Abstract: It is known that breast cancer is most common cancer in women of
developed countries and is on rise in developing countries. Besides recurrence, one of
the major complications is lymphoedema. This study was done on women who
presented with lymphoedema after primary surgical treatment of breast cancer. A
detail history was recorded with special emphasis on irradiation to axilla,
chemotherapy and hormonal therapy. They were specifically asked regarding the
mode of onset of lymphoedema. A detailed physical examination was done with
special emphasis on diagnosis of lymphoedema. The data were then analyzed based on
Exploratory Data Analysis. Out of 1047 patients who underwent surgical intervention,
the occurrence of lymphoedema is 6.017% with maximum occurrence in
age group 56-65 years (8.3%) with maximum occurrence of lymphoedema observed in 2nd
year after primary surgical treatment. Maximum occurrence of lymphoedema was observed
in T2 subgroup (8.15%), N1 subgroup (7.33%), and in MRM subgroup (6.67%).
Patients who were irradiated after surgery showed higher occurrence of lymphoedema
(13.64%). Maximum occurrence of lymphoedema was seen within 1-2-year post
mastectomy (47.62%) and in patient with T2, N1 stage. There was consistent increase
in occurrence of lymphoedema with increase in BMI & patient with history of
radiation post mastectomy.

Keywords: Mastectomy, Lymphoedema, Breast Cancer, Post Mastectomy
Lymphoedema.

INTRODUCTION
Breast cancer is the most common cancer in women of developed countries
and is on rise in developing countries [1]. Besides recurrence, one of the major
complications is lymphoedema.

Lymphoedema can cause severe physical and
psychological morbidity in breast cancer survivors and
measurable reduction in quality of life in respect to
functional, emotional, physical and social wellbeing. Studies have shown that women who develop
lymphoedema exhibit higher levels of psychological,
social, sexual and functional morbidity than those who
do not develop this complication. Keeping this in mind
I would like to throw some light on this clinical entity.

It is not a new topic of consideration for
practitioners and researchers concerned with skin and
wound care. In 1587, the noted Ming Dynasty Physician
Gong Tingxian described ‘phlegm-damp’accumulation
and treatment. More recently King and DiFalco [2]
discussed the rise of lymphoedema in an ageing
population. They highlighted the array of skin problems
associated with lymphoedema and noted that such
conditions lead to cellulitis which further damages the
lymphatic system. They state that “... most
lymphoedema is the result of surgical treatment of
malignant disease. Because malignancy is increasingly
curable, the latent potential for developing
lymphoedema is growing medical problem.”

Lymphoedema following breast cancer
treatment is traditionally attributed to lymphatic
obstruction with venous obstruction as an infrequent
complicating factor. The lymphatic system also known
as ‘Third Circulation’ consists of thin walled, low
pressure vessels, nodes that occur along the course of
lymphatic vessels. By regulating fluid absorption from
the interstitium, the lymphatic system maintains plasma
drainage routes by surgery, radiotherapy, and
disturbances in Starling forces in the skin and
subcutaneous tissue contributes to post mastectomy lymphoedema.

When lymphoedema remains untreated, protein rich fluid continues to accumulate, leading to an increase of swelling and a hardening or fibrosis of tissue. In this state, the swollen limb becomes a perfect culture medium for bacteria and subsequent recurrent lymphangitis. Moreover, untreated lymphoedema can lead into a decrease or loss of functioning of the limb(s), skin breakdown, chronic infection and, sometimes, irreversible complications. In the most severe cases, untreated lymphoedema can develop into rare form of lymphatic cancer called lymphangiocarcinoma (most often in secondary lymphoedema).

Lymphoedema that results from chronic lymphatic insufficiency is a chronic debilitating disease that is frequently misdiagnosed, treated too late, or not treated at all. There are, however, effective therapies for lymphoedema that can be implemented, particularly after the disorder is properly diagnosed. Primary care physicians could successfully provide follow–up care.

It is not only important to put days into life but also to put life into the days. In awe of treating dreaded cancer we tend to overlook the sequel of the same. The present work is undertaken to analyze post-surgical morbidity in breast cancer patients with our thrust on lymphoedema, its occurrence, morbidity and its prevention.

Aims and Objectives
This descriptive study was aimed at study of Occurrence of lymphoedema after primary surgical treatment of breast cancer and focus on the risk factors of lymphoedema.

MATERIALS AND METHODS
This Descriptive study was done on women who presented with lymphoedema after primary surgical treatment of breast cancer. These patients were registered in breast clinic, attended the surgical outdoor and admitted in surgical wards at Maharana Bihupal Government Hospital, Udaipur attached to Rabindra Nath Tagore Medical college, Udaipur (Rajasthan).

A detailed history was recorded with special points including marital status, obstetrical and menstrual history and malignancy in first degree relatives, duration of disease, treatment modalities including irradiation to axilla, chemotherapy and hormonal therapy. They were specifically asked regarding the mode of onset of lymphoedema, their routine lifestyle, any history of trauma in affected arm, about the complains related to arm like pain, numbness, swelling, shoulder mobility and their psychological impact on them.

A detailed physical examination was done with special emphasis on both arms and diagnosis of lymphoedema. Difference of circumferential measurements was taken at 4 points: the metacarpal-phalangeal joint, the wrists, and 10 centimeters distal to the lateral epicondyles and 15 centimeters proximal to lateral epicondyles.

Height was measured in meters against a calibrated wall in standing erect posture with bare feet. Weight was measured in kilograms. Body mass index was calculated from these measurements using formula:

\[ \text{BMI} = \frac{\text{weight in Kg}}{\text{height in meters}^2} \]

The data were then analyzed based on Exploratory Data Analysis.

RESULTS
A total of 1250 patients of carcinoma breast had been registered from January 1992 to January 2011. Out of them 1047 patients underwent surgical intervention. So, the occurrence of lymphoedema is 6.017%. Maximum occurrence of lymphoedema was seen in age group 56-65 year. Mean age of the patients having lymphoedema was 59.73±48.63. Maximum occurrence of lymphoedema observed in 2nd year (47.62%) followed by < 1 year (17.46%) after primary surgical treatment. (Table 1).

There wasn’t any significant variation of lymphoedema in relation to size of primary tumor. Maximum occurrence was seen in T2 subgroup T2 (Tumor 2.5 centimeters). Baring Tx subgroup (Tumour couldn’t be assessed) (Table 2).

Maximum occurrence was seen in Nodal Stage N1, Baring Nx subgroup 1 (Nodal status couldn’t be assessed) (Table 3).

Occurrence was high when radical surgery was performed as compared to breast conserving surgery. Majority of patients with lymphoedema underwent modified radical mastectomy. (Table 4).

On analyzing records of significant difference was observed among patients in whom axilla has been irradiated as compared to those who didn’t receive radiotherapy. (Table 5).

Higher Occurrence of lymphoedema was observed in patients who have body mass index more than 25. This observation was consistent as we approach to higher BMI (Table 6).

In most of the patients (66.67%) 16-25 lymph nodes were retrieved during axillary dissection (Table 7).
### Table 1: Distribution of all post-surgical patients and patients with lymphoedema in different age group

<table>
<thead>
<tr>
<th>Age in Years</th>
<th>Total Post-Surgical Patients</th>
<th>%</th>
<th>Patients with Lymphoedema</th>
<th>Lymphoedema Occurrence</th>
</tr>
</thead>
<tbody>
<tr>
<td>≤ 35</td>
<td>159</td>
<td>15.2%</td>
<td>0</td>
<td>0%</td>
</tr>
<tr>
<td>36-45</td>
<td>316</td>
<td>30.18%</td>
<td>18</td>
<td>5.70%</td>
</tr>
<tr>
<td>46-55</td>
<td>297</td>
<td>28.41%</td>
<td>23</td>
<td>7.74%</td>
</tr>
<tr>
<td>56-65</td>
<td>191</td>
<td>18.28%</td>
<td>16</td>
<td>8.3%</td>
</tr>
<tr>
<td>&gt; 65</td>
<td>84</td>
<td>7.93%</td>
<td>6</td>
<td>7.14%</td>
</tr>
<tr>
<td>Total</td>
<td>1047</td>
<td>100%</td>
<td>63</td>
<td>6.017%</td>
</tr>
</tbody>
</table>

### Table 2: Distribution of all post-surgical patients and patient with lymphoedema according to Tumor Size

<table>
<thead>
<tr>
<th>Tumor Size</th>
<th>Total Post-Surgical Patients</th>
<th>%</th>
<th>Patients with Lymphoedema</th>
<th>Lymphoedema Occurrence</th>
</tr>
</thead>
<tbody>
<tr>
<td>T1s</td>
<td>81</td>
<td>7.7%</td>
<td>0</td>
<td>0%</td>
</tr>
<tr>
<td>T1</td>
<td>46</td>
<td>4.4%</td>
<td>2</td>
<td>4.3%</td>
</tr>
<tr>
<td>T2</td>
<td>417</td>
<td>39.87%</td>
<td>34</td>
<td>8.15%</td>
</tr>
<tr>
<td>T3</td>
<td>401</td>
<td>38.32%</td>
<td>26</td>
<td>6.48%</td>
</tr>
<tr>
<td>T4</td>
<td>89</td>
<td>8.59%</td>
<td>0</td>
<td>0%</td>
</tr>
<tr>
<td>T5</td>
<td>13</td>
<td>1.1%</td>
<td>1</td>
<td>7.69%</td>
</tr>
<tr>
<td>Total</td>
<td>1047</td>
<td>100%</td>
<td>63</td>
<td>6.017%</td>
</tr>
</tbody>
</table>

### Table 3: Distribution of all post-surgical patients and patients with lymphoedema according to Nodal Status

<table>
<thead>
<tr>
<th>Nodal Size</th>
<th>Total Post-Surgical Patients</th>
<th>%</th>
<th>Patients with Lymphoedema</th>
<th>Lymphoedema Occurrence</th>
</tr>
</thead>
<tbody>
<tr>
<td>N0</td>
<td>489</td>
<td>46.7%</td>
<td>26</td>
<td>5.31%</td>
</tr>
<tr>
<td>N1</td>
<td>472</td>
<td>45.15%</td>
<td>32</td>
<td>6.78%</td>
</tr>
<tr>
<td>N2</td>
<td>63</td>
<td>7.05%</td>
<td>4</td>
<td>6.35%</td>
</tr>
<tr>
<td>N3</td>
<td>11</td>
<td>1.1%</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>N4</td>
<td>13</td>
<td>1.1%</td>
<td>1</td>
<td>7.69%</td>
</tr>
<tr>
<td>Total</td>
<td>1047</td>
<td>100%</td>
<td>63</td>
<td>6.017%</td>
</tr>
</tbody>
</table>

### Table 4: Distribution of all post-surgical patients and patients with lymphoedema according to type of surgery performed

<table>
<thead>
<tr>
<th>Type of Surgery</th>
<th>Total Post-Surgical Patients</th>
<th>Patients with Lymphoedema</th>
<th>Lymphoedema Occurrence</th>
</tr>
</thead>
<tbody>
<tr>
<td>MRM</td>
<td>854</td>
<td>57</td>
<td>6.67%</td>
</tr>
<tr>
<td>BCT + Simple mastectomy with ALND + Salvage mastectomy</td>
<td>193</td>
<td>6</td>
<td>3.11</td>
</tr>
<tr>
<td>Total</td>
<td>1047</td>
<td>63</td>
<td>6.017%</td>
</tr>
</tbody>
</table>

### Table 5: Distribution of all post-surgical patients and patients with lymphoedema according to Radiotherapy

<table>
<thead>
<tr>
<th>Radiotherapy</th>
<th>Total Post-Surgical Patients</th>
<th>Patients with Lymphoedema</th>
<th>Lymphoedema Occurrence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>242</td>
<td>33</td>
<td>13.64%</td>
</tr>
<tr>
<td>No</td>
<td>805</td>
<td>30</td>
<td>3.7%</td>
</tr>
<tr>
<td>Total</td>
<td>1047</td>
<td>63</td>
<td>6.017%</td>
</tr>
</tbody>
</table>

### Table 6: Distribution of all postsurgical patients and patients with lymphoedema according to Body Mass Index

<table>
<thead>
<tr>
<th>BMI</th>
<th>Total Post-Surgical Patients</th>
<th>Patients with Lymphoedema</th>
<th>Lymphoedema Occurrence</th>
</tr>
</thead>
<tbody>
<tr>
<td>≤25</td>
<td>501</td>
<td>23</td>
<td>4.59%</td>
</tr>
<tr>
<td>25-30</td>
<td>483</td>
<td>31</td>
<td>6.42%</td>
</tr>
<tr>
<td>&gt;30</td>
<td>63</td>
<td>9</td>
<td>17.46%</td>
</tr>
<tr>
<td>Total</td>
<td>1047</td>
<td>63</td>
<td>6.017%</td>
</tr>
</tbody>
</table>

Table 7: Distribution of Lymphoedema patients according to number of gross lymph node retrieval

<table>
<thead>
<tr>
<th>No. of Lymph Node Retrieval</th>
<th>Patients Lymph Node</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;15</td>
<td>19</td>
<td>30.16%</td>
</tr>
<tr>
<td>16-25</td>
<td>42</td>
<td>66.67%</td>
</tr>
<tr>
<td>&gt;25</td>
<td>1</td>
<td>1.59%</td>
</tr>
<tr>
<td>Not Assessed</td>
<td>1</td>
<td>1.59%</td>
</tr>
<tr>
<td>Total</td>
<td>63</td>
<td>100%</td>
</tr>
</tbody>
</table>

**DISCUSSION**

Lymphoedema is a vestige which surprise women ‘cured’ of their cancer. The process from malignant disease to recovery of health by radio-chemo-surgical treatment is interrupted by onset of lymphatic disease.

**Epidemiology**

Keil and Radmacker reported the incidence of 39% in a prospective study [3]. Petrek and Heelan reported on the incidence of lymphoedema after breast cancer treatment in a review of 7 retrospective studies published since 1990, the incidence of lymphoedema ranged from 6% to 30% [4]. In present study, out of 1250 patients registered in breast clinic 1047 patients underwent surgical interventions and 63 patients were found to have lymphoedema. So the occurrence of lymphoedema was 6.017%.

Pezner et al (California, US) have reported that the incidence of lymphoedema was 25% at age greater than 60 years and 7% at age under 60 years [5] whereas Kiel and Radmacker reported an incidence of 56% for age over 55 years and 23% for age under 55 years [3]. Armor J Fu (US) conducted a study on 102 patients treated and followed. He reported that lymphoedema occurrence was relatively higher i.e. 41.2% in patients younger than 60 years than those older than 60 years i.e. 30% [1]. In present study higher occurrence was observed in age group 56-65 years (8.3%) followed by in age group in 46-55 years (7.74%) as compared to overall occurrence (6.017%), which is statistically insignificant.

Dennis (US) reported only 9 patients but observed a large variability in the time between surgery and onset of lymphoedema i.e. between 2 months and 3 years [6]. In present series maximum number of patients i.e. 30 patients (47.62%) developed lymphoedema between 1 to 2 years after surgery followed by 15 patients (23.81%) who developed lymphoedema between 2-3 years.

**Risk factors**

Kasse et al from univariate analysis elaborated risk factors for lymphoedema of arm after mastectomy for breast cancer which include big size of tumor (p=0.005), clinically involved axillary lymph nodes (p=0.001) [7]. Kiel and Rademacker reported that the presence of axillary metastasis increased the risk of development of lymphoedema [3]. A Turkish study conducted by Cihangir Ozaslan et al. reported that Axillary radiotherapy and body mass index were found to increase the incidence of the lymphoedema. Women who had the combination of full axillary dissection and axillary radiotherapy carry a significant risk of lymphoedema [8]. Of 332 patients with Sentinel Lymph Node Biopsy (SLNB), 134 had SLN positivity, and 116 of them further underwent completion axillary dissection. Patients with T2 tumors, or tumors with lymphovascular invasion, or invasive ductal cancer were more likely to have a positive Sentinel Lymph Node [9]. With the knowledge of axillary dissection’s complicate nature, efforts are concentrated on avoiding it when applicable [10].

In present study maximum occurrence of lymphoedema was observed in subgroup T2 (tumor size 2-5) followed by sub group T3 (tumor size>5cm) which were 8.15% and 6.48% respectively but not statistically significant. Among all post-surgical patients, nodal metastases were seen in 52.20% of patients whereas maximum occurrence of lymphoedema was seen in N1 subgroup (6.78%) followed by N2 subgroup (6.35%). Thus, higher occurrence of lymphoedema was seen in N1 subgroup, but it was not of statistical significance. Least occurrence was seen in N0 subgroup (5.77%).

Nikkanen T.A. et al. (UK) studied 76 patients of cancer breast for arm swelling, mobility of shoulder and muscle strength. Marked arm swelling was found on the operated side in 31% patients operated by radical mastectomy and in 18% patients who had undergone total mastectomy [11]. Kuno et al. (US) observed variation in incidence of lymphoedema with type of surgery performed, the more the radical the surgery is, the higher are the incidence. He reported the incidence of moderate and severe edema is 2.5% for 637 patients with modified radical mastectomy, 7.7% for 440 patients with standard radical mastectomy and 10.5% for 38 patients with extended radical mastectomy [12]. As these radical surgeries are not being performed these days the comparison was drawn between modified radical mastectomy and breast conserving treatment. A higher occurrence was observed in MRM group (6.67%) as compared to breast conserving surgery subgroup (3.11%). In 63 patients who suffered lymphoedema in present study 57 were operated for MRM and 6 patients underwent BCT.

In univariate analysis by Stephane Vignes, et al. factors associated with lymphoedema volume are

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duration of lymphoedema. Body Mass Index, mastectomy, and past history of cellulitis [13], though obesity is not directly related to breast cancer [14]. Helyer L K et al. (San Francisco) performed a study on “obesity a risk factor developing post-operative lymphoedema”. The study of BMI by multivariate analysis revealed that patients with BMI >30 had an odd ratio of 2.93 with those of BMI <25 of having lymphedema [15]. Edward TL reported that body weight or BMI are important factor that increase the risk of lymphedema [16]. In present study there was consistent trend of increase in occurrence of lymphoedema with increase in BMI, in subgroups of <25, 25-30, >30.

Edwards found that the number of lymph nodes removed was not correlated with lymphoedema[16]. Roses et al. stated that the number of removed lymph nodes was not a risk factor in multivariate analysis, but in univariate analysis it increased the risk [17]. In present series patients were assigned into three categories with respect to number of lymph nodes removed i.e. <15, 15-25, and ≥25. Out of 63 patients 42 patients (66.07%) belong to the group where the number of removed lymph nodes were between 16-25, 19 patients (30.16%) rest in group where number of removed lymph nodes were <15.

Nikanen’s study supports an increase in incidence of edema in patients irradiated post operatively [11]. A study conducted by Schuemann (San Diego, US) showed the highest incidence of edema was among patients who had received radiotherapy in high doses with few fractions to the axilla (60%) [18]. Radiologyinfo.org reviewed that radiation therapy given to the axillary lymph nodes can increase the risk of patients developing arm swelling (“lymphoedema”) following axillary (armpit) dissection [19].

In present study occurrence of lymphoedema was higher in the patients who were irradiated (13.64%) as compared to those who didn’t receive radiotherapy (3.72%). Out of 63 patients who developed lymphoedema, 33 patients were given postoperative radiotherapy.

CONCLUSION

- The occurrence of lymphoedema in patients registered in breast clinic was found to be 6.017%.
- Maximum occurrence of lymphoedema was seen within 1-2 years i.e. 47.62% after primary surgical treatment followed by 23.80% seen between 2-3 years. Then there was decrease in occurrence of lymphoedema with increase in duration after surgery.
- Patients, who received radiotherapy where axillary dissection was performed, had increased risk of lymphoedema (13.64%).
- 53.96% of patients having lymphoedema were having tumor size ranging from 2-5 cm with overall incidence of 8.15%.
- 57.14% of patients having lymphoedema were node positive, with maximum incidence of lymphoedema.
- There was consistent increase in occurrence of lymphoedema with increase in BMI. The occurrence of lymphoedema was 4.59%, 6.42% and 17.46% in BMI categories < 25, 25-30 and > 30 respectively.

REFERENCES

11. Nikkanen TA, Vanharanta H, Helenius-Reunanen H. Swelling of the upper extremity, function and muscle strength of shoulder joint following

Available online: http://saspublisher.com/sjams/