OPEN ACCESS

Saudi Journal of Medical and Pharmaceutical Sciences
Abbreviated Key Title: Saudi J Med Pharm Sci
ISSN 2413-4929 (Print) | ISSN 2413-4910 (Online)
Scholars Middle East Publishers, Dubai, United Arab Emirates
Journal homepage: https://saudijournals.com

Original Research Article **Medical Oncology**

Associations of Body Mass Index with Molecular Sub Types, Clinical and Pathological Characteristics of Breast Cancer in Bangladeshi Women

Dr. Mehdi Faruk Proteek[1*], Prof. Dr. Nazrina Khatun[2], Dr. Beauty Saha[3], Dr. Nazma Azim[4], Dr. Syed Md. Ariful Islam[5], Dr. Narita Khurshid[1], Dr. Mohammad Rahmat Ullah Bhuiyan[6], Dr. Md. Rashedul Islam[7], Dr. Zakia Haque[8], Dr. Tasnim Binta Shahid[9], Dr. Mohammad Kamruzzaman Khan[10]

[1]MBBS, MD, Medical Oncology Specialist, Department of Medical Oncology, Evercare Hospital Dhaka, Bangladesh
[2]Professor and Head, Department of Medical Oncology, National Institute of Cancer Research and Hospital, Dhaka, Bangladesh
[3]MBBS, MD, Medical Oncology Registrar, Department of Radiotherapy, Mymensingh Medical College Hospital, Bangladesh
[4]MBBS, MD, Medical Oncology Programmer, National Institute of Cancer Research and Hospital, Dhaka, Bangladesh
[5]MBBS, MD, Medical Oncology, Medical Officer, Kurmitola General Hospital, Dhaka, Bangladesh
[6]MBBS, MD, Radiation Oncology, Emergency Medical Officer, 250 beded General Hospital, Brahmanbaria, Bangladesh
[7]MBBS, MD, Medical Oncology, Assistant Registrar, Department of Medical Oncology, Hospital, National Institute of Cancer Research and Hospital, Dhaka, Bangladesh
[8]MBBS, Resident, Medical Oncology, National Institute of Cancer Research and Hospital, Dhaka, Bangladesh
[9]MBBS, Post Graduate Student of Diploma in Child Health, Centre for Woman and Child Health (CWCH), Ashulia, Savar, Bangladesh
[10]MBBS, MPH, Associate Professor and Head, Department of Community Medicine, Mymensingh Medical College, Bangladesh

DOI: 10.36348/sjmps.2022.v08i08.005 | **Received:** 27.06.2022 | **Accepted:** 31.07.2022 | **Published:** 19.08.2022

***Corresponding author:** Dr. Mehdi Faruk Proteek
MBBS, MD, Medical Oncology Specialist, Department of Medical Oncology, Evercare Hospital Dhaka, Bangladesh

Abstract

Obesity is a major health hazard not only for developed countries but also for Bangladesh and it is an established risk factor of breast cancer. In our country there is a scarcity of studies on the associations of BMI and different features of breast tumour. This study was aimed to evaluate the associations of BMI with molecular sub-types, clinical and pathological characteristics of breast cancer in Bangladeshi women. This cross sectional descriptive type of observational study was conducted in National Institute of Cancer Research and Hospital (NICRH), Mohakhali, Dhaka from September, 2019 to August, 2020. A total of 90 patients with breast cancer were selected purposively according to inclusion and exclusion criteria. An informed consent was sought from the patient to take part is this study. Detail history taking thorough physical examination was done along with relevant investigations. Data were collected by semi structured questionnaire and analysis was done with the help of Statistical Package for Social Science (SPSS), version 21.0. Mean age of the respondents was 41.17 years with a standard deviation of ±8.79 and a range of 24-65 years. Of all, ninety percent patients were housewives and 52.2% belonged to upper middle socio-economic class. About 66.7% patients were pre-menopausal and 33.3% were post-menopausal. The mean BMI of respondents was 25.89(±4.67) kg/m2 and among them 51.1% were obese, 23.3% were overweight and 20.0% had normal weight. No association between BMI and vii molecular subtypes of breast cancer were noted ($p>0.05$). No association between BMI and hormone receptor status of breast cancer was found. Association with tumor size, axillary lymph nodes, tumor grade and lymphovascular space invasion were also not significant ($p>0.05$). No association between BMI and molecular subtypes, clinical and pathological features of breast cancer were noted both in pre and post-menopausal groups. This study found no association between BMI and different features of tumor, which could be attributed to small sample size, absence of control and a single centered study. However, further extensive study is recommended.

Keywords: Body mass index, Molecular sub-types, Clinical and pathological features, Breast cancer, Bangladeshi women.

INTRODUCTION

Breast cancer is the most common cancer among females and is one of the commonest causes of amongst women followed by carcinoma of the cervix with a rising incidence in young premenopausal women. The incidence of breast cancer was about 12,764 (19%) in 2018 & prevalence in five years was about 29,038 (35.19%) in Bangladeshi woman of all age group. Among top ten cancers age standardized

(world) incidence was 17% and mortality rate was 9.3% [1]. According to hospital cancer registry report 2014 of top ten cancers in female in NICRH, the incidence of breast cancer was about 1,363 (27.4%) [2]. Heterogeneity is the most characteristic feature of breast cancer, which is seen in many aspects of the patients from clinical features to pathological and racial or ethnic properties [3]. This makes the identification of risk factors for breast cancer more difficult and has been divided into Luminal, HER2 enriched and basal-like subtype, triple negative based on molecular profiling [4]. More recently, the genomic assays (oncotype DX, mammaprint, endopredict and Prosigna) are becoming a useful tool for defining the prognostic characteristics and in some cases for deciding the therapeutic strategy. However, in routine clinical practice, breast cancer subtype is commonly approximated using the surrogate immunohistochemistry (IHC) markers, estrogen receptor (ER), progesterone receptor (PR), human epidermal growth factor receptor 2(HER2) and Ki67 [5, 6]. It was revealed that increased body mass index (BMI) is a risk factor for breast cancer in postmenopausal women. It is associated with more aggressive tumour biology and a poor prognosis [7, 8]. There are few studies that have found high BMI to be 2 associated with a higher proliferation index, histological grade, a larger tumour size and a higher number of axillary node metastasis at the time of diagnosis. Some studies have also related a higher incidence of ER-positive breast cancer with BMI [9, 10]. However, it remains uncertain whether the same association is present in the Bangladeshi population which has different reproductive patterns compared to a western population and possibly a different subtype distribution as well. Moreover, the prevalence of obesity is not similar as compared to the western population [11].

This study was aimed to find any associations between BMI, tumour subtype and the breast cancer clinical and pathological features.

Breast cancer was the cause of 21% of total death in Bangladesh among women between 15 and 49 years of age [12]. It accounts for 69% of cancer death in women which is actually a hidden burden [13]. Obesity is also a major health hazard not only for developed countries but also for Bangladesh. Though breast cancer has strong association with increased BMI but its associations with different molecular sub types, clinical and pathological features of breast cancer in pre and postmenopausal patients is not clear yet. Different conflicting result found in different ethnic groups of people in western countries. So, the scenario in our country should be drowning. Such study has not been conducted in our country before and this study may help to understand breast cancer biology as well as to adopt preventive strategies against breast cancer. Furthermore, in future it might help to determine treatment modalities, duration and outcome of treatment of breast cancer.

METHODOLOGY

The cross-sectional descriptive type of observational study was carried out in National Institute of Cancer Research & Hospital (NICRH), Mohakhali, Dhaka, Bangladesh during the period of September, 2019 to August 2020. Data were collected from purposively selected 90 patients with breast cancer. Interview, clinical examinations and necessary investigations were done accordingly. An informed consent was sought from the patient to take part is this study. Data were checked for the incompleteness and inconsistency and managed accordingly. Data were analyzed by computer software, Statistical Package for Social Science (SPSS), version 21.0. Quantitative data were summarized by mean and standard deviation and qualitative data were summarized by percentage. Necessary bivariate analysis and Chi- square test was done. Ethical clearance was obtained from Institutional Review Board (IRB) of National Institute of Cancer Research and Hospital (NICRH), Mohakhali, Dhaka, Bangladesh (memo no. NICRH/Ethics/2020/15; Date: 24.02.2020).

RESULTS

This hospital-based Cross-sectional observational study was conducted in National Institute of Cancer Research and Hospital (NICRH), Mohakhali, Dhaka. Total 90 diagnosed case of breast cancer were included in the study. The main aim of the study was to see the association of BMI with molecular subtypes, clinical features, and pathological features of breast cancer among patients. The mean age of the breast cancer patients was 41.17±8.79 years, ranging from 24 and 65 years. Majority of the patients were aged between 31 – 40 years (47.0%) followed in decreasing order by 41 – 50 years (37.0%), >50 years (11%) and 21 – 30 years (5.0%) (Figure 1). Most of the patients had education below primary level (36.7%), followed in decreasing order by between primary & SSC (30.0%), HSC (15.6%) and graduate (11.1%). Among all 6.7% had no formal education. Out of 90 patients 90.0% were housewives, 7.8% were service holders and 2.2% were doing other jobs. Maximum respondents belonged to upper middle class (52.2%), followed in second by lower middle class (43.3%). Only 2.2% patient belonged to poor as well as upper class (each) (Figure 2).

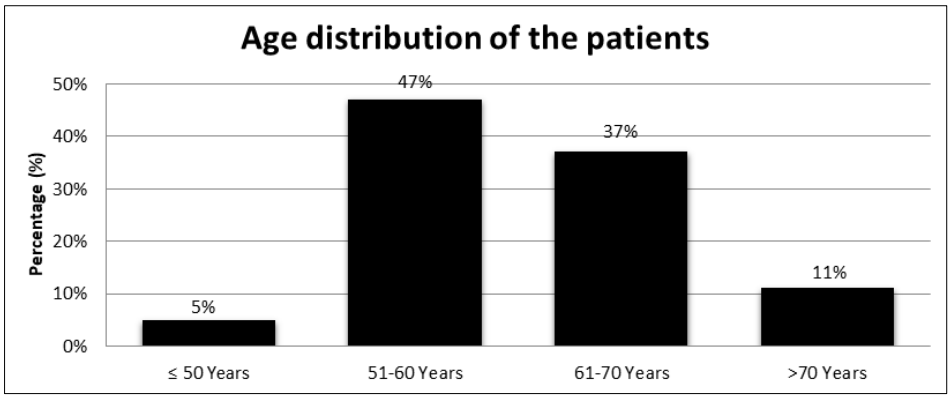

Figure 1: Distribution of participants according to their age (n=90)

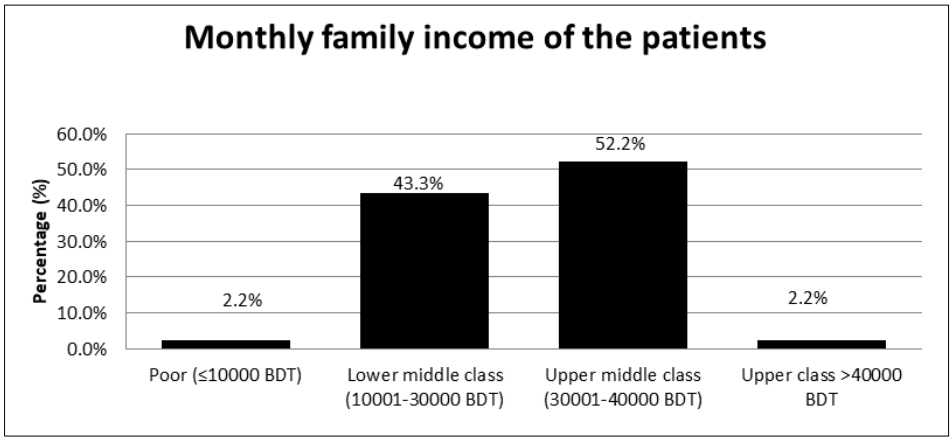

Figure 2: Distribution of participants according to their monthly family income (n=90)

Among the study subjects 97.8% were married and 2.2% were single (either of never married or separated); 66.7% were pre-menopausal and 33.3% were post-menopausal. The mean age of menarche was 12.99±0.76 years, average age of marriage was 17.85±3.39 years, and age at first child was 19.70±3.74 years. Among all, 91.1% were multipara. Among all 37.8% had history of taking oral contraceptive pill. The participants had an average BMI of 25.89±4.67 kg/m2, ranging from 15.37 to 38.24 years. More than half of the participants (51.1%) were obese (>25 kg/m2), 23.3% were overweight and 20.0% had normal weight (Table I). There was not any significant difference in BMI between premenopausal and post-menopausal women (p>0.05) (Table II). Most of the participants had carcinoma of right breast (68.9%). Average tumor size was 3.99±1.87 cm and 60% had a moderate tumor size (>2 to ≤5cm). Most of the participants had low grade tumor (68.9%). Involvement of axillary lymph node was present in 81.1%, lympho- vascular space invasion was present in 46.7% and perineural invasion was present in 45.6% (Table III).

Table I: Body Mass Index (BMI) characteristics of participants (n=90)

Body Mass Index (kg/m^2)	**Mean±SD**
Mean ±SD	25.89±4.67
Median	25.83
Range	15.37 – 38.24
Categories*	**N (%)**
Underweight (<18.5)	5 (5.6)
Normal (18.5 – 22.9)	18 (20.0)
Overweight (23 – 24.9)	21 (23.3)
Obese (≥25)	46 (51.1)

*According to Asian Criteria

Table II: Body Mass Index (BMI) of participants across menopausal history (n=90)

Body Mass Index (kg/m^2)	**Premenopausal (n=60) N (%)**	**Post-menopausal (n=30) N (%)**	**p value**
Mean ±SD	25.46 ±4.92	26.75 ±4.10	0.218
Categories*			
Underweight (<18.5)	4 (6.7)	1 (3.3)	0.207
Normal (18.5 – 22.9)	14 (23.3)	4 (13.3)	
Overweight (23 – 24.9)	12 (20.0)	9 (30.0)	
Obese (≥25)	30 (50.0)	16 (53.3)	

*According to Asian Criteria; p value determined by Student's t test and Fisher's exact test as appropriate

Table III: Clinical and pathological features of breast cancer among participants (n=90)

Feature	N (%)
Side of involvement	
Right	62 (68.9)
Left	28 (31.1)
Tumor size (cm)	
< 2	15 (16.7)
> 2 to ≤ 5	54 (60.0)
> 5	21 (23.3)
Mean±SD	3.99±1.87
Tumor grade	
Low	62 (68.9)
High	28 (31.1)
Involvement of axillary lymph node	
Present	73 (81.1)
Absent	17 (18.9)
Lymphovascular space invasion	
Present	42 (46.7)
Absent	48 (53.3)
Perineural invasion	
Present	41 (45.6)
Negative	49 (54.4)

Table IV: Hormone receptor status and molecular subtypes of breast cancer among participants (n=90)

Feature	N (%)
ER receptor*	
Positive	35 (38.9)
Negative	55 (61.1)
PR receptor*	
Positive	30 (33.3)
Negative	60 (66.7)
Her2*	
Positive	17 (18.9)
Negative	68 (75.6)
Equivocal	5 (5.6)
Molecular subtypes	
Basal like (TNBC)	45 (50)
Luminal (A & B)	36 (40.0)
Her2 receptor overexpressing	9 (10.0)

*Multiple Response

Among all, 38.9% were ER receptor positive, 33.3% were PR receptor positive and 17.9% were Her2 receptor positive. The most common molecular subtype was basal like (50%), followed in decreasing order by luminal (40.0%), and Her2 receptor overexpressing (10.0%) (Table IV). No association between BMI and molecular subtypes of breast cancer were noted. Patients of each type of cancer had a BMI in the obese range. Basal-like (TNBC), luminal (A and B), and her2recetpor overexpressing tumors had an average BMI (SD) of 25.95±4.21, 25.64±5.12, 26.50±5.96 and 26.20±2.21 kg/m2 respectively (Table V). No association between BMI and hormone receptor status of breast cancer was noted. Patients of each type of cancer had a BMI in the obese range. ER, PR and HER2 positive cancers had an average BMI of 25.66±5.19 kg/m2, 25.09±5.29 kg/m2 and 25.43±4.55 kg/m2 (Table VI).

Table V: Association of BMI with molecular sub-types of breast cancer (n=90)

	Molecular Subtypes			**p value**
Characteristics	**Basal like (TNBC) (n=45)**	**Luminal (A & B) (n=36)**	**Her2 receptor overexpressing (n=9)**	
BMI (mean±SD)	25.97±4.09	25.64±5.12	26.51±5.96	0.876*
BMI categories	**n(%)**	**n(%)**	**n(%)**	
Underweight	1 (2.2)	2 (5.6)	2 (22.2)	0.161**
Normal	9 (20.0)	9 (25.0)	0	
Overweight	9 (20.0)	10 (27.8)	2 (22.2)	
Obese	26 (57.8)	15 (41.7)	5 (55.6)	

p values were determined by one way *ANOVA and **Chi-square test

Table VI: Association of BMI with hormone receptor status of breast cancer (n=90)

Hormone receptor status		n	BMI (kg/m^2) Mean±SD	P value	Under weight N (%)	Normal N (%)	Overweight N (%)	Obese N (%)	p value***
ER	Positive	35	25.66±5.19		2 (5.7)	9 (25.7)	9 (25.7)	15 (42.9)	
	Negative	55	26.04±4.36	0.712*	3 (5.5)	9 (16.4)	12 (21.8)	31 (56.4)	0.606
PR	Positive	30	25.09±5.29		2 (6.7)	9 (30.0)	9 (30.0)	10 (33.3)	
	Negative	60	26.28±4.32	0.258*	3 (5.0)	9 (15.0)	12 (20.0)	36 (60.0)	0.112
HER2	Positive	17	25.43±4.55		2 (11.8)	3 (17.6)	5 (29.4)	7 (41.2)	
	Negative	68	26.16±4.62	0.528**	2 (2.9)	14 (20.6)	16 (23.5)	36 (52.9)	0.441
	Equivocal	5	23.89±6.26		1 (20.0)	1 (20.0)	0 (0.0)	3 (60.0)	

p values were determined by *Student's t test, **one way ANOVA and ***Chi-squared test

Table VII: Association of BMI with clinical features of breast cancer (n=90)

Characteristics		n	BMI (kg/m^2) Mean±SD	P value	Under weight N (%)	Normal N (%)	Overweight N (%)	Obese N (%)	p value***
Tumor size	≤ 2 cm	15	26.56±4.69	0.834**	0 (0.0)	3 (20.0)	5 (33.3)	7 (46.7)	
	2 – ≤5 cm	54	25.75±4.87		4 (7.4)	11 (20.4)	12 (22.2)	27 (50.0)	0.894
	> 5 cm	21	25.75±4.31		1 (4.8)	4 (19.0)	4 (19.0)	12 (57.1)	
Axillary lymph node involvement	Present	73	26.04±4.51	0.531*	3 (4.1)	12 (16.4)	19 (26.0)	39 (53.4)	0.138
	Absent	17	25.24±5.43		5(5.6)	18 (20.0)	21 (23.3)	46 (51.1)	

p values were determined by *Student's t test, **one way ANOVA and ***Chi-squared test

No association between BMI and tumor size and between BMI and axillary lymph nodes was noted. Patients of each type of cancer had a BMI in the obese range. Patients having a tumor size ≥ 5 cm had a mean BMI of 25.75±4.31 kg/m^2. Patients having axillary lymph nodes had a BMI of 26.04±.51 kg/m^2 (Table VII). No association between BMI and tumor grade and lympho-vascular space invasion among the participants. Patients of each pathologic type of cancer had a BMI in the obese range except high grade tumor (which again was in the overweight range). Patients with high grade tumor had an average BMI of 24.98±4.64 kg/m^2. Those who had lympho-vascular invasion had a mean BMI of 25.13±4.46 kg/m^2 (Table VIII). No association between BMI and molecular subtypes, clinical and pathological features of breast cancer were noted both in pre- and post-menopausal groups except for lympho-vascular space invasion. The latter if present among post-menopausal group was associated with significantly lower BMI than those among whom it was absent (mean BMI 25.23 vs 28.27±4.22, p=0.04) (Table IX).

Table VIII: Association of BMI with pathological features of breast cancer (n=90)

Characteristics		N	BMI (kg/m^2) Mean±SD	P value*	Under weight N (%)	Normal N (%)	Overweight N (%)	Obese N (%)	p value**
Tumor grade	High	28	24.98±4.64	0.216	3 (10.7)	7 (25.0)	2 (7.1)	16(57.1)	
	Low	62	26.30±4.67		2 (3.2)	11(17.7)	19 (30.6)	30(48.4)	0.063
Lympho-vascular space invasion	Present	42	25.13±4.46		3 (7.1)	11(26.2)	7 (16.7)	21(50.0)	
	Absent	48	26.55±4.80	0.153	5 (5.6)	18(20.0)	21 (23.3)	46(51.1)	0.336

p value determined by *Student's t test and **Chi-squared test

Table IX: Association of BMI with molecular, clinical and pathological features of breast cancer across history of menopause (n=90)

Characteristics		n	Pre-menopausal Mean±SD	P value	n	Post-menopausal Mean±SD	P value
Molecular subtype	Basal like (TNBC)	34	25.91±4.53		12	27.20±4.39	
	Luminal (A&B)	24	24.86±5.36		11	26.17±3.04	
	Her2 receptor overexpressing	2	25.12±10.13	0.892**	7	26.90±5.43	0.839**
ER	Positive	24	24.86±5.37	0.447*	11	27.40±4.55	0.518*
	Negative	36	25.85±4.62		19	26.38±3.90	
PR	Positive	23	24.78±5.48	0.406*	7	26.13±4.92	0.654*
	Negative	37	25.88±4.56		23	26.94±3.92	
Her2	Positive	7	23.89±4.50		10	26.49±4.51	
	Negative	49	25.97±4.89	0.186**	19	26.61±3.92	0.449**
	Equivocal	4	21.87±5.01		1	31.96	

Characteristics		n	Pre-menopausal Mean±SD	P value	n	Post-menopausal Mean±SD	P value
Tumor size (cm)	≤ 2	11	26.57±4.98		4	26.53±4.44	
	> 2 - ≤5	36	24.91±5.07	0.559**	18	27.44±4.07	0.956**
	> 5	13	26.09±4.54		8	25.30±4.16	
Axillary lymph node involvement	Present	48	25.91±4.84	0.150*	25	26.28±3.89	0.158*
	Negative	12	23.63			29.14±4.75	
Tumor grade	High	17	24.37±5.08	0.286*	11	25.91±3.89	0.404*
	Low	43	25.89±4.84		19	27.24±4.24	
Lympho-vascular space invasion	Present	27	25.08±4.98		15	25.23±3.47	
	Absent	33	25.76±4.91	0.596*	15	28.27±4.22	0.040*

p values were determined by *Student's t test and **ANOVA test

DISCUSSION

Breast cancer (BC) is the mostly occurring malignancy in women. Its incidence is rising by 3.1% annually (Breast cancer, no date). Nearly 32.8% of cancers in women is breast cancer in Bangladesh [14]. Clinical characteristics like age, tumor size, menstrual status, morphology, and lymph node status of the tumor are traditionally the most important prognostic factors. However, research on the tumor's molecular features led to a greatly increased the understanding about the nature of the disease [15]. A high BMI was found to be associated with increased risk of breast cancer among women irrespective of menopausal history [16, 17]. As molecular, clinical and pathological characteristics of cancer determined the mode of management in breast cancer patients and exploration of the association between these features and BMI was the aim of this study.

This cross-sectional study was done on 90 adult female patients with histologically confirmed carcinoma of the breast who were admitted in National Institute of Cancer Research and Hospital (NICRH) for management. Average age of the patients was 41.17±8.79 years and majority respondents belonged to age group 31-40 years (47%) followed in second by 41–50 years (37%). This is similar to the findings of Bellah and colleagues [18] who conducted a study among women breast cancer patients in NICRH in 2016. They found majority case between 34 to 43 years (37.6%) followed in second by 44 to 53 years. Manhoran and colleagues, in a study conducted in New Delhi in 2012, found that majority incidence of breast cancer occurs in the age group 45 – 49. Age range of 30 to 49 years accounted for 28% of the breast cancers in New Delhi [19]. A younger age of involvement in the present study warrants investigation into the risk factors in this region. Majority respondents were educated below primary with nearly two-third of the participants only completing upto SSC (36.7% below primary and 30% between primary & SSC). This goes well with the findings of Malvia and colleagues (2017) [20] who noted an increased risk of breast cancer among lower educated women.

Maximum patients were housewives in occupation (90.0%), which corresponds with that of Bellah *et al.,* (2016) [18]. Moreover, according to socioeconomic status majority respondents were from upper middle-class families (52.2%) followed in second by lower middle-class (52.2%). According to the review by Hossain and colleagues, in Bangladesh most of respondents of breast carcinoma were from lower socio-economic class (80%), were uneducated (illiterate or having only a primary level of education) and housewives (81%) [21]. All these findings were noted in this study. Out of 90 patients in this study 66.7% were pre-menopausal and 33.3% were postmenopausal. This differs from that of Bellah *et al.,* who found 37% pre-menopausal and 63% post-menopausal women among 322 patients who admitted in NICRH between July 2010 and June 2011 [18]. As most of the aged person was being restrained in their home to keep them safe from the COVID-19 this might have affected the pattern of participants in this study which was conducted during the pandemic.

The average age of menarche, at marriage and at first child was respectively, 12.99, 17.85 and 19.70 years. This is very similar to that found by Zannat *et al.,* [22] and Babu *et al.,* [23] in their study. Zannat and colleague found a mean age of marriage 17.99 years and mean age at first pregnancy 19.44 years. Babu and colleagues found age of menarche 13.7 and age at first live birth at 23.4 years. They also found a 52 very low percentage of nulliparous women (4%) similar to this study (2.2%) [23]. Regular use of oral contraceptive pill has an established association with breast cancer [24] and we found that 37.8% of the breast cancer patients in this study had history of taking OCP.

We found an average BMI of participants among obese range (25.89±4.67 kg/m2) and more than half of the participants (51.1%) were obese and 23.3% were overweight according to Asian criteria. Zannat and her co-researchers found that 41.4% of women with breast cancer were overweight according to WHO criteria which correspond to Asian obese, which is similar to our findings [22]. An increased BMI is an established risk factor for many type of cancers. Contrary to the study by Babu and colleagues we found average BMI in the obese range in both premenopausal and postmenopausal patients [23]. A meta-analysis revealed that in Asia being overweight and obese was

significantly associated with breast cancer in pre-menopausal women [25]. While another meta-analysis found that obesity was associated with increased breast cancer risk in post-menopausal women [16]. A high proportion of overweight and obese individual in our study goes along with these studies and indicates the importance of BMI control to prevent breast cancer.

In this study, majority patients had low grade tumor (68.9%), and axillary lymph node involvement (81.1%). Babu *et al.*, also found a high proportion of low grade tumors (6.7% T1 and 52.7% T2) and 71.4% axillary lymph node positive [23]. Majority had a medium size tumor (60%) which is similar to that of Biglia *et al.*, who found 41.9% tumor with medium diameter [26]. They found lymphatic 53 and vascular invasion of tumor in 38.9 and 41.5% patients respectively. While this study found 46.7% patients with lymphovascular invasion similar to their study.

We found the most common molecular subtype- basal like-TNBC (50%), followed in decreasing order by luminal (40.0%), and Her2 receptor overexpressing (10.0%). This is different than that of Babu el al who found 53% luminal, 31% TNBC and 16% Her2 enriched [23]. When ER and PR are negative and there is lack of over expression of HER2 then it is called triple-negative breast cancer. Three quarters of such triple-negative breast cancers express basal markers. The triple-negative type is frequently considered as a surrogate marker of basal-like breast cancer. This "triple- negative" category comprises 10% to 15% of all breast cancers. In retrospective studies, patients with TNBC have worse clinical outcomes when compared with those with non-TNBC [27] Babu and colleagues [23] also found that mean BMI in luminal, TNBC and Her2 enriched was respectively 24.7, 23.9 and 22.4 kg/m^2. But we found that mean BMI was respectively 25.64, 25.97 and 26.51 in respectively luminal, TNBC and Her2 overexpressing patients. And there was not any significant difference among these subtypes in relation BMI ($p>0.05$). Li *et al.*, (2017) conducted a case-control study to see the association between BMI and molecular subtypes of breast cancer and found that among breast cancer patients higher BMI was associated with luminal and triple negative subtypes [28]. This study corresponds with their finding in that we found a higher proportion of obese patients in both TNBC and luminal group. Although we also found that Her2 overexpressing patients had the highest average BMI among all contrary to other studies [23, 28].

We didn't find any association of tumor size and presence of axillary lymph node with BMI. As all sizes of tumor had a high average BMI in this study. Also, BMI was high 54 irrespective of presence of axillary lymph nodes. But a relatively higher BMI was noted with increasing tumor size and with presence of axillary nodes. These findings correspond with the findings of Biglia *et al.*, who noted a similar pattern [26]. In our study tumor size ≤ 2 cm, 2 - ≤ 5 cm and >5 cm had respectively 46.7, 50 and 57.1% of obese patients. While Biglia and colleagues found that among obese patients respectively 21.6, 36.8 and 41.6% patients had tumor size 1cm to 2cm. Similarly, we found 53.4 and 51.1% obese in respectively lymph node present and absent patients. Biglia *et al.*, noted that among obese patients 43.7% had lymph nodes and 56.3% didn't have lymph nodes [26]. We also didn't found any association between tumor grade, lymphovascular space invasion and BMI. This also corresponds with Biglia *et al.*, who noted that among obese patients 34.1% had lymphatic space invasion with the difference being non-significant [26]. The absence of association between BMI and different features of tumor could be attributed to small sample size, absence of control and a single center basis in our study. But we found a difference of BMI among different categories, although small and statistically non- significant. Therefore, multicenter, case-control studies with large sample studies are needed to further explore the extent of this difference.

CONCLUSION

This study found small and non-significant difference of BMI among the breast cancer patients with different features of tumor. As our study has several limitations, larger study is required to get details epidemiological trends of this cancer. Considering the small number of patients and single center study, it will not be logical to come to a definite conclusion that there is no association of BMI with molecular subtypes, clinical and pathological characteristics of breast cancer. Further multi-center studies with better design and longer duration are required to reach a conclusive decision.

REFERENCES

1. Globocan Observatory. (2019). Cancer Today – World. *International Agency for Research on Cancer*, 876, 2018-2019.
2. National institute of cancer research and Hospital. Hospital cancer registry report 2014. Mohakhali, Dhaka, Bangladesh.
3. Chlebowski, R. T., Chen, Z., Anderson, G. L., Rohan, T., Aragaki, A., Lane, D., ... & Prentice, R. (2005). Ethnicity and breast cancer: factors influencing differences in incidence and outcome. *Journal of the National Cancer Institute*, *97*(6), 439-448.
4. Obeidat, F., Ahram, M., Al Khader, A., Battah, K., Alchalabi, M., Melhem, J. M., & Suleiman, A. (2017). Clinical and histopathological features of breast cancer in Jordan: Experience from a tertiary care hospital. *JPMA*, *67*(8), 1206-1212.
5. Perou, C. M., Sørlie, T., Eisen, M. B., Van De Rijn, M., Jeffrey, S. S., Rees, C. A., ... & Botstein, D.

(2000). Molecular portraits of human breast tumours. *nature*, *406*(6797), 747-752.

6. Carey, L. A., Perou, C. M., Livasy, C. A., Dressler, L. G., Cowan, D., Conway, K., ... & Millikan, R. C. (2006). Race, breast cancer subtypes, and survival in the Carolina Breast Cancer Study. *Jama*, *295*(21), 2492-2502.
7. Rodriguez, C., Calle, E. E., Fakhrabadi-Shokoohi, D., Jacobs, E. J., & Thun, M. J. (2002). Body mass index, height, and the risk of ovarian cancer mortality in a prospective cohort of postmenopausal women. *Cancer Epidemiology Biomarkers & Prevention*, *11*(9), 822-828.
8. Renehan, A. G., Tyson, M., Egger, M., Heller, R. F., & Zwahlen, M. (2008). Body-mass index and incidence of cancer: a systematic review and meta-analysis of prospective observational studies. *The lancet*, *371*(9612), 569-578.
9. Daling, J. R., Malone, K. E., Doody, D. R., Johnson, L. G., Gralow, J. R., & Porter, P. L. (2001). Relation of body mass index to tumor markers and survival among young women with invasive ductal breast carcinoma. *Cancer*, 92(4), 720-729.
10. Loi, S., Milne, R. L., Friedlander, M. L., McCredie, M. R., Giles, G. G., Hopper, J. L., & Phillips, K. A. (2005). Obesity and outcomes in premenopausal and postmenopausal breast cancer. *Cancer Epidemiology Biomarkers & Prevention*, *14*(7), 1686-1691.
11. World Health Organization. (2018). Obesity and overweight, *Geneva, Switzerland.*
12. Measure Evaluation. (2020). Bangladesh Maternal Mortality and Health Care Survey, 2010; *2001(BMMS 2001).*
13. Third Indo-Global Summit and Expo on Healthcare. (2015). *Health Care: Current Reviews Incidence of breast cancer in Bangladesh*, 2-3.
14. Hussain, S. M. A. (2013). Comprehensive update on cancer scenario of Bangladesh. South Asian journal of cancer, 2(04), 279-284.
15. Yan, J., Liu, X. L., Han, L. Z., Xiao, G., Li, N. L., Deng, Y. N., ... & Liu, L. X. (2015). Relation between Ki-67, ER, PR, Her2/neu, p21, EGFR, and TOP II-α expression in invasive ductal breast cancer patients and correlations with prognosis. *Asian Pacific Journal of Cancer Prevention*, *16*(2), 823-829.
16. Munsell, M. F., Sprague, B. L., Berry, D. A., Chisholm, G., & Trentham-Dietz, A. (2014). Body mass index and breast cancer risk according to postmenopausal estrogen-progestin use and hormone receptor status. *Epidemiologic reviews*, *36*(1), 114-136.
17. Schoemaker, M. J., Nichols, H. B., Wright, L. B., Brook, M. N., Jones, M. E., O'Brien, K. M., ... & Swerdlow, A. J. (2018). Association of body mass index and age with subsequent breast cancer risk in premenopausal women. *JAMA oncology*, *4*(11), e181771-e181771.
18. Bellah, S. F., Salam, M., Karim, M., Hossain, M., & Ashrafudoulla, M. (2016). Epidemiology of breast cancer among the female patients in Bangladesh. *Oriental Pharmacy and Experimental Medicine*, *16*(2), 85-95.
19. Manoharan, N., Nair, O., Shukla, N. K., & Rath, G. K. (2017). Descriptive epidemiology of female breast cancer in Delhi, India. *Asian Pacific journal of cancer prevention: APJCP*, *18*(4), 1015-1018.
20. Malvia, S., Bagadi, S. A., Dubey, U. S., & Saxena, S. (2017). Epidemiology of breast cancer in Indian women. *Asia-Pacific Journal of Clinical Oncology*, *13*(4), 289-295.
21. Hossain, M. S., Ferdous, S., & Karim-Kos, H. E. (2014). Breast cancer in South Asia: a Bangladeshi perspective. *Cancer epidemiology*, *38*(5), 465-470.
22. Zannat, K. E., Karim, N., Faruquee, M. H., & Haque, M. (2015). Risk factors for breast cancer among women attending in selected hospitals of Dhaka city. *Journal of Medical and Biological Science Research*, *1*(10), 162-168.
23. Babu, K. G., Anand, A., Lakshmaiah, K. C., Lokanatha, D., Jacob, L. A., Babu, M. S., ... & Kumar, R. V. (2018). Correlation of BMI with breast cancer subtype and tumour size 1-7. *ecancermedicalscience*, *12*.
24. Bardaweel, S. K., Akour, A. A., Al-Muhaissen, S., AlSalamat, H. A., & Ammar, K. (2019). Oral contraceptive and breast cancer: do benefits outweigh the risks? A case–control study from Jordan. *BMC women's health*, *19*(1), 1-7.
25. Nindrea, R. D., Aryandono, T., Lazuardi, L., & Dwiprahasto, I. (2019). Association of overweight and obesity with breast cancer during premenopausal period in Asia: A meta-analysis. *International Journal of Preventive Medicine*, *10*(1), 192.
26. Biglia, N., Peano, E., Sgandurra, P., Moggio, G., Pecchio, S., Maggiorotto, F., & Sismondi, P. (2013). Body mass index (BMI) and breast cancer: impact on tumor histopatologic features, cancer subtypes and recurrence rate in pre and postmenopausal women. *Gynecological Endocrinology*, *29*(3), 263-267.
27. Yin, L., Shuang, H., Sheng, C., Liang, H., Sun, X. J., Yang, W. T., & Shao, Z. M. (2018). The Prognostic Value of Nodal Staging in Triple-Negative Breast Cancer—A Cohort from China. *Scientific reports*, *8*(1), 1-7.
28. Li, H., Sun, X., Miller, E., Wang, Q., Tao, P., Liu, L., ... & Li, J. (2017). BMI, reproductive factors, and breast cancer molecular subtypes: a case-control study and meta-analysis. *Journal of epidemiology*, *27*(4), 143-151.