. Thus, obesity is a potential risk factor for breast cancer in women; therefore, prevention of weight gain and onset of obesity should be avoided to postpone or prevent some kinds of breast cancer.

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DECLARATION OF PATIENT'S INTEREST:

Patient's consent was not required as patients were not physically enrolled in this study.

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There are no conflicts of interest.

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The authors confirm that there was no use of artificial intelligence (AI)-assisted technology for assisting in the writing or editing of the manuscript and no images were manipulated using AI.

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