

Obesity As A Risk Factor For Lymphedema In Breast Cancer Patients After Modified Radical Mastectomy

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Abstract:

Backgrounds: Surgical therapy with the Modified Radical Mastectomy technique is the primary choice in treating breast cancer, but some complications may arise, such as lymphedema. Lymphedema causes permanent loss of function of body parts, such as decreased range of motion that impacts the quality of life. Postoperative obesity is a significant risk factor for the development of lymphedema.

Aim: to determine the relationship of obesity to the incidence of post-MRM lymphedema.

Methods: An analytical study using a case-control study design in breast cancer patients who had undergone MRM surgery and were hospitalized and controlled at the Oncology Surgery Polyclinic of Sanglah Hospital Denpasar from January 2020 to July 2020. The bivariate test uses chi-square and the multivariate analysis uses Poiston regression. The p-value of 0.05 was considered significant.

Results: Obesity was associated with the incidence of post-MRM lymphedema (OR: 36.529; 95% Confidence Interval 4.5 to 295.95; p-value <0.0001), a history of inflammation in the ipsilateral arm also had a significant relationship (OR: 3.8; 95% CI 1.2 to 11.98; p-value = 0.023. In multivariate analysis, it was found that obesity was the risk factor that most influenced the occurrence of lymphadenopathy (AOR: 6.3; 95% CI -1.392 to -0.170; p-value = 0.012), but a history of inflammation in the ipsilateral arm was not a risk factor (AOR: 1.16; 95% CI -0.921 to 0.268; p value=0.282).

Conclusion: Obesity is a risk factor for lymphedema in breast cancer patients after Modified Radical Mastectomy surgery.

Keywords: Breast cancer, Modified Radical Mastectomy, Obesity

Introduction:

Breast cancer is a malignancy of epithelial cells found in breast tissue originating from the lobular and ductal epithelial components. Currently, breast cancer is the most common carcinoma found in women in developed countries. Along with its development, cancer cells form a mass that infiltrates nearby tissues (invasive) and can spread (metastasize) throughout the body.[1,2].

Based on statistical data from the World Health Organization (WHO), the incidence of breast cancer is 1.67 million, with a mortality rate of 90% in advanced or metastatic stages. Based on data from the International Agency for Research on Cancer (IARC) in 2012, the incidence of breast cancer was 40 per 100,000 women[3]. In 2010, according to histopathological data, it was estimated that the incidence rate in Indonesia was 12/per 100,000 women[4]. A late diagnosis of cancer often causes a high mortality rate. Most breast cancers are detected for the first time through mammography, which shows an abnormality, and patients rarely complain of pain or abnormalities in the breast[5].

Breast cancer management consists of surgical therapy, hormonal therapy, radiation therapy, and chemotherapy. The management of breast cancer depends on various factors, including the stage of cancer and the patient's age. Surgery is the primary treatment choice for breast cancer that is still operable. Surgery through a mastectomy (removal of all parts of the breast), quadrantectomy (a quarter of the breast), or lumpectomy (only a small amount of the breast)[5]. One technique, mastectomy, is often accompanied by axillary lymph node dissection. The evolution of mastectomy techniques, starting with simple mastectomy and radical mastectomy to modified radical mastectomy, emphasizes the role of lymph node drainage as a factor related to postoperative cancer survival and recurrence.[6].

Surgical therapy with the Modified Radical Mastectomy technique is the primary choice in managing breast cancer today. This technique involves surgical removal of the breast, nipple-areola complex, preserving the pectoralis major and minor muscles, and level I and II lymph node dissection. Although this technique has the advantage of not wasting chest muscles and minimal risk of scar tissue in the chest area, it can reduce the risk of decreased arm strength and limited movement of the shoulder joints.[6].

Breast cancer surgery techniques involve removing lymph nodes in the axillary area. Removal of the lymph nodes causes the body to lose the channel to drain lymph fluid so that lymphatic flow from the breast to the arm is disrupted and blocked. This blockage will cause the accumulation of fluid and protein effusion into the interstitial area resulting from drainage failure. The swelling causes discomfort and symptoms such as a feeling of heaviness in the hand, swelling, and decreased flexibility in the hand area[7].

Clinical studies have provided evidence that obesity and postoperative weight gain are significant risk factors for the development of lymphedema. Research by Dominick (2013) and Huang (2012) found that the risk of lymphedema increased almost sixfold as body weight increased[8,9]. This is also to research conducted by Can et al. that obesity positively correlates with lymphadenopathy. Based on research, it is said that women with obesity have a 3.6 times higher risk of developing lymphadenopathy in the second postoperative year[10]. Although the

etiology is unclear, several theories have been discussed regarding the association between obesity, lymphedema, and breast cancer surgery.

The theory that might explain the effect of obesity on lymphedema is that the first is damage to the lymphatic system. An increase in body fat mass can cause an imbalance between fluid volume and lymphatic transport capacity.[11]. This is related to a significant increase in intracellular and extracellular fluid directly proportional to the increase in BMI[12]. This is also related to the increase in fat and the role of subcutaneous tissue as a source of lymphatic fluid[13]. Second, a high body mass index causes chronic venous insufficiency and impairs lymphatic return, resulting in lymphadenopathy [14]. Third, the increased endocrine response contributes to the development of lymphedema and inflammation in the tissues. When combined with surgery that contributes to damaging the lymphatic system tissue, these three things will increase the risk of lymphedema [11].

As the survival rate of breast cancer patients increases due to the development of diagnostic and therapeutic techniques, lymphedema after breast cancer surgery is an essential complication because it affects the patient's quality of life in the long term. If not diagnosed and treated in the early postoperative period, effective management will be challenging to achieve and lead to chronic morbidity. It is therefore essential to avoid or minimize this condition.

One of the initial approaches is identifying risk factors, especially modifiable risk factors. High BMI or obesity is a strongly suspected factor to support the occurrence of lymphedema. Research in the Indonesian population regarding the relationship of BMI with the incidence of lymphedema is still scarce. This is in contrast to Western countries. On the other hand, considering the minor average body posture of the Indonesian population and the different BMI criteria (BMI ASIA) from western countries, it reduces the applicability of the results of population-based studies in these countries. Therefore, this study was conducted to determine the relationship between obesity and the incidence of lymphedema in the Indonesian population using the Asian BMI criteria guidelines.

Methods:

This study is an analytic study using a case-control study design to determine the relationship and magnitude between obesity as a risk factor for the incidence of lymphedema in breast cancer patients after Modified Radical Mastectomy surgery. The definition of the case group was postoperative breast carcinoma Modified Radical Mastectomy patients with positive lymphadenopathy, which was confirmed by a difference of 2 cm in the measurement of the circumference of the two upper extremities at least at 1 measurement point. The definition of the control group was postoperative breast carcinoma Modified Radical Mastectomy patients with negative lymphadenopathy, which was established by the absence of a difference of 2 cm in the circumference measurement of the two upper extremities at 5 measurement points. The study was conducted in the surgical ward and the Surgical Oncology Polyclinic of Sanglah Hospital Denpasar from January 2020 to July 2020. The Ethics Committee approved this research of Udayana University/ Sanglah Hospital Denpasar Bali with No. 2016/un14.2.2/td.06/2021.

Case group inclusion criteria: (1) All female patients aged 18 years who had been diagnosed with breast cancer (2) Had undergone Modified Radical Mastectomy surgery at Sanglah Hospital Denpasar. (3) Control to the surgical oncology polyclinic or being treated in the

surgical ward. Exclusion criteria: (1) subjects with comorbidities in other organ systems that can cause clinical features of edema, such as chronic kidney disease, heart failure, hypoalbuminemia, and lymphatic filariasis. (2) Subjects with bilateral breast cancer. (3) Subjects who experience weakness in one extremity due to chronic musculoskeletal or neurological disorders that cause decreased activity levels in the upper extremities. (4) Subjects who underwent amputation in one of the upper extremities due to various indications or causes.

Statistical tests were carried out using the Statistical Package for Social Sciences (SPSS) program, version 25.0 and R. Statistical data analysis consisted of (1) Descriptive analytic (2) Bivariate analysis with chi-square test, and multivariate Poiston Regression analysis.

Results:

This study obtained 68 respondents of breast cancer patients after Modified Radical Mastectomy surgery at Sanglah Hospital, Denpasar. Based on the results of the analysis of the characteristics of the research subjects, which have been summarized in Table 1.

Table 1 Distribution of Research Respondent's Characteristics.

Characteristics	Frequency n (%)
Age	
Average ± SD	51.7±9.5
< 60 years old	54 (79.4%)
60 years	14 (20.6%)
Body Mass Index (BMI)	
Average ± SD	23.9±4.4
Nutritional status	
Obesity	28 (41.2%)
Not obese	40 (58.8%)
Lymphedema	
Yes	44 (64.7%)
No	24 (35.3%)
tumor stage	
Early stages (I and II)	26 (38.2%)
Advanced stage (III and IV)	42 (61.8%)
History of surgical wound infection	
Yes	20 (29.4%)
No	48 (70.6%)
History of postoperative radiotherapy	
Yes	4 (5.9%)
No	64 (84.1%)
History of inflammation of the ipsilateral arm	
Yes	27 (39.7%)
No	41 (60.3%)
Postoperative time	
The first year after surgery	40 (58.8%)

More than one year after surgery	28 (41.2%)
Tumor infiltration into KGB	
Yes	22 (32.4%)
No	46 (67.6%)
Total	68 (100.0%)

The bivariate analysis results to find the relationship between independent and confounding variables with the dependent variable are summarized in Table 2. Of all the variables, only nutritional status and history of inflammation in the ipsilateral arm had a significant relationship (p-value 0.05).

Table 2 Risk Factors for the Incidence of Lymphedema in Breast Cancer Patients After Modified Radical Mastectomy Surgery.

Variable	Lymphedema n(%)	Without Lymphedema n(%)	p	OR	CI 95%	
					Lower	Upper
Age						
< 60 years old	34 (77.3%)	20 (83.3%)	0.755*	1,471	0.407	5,312
60 years	10 (22.7%)	4 (16.7%)				
Nutritional status						
Obesity	27 (61.4%)	1 (4.4%)	0.000*	36,529	4,509	295,947
Not obese	17 (38.6%)	23 (95.6%)				
Tumor stage						
Early stages (I and II)	15 (34.1%)	11 (45.8%)	0.343	1,636	0.592	4,521
Advanced stage (III and IV)	29 (65.9%)	13 (54.2%)				
History of surgical wound infection						
Yes	14 (31.8%)	6 (25.0%)	0.556	1,400	0.456	4,294
No	30 (68.2%)	18 (75.0%)				
History of postoperative radiotherapy						
Yes	1 (2.3%)	3 (87.5%)	0.122*	0.163	0.016	1,661
No	43 (97.7%)	21 (12.5%)				
History of inflammation of the ipsilateral arm						
Yes	22 (50.0%)	5 (20.8%)	0.023	3,800	1,205	11,987
No	22 (50.0%)	19 (79.2%)				
Postoperative time						
6-12 months	27 (61.4%)	13 (54.2%)	0.565	0.744	0.272	2.036
13 months	17 (38.6%)	11 (45.8%)				
Tumor infiltration into KGB						
Yes	17 (38.6%)	5 (20.8%)	0.139	2,393	0.752	7,610
No	27 (61.4%)	19 (79.3%)				

Total 44 (100.0%) 24 (100.0%)

Significant p value was stated < 0.05; CI = Confidence Interval; OR= odds ratio;

Based on the results of bivariate analysis, it was found that nutritional status (obesity) and history of inflammation in the ipsilateral arm had a significant relationship with lymphedema incidence. Thus, a multivariate analysis was carried out to obtain the adjusted odds ratio (AOR) value which was used to assess the contribution of each variable. In Table 3, obesity showed an AOR value of 6.281 (p-value = 0.012), while a history of inflammation in the ipsilateral arm had an AOR value of 1.157 (p-value = 0.282). Thus, based on multivariate analysis, obesity was the risk factor that most influenced the occurrence of lymphadenoma in breast cancer patients after MRM surgery. Still, a history of inflammation in the ipsilateral arm was not a risk factor.

Table 3 Multivariate Trial of Risk Factors for Lymphedema in Breast Cancer Patients Post Surgery Modified Radical Mastectomy.

	B	SE	adjusted	df	p	CI 95%	
						Lower	Upper
Obesity	-0.781	0.3117	6,281	1	0.012	-1,392	-0.170
History of inflammation of the ipsilateral arm	-0.327	0.3035	1,157	1	0.282	-0.921	0.268

Poisson Regression Multivariate Test, significant p value < 0.05. CI = Confidence Interval

Discussions:

Sixty-eight respondents were breast cancer patients after Modified Radical Mastectomy surgery at Sanglah Hospital, Denpasar. Based on the findings of this study, most of the patients were under 60 years old with the incidence of lymphedema. Mayastuti et al. reported the same thing in their research respondents[15]. Similar results were also obtained in the study of Tsai et al. in 2018, which said that of 522 patients with breast cancer after undergoing surgery, 47 of them experienced lymphedema under 60 years[16]. This can be influenced by the distribution of cases in each area influenced by various demographic factors.

This study also found that most respondents were in an advanced stage and did not undergo postoperative radiotherapy. Several previous studies have found the opposite. The research of Tsai et al. found that most breast cancer patients were in stage I. The survey of Ugur et al. also reported that the characteristics of the respondents were dominated by stages I and II.[17]. Reports from Pereira et al. showed that breast cancer patients were predominantly at stage IIA.[18].

The study results also showed that there was no relationship between clinical stage and the incidence of lymphedema in breast cancer patients after MRM surgery. Most studies examining the relationship between breast cancer stage and risk of developing lymphedema believe no statistically significant relationship between these two entities.[18,19]. Based on the study by Ugur et al., it was stated that the risk of lymphedema was statistically higher in patients with advanced breast cancer (Stage III) than in patients with early-stage breast cancer (Stage I,

II) ($p = 0.018$)[17]. Furthermore, in determining the stage of the clinical course in breast cancer patients, it is shown that the appropriate management is carried out on the patient, either doing chemotherapy, radiation, or surgery.

Breast cancer management so far consists of surgery, hormonal therapy, radiation therapy, and chemotherapy. The management of breast cancer depends on various factors, including the stage of cancer and the patient's age. Surgery is the primary choice of breast cancer therapy which is still a priority. Surgery using a mastectomy (removal of all parts of the breast), quadrantectomy (a quarter of the breast), or lumpectomy (only a small amount of the breast)[5]. One technique, mastectomy, is often accompanied by axillary lymph node dissection. The evolution of mastectomy techniques, starting with simple mastectomy and radical mastectomy to modified radical mastectomy, emphasizes the role of lymph node drainage as a factor related to postoperative cancer survival and recurrence.[6].

This study refers to patients with breast cancer who have undergone Modified Radical Mastectomy surgery. The interval between clinical status examinations after surgery was also obtained, most of which were within the first year after MRM surgery. This is related to the incidence of postoperative complications[20–22]. Based on a study by Gozzo et al., one of the complications of surgery for breast cancer is the occurrence of lymphedema[23]. This has also been conveyed in the previous literature related to surgical complications on the incidence of lymphedema in breast cancer patients[16,17,24]. The study of Wu et al. (2020) in Pakistan also showed that the initial complication of MRM was seroma formation and the majority of the later complications were lymphedema [25]. A study in the same year by Shahpar et al. reported that there was one patient who had an early complication of lymphedema [26]. However, several cohort studies showed a non-significant number of risk factors for surgery with MRM techniques on the incidence of lymphedema. This study also found that the time after MRM surgery in breast cancer patients was not associated with the incidence of lymphedema. However, several postoperative events reported the risk of these complications.[11,20,22].

Surgical therapy with the Modified Radical Mastectomy technique is the primary choice in managing breast cancer today. This technique involves surgical removal of the breast, nipple-areola complex, preserving the pectoralis major and minor muscles, and level I and II lymph node dissection. Although this technique has the advantage of not wasting chest muscles and minimal risk of scar tissue in the chest area, it can reduce the risk of decreased arm strength and limited movement of the shoulder joints.[6].

Breast cancer surgery techniques involve removing lymph nodes in the axillary area. Removal of the lymph nodes causes the body to lose the channel to drain lymph fluid so that lymphatic flow from the breast to the arm is disrupted and blocked. This blockage will cause the accumulation of fluid and protein effusion into the interstitial area resulting from drainage failure. The swelling causes discomfort and symptoms such as a feeling of heaviness in the hand, swelling, and decreased flexibility in the hand area[6,7,27].

Previous studies have shown that there are several risk factors for lymphedema, including the incidence of infection, radiation therapy, axillary dissection, the type of surgery performed, the number of lymph nodes removed and involved, and the condition of patients with obesity.[17,27–30].

Based on all these risk factors, in this study, only a history of inflammation in the ipsilateral arm and nutritional status with obesity had a significant relationship to lymphedema in breast cancer patients after MRM surgery. The risk factor for a history of inflammation in the ipsilateral arm was 3.8 times that affected the incidence of lymphedema in postoperative breast cancer patients. However, based on some literature, the incidence of inflammation in the ipsilateral arm can be caused by fluid accumulation and the accompanying lymphedema condition.[15].

This study does not show a significant relationship between postoperative infection and tumor infiltration in the lymph nodes with the incidence of lymphedema. However, Mak et al. found that arm or chest infection was a significant risk factor for developing or enlarging lymphedema[17]. In the study of Ugur et al., the risk of developing lymphedema in patients with a history of wound infection was 3.11 times greater than in patients not infected with surgical wounds ($p = 0.003$). In addition to infection, the risk was also 3.83 times higher in patients with a history of lymphangitis than in those without a history of lymphangitis ($p = 0.002$)[17]. Most of the patients with severe lymphedema in the study were patients with a history of lymphangitis. Interestingly, two patients had permanent and severe lymphedema due to lymphangitis, which developed after a bee sting. Therefore, Ugur et al. suggest that to avoid severe lymphedema, it is necessary to pay attention to hand and arm hygiene and prevent injury to reduce the risk of lymphangitis.[17].

Based on this study, it was shown that the nutritional status of obesity resulted in almost 36 times the risk of influencing the occurrence of lymphedema in breast cancer patients after MRM surgery at Sanglah Hospital. So nutritional status (obesity) and history of inflammation in the ipsilateral arm are risk factors for lymphedema in breast cancer patients after MRM surgery at Sanglah Hospital, Denpasar. Other variables such as age, tumor stage, history of wound infection, history of postoperative radiotherapy, length of time after surgery, and family planning did not show a significant risk of lymphadenopathy in breast cancer patients after MRM surgery.

Almost all respondents in the study were patients with obesity and who had lymphedema. Based on previous studies, many have discussed the incidence of lymphedema in breast cancer patients. The study by Tsai et al. showed that patients with breast cancer with lymphedema incidence occurred as much as 19.5%.[16]. The study by Ugur et al. reported the incidence of lymphedema in breast cancer patients after MRM surgery was around 25.8%.[17]. In addition, based on this study, Oliveira et al. showed the incidence of lymphedema in patients with breast cancer after MRM was around 54.4%.[11]. The survey by Leray et al. also showed that lymphedema with a fluid volume of more than 400 mL occurred in 46% of patients after MRM surgery.[31]. Pireira et al.'s 10-year prospective cohort study found that the risk of postoperative lymphedema in breast cancer patients was 13.5% after two years of follow-up, 30.2% at 5 years, and 41.1% at 10 years. Other prospective studies have also described a cumulative incidence of 10% at 2 years, between 21.5%-54% at 3 years, and between 16%-94% at 5 years postoperatively in these patients.[32].

The majority of the incidence of lymphedema in breast cancer patients is one to two years after surgery. Although the risk of breast cancer patients can occur for life will experience the occurrence of lymphedema, the process takes a long time after going through surgery. The incidence rate of lymphedema varies in previous studies, we found that there were about 64%

cases of lymphedema, but based on some literature, the overall incidence of lymphedema was only 21%.

Lymphedema is caused by damage to the lymphatic system and is characterized by abnormal increases in tissue protein, edema, chronic inflammation, and fibrosis[33,34]. These problems are easy to detect, leading to decreased quality of life due to pain, the sensation of heaviness in the limbs, reduced mobility, and repeated tissue infections[35]. Lymphedema is one of the primary and most feared complications of breast cancer management[7]. Lymphedema occurs in about 25% of patients undergoing treatment. Research on lymphedema shows that, in general, breast cancer patients are likely to be at risk for developing lymphadenoma in the two to three years after surgery.

This study also found that obesity had a significant effect on the incidence of lymphedema in breast cancer patients after MRM surgery. Previous studies have also found that body mass index influences the incidence of lymphedema in breast cancer patients[11]. A prospective cohort study reported that the incidence of lymphedema is influenced by risk factors such as obesity which is significantly 1.52 times in postoperative breast cancer patients. This study also found that obesity had the most significant effect based on the multivariate Poisson regression test results with an adjusted odds ratio of 6, indicating that obesity greatly influences the incidence of lymphedema in postoperative breast cancer patients and is evidence that is following previous literature reviews. This is also found in systematic review articles and meta-analyses that predict obesity conditions affect the incidence of lymphedema in breast cancer patients after surgery.[36].

There was no positive correlation between BMI and scar tissue adhesion, pain, and lymphedema in the first postoperative year. However, in the second postoperative year, there was a high association with lymphedema, especially in overweight and obese women. Based on research by Oliviera et al., it is said that between BMI categories, there is a significant difference in the incidence of lymphadenopathy ($p = 0.0268$), and women with obesity have a 3.6 times higher risk of developing lymphadenopathy in the second postoperative year with an odds ratio of 3.61 (95% CI 1.36 to 9.41)[11]. Multivariate analysis showed patients with a BMI > 30 (obese) had an odds ratio of 2.93 (95% CI 1.03-8.31) compared with patients with a BMI <25 for lymphadenopathy.[37]. Oliviera (2015) concluded that a BMI of 25kg/m² before breast cancer surgery is a risk factor for developing lymphedema in the two years after surgery.[11]. Although being overweight or obese was associated with a higher incidence of lymphedema, other complications were not correlated with BMI. When BMI was assessed as a risk factor, Solder et al. found no statistically significant difference between BMI values > 25 or 25 concerning the incidence of lymphadenopathy. In that study, the risk of lymphoma showed a 3-fold increase if the cut-off point used was BMI>25[13].

Based on the studies previously described, women diagnosed with obesity or who gain weight after breast cancer may be at higher risk for developing lymphedema. However, it is not clear whether increased BMI is a direct risk factor for the development of lymphadenopathy or a confounding factor. There are two possible explanations for the effect of obesity on the appearance of lymphedema: (a) in breast cancer patients with an impaired lymphatic system, and there is an increased demand created by the increase in body fat mass, causing an imbalance between fluid volume and lymphatic transport capacity.[38,39]. This theory is also supported by

the statement of Solder et al., namely an increase in fat and the role of subcutaneous tissue as a source of lymphatic fluid or an increase in lymphatic damage due to the increased need for axillary intervention.[13]. In essence, more extensive surgery resulting from the presence of excess adipose tissue will further damage the lymphatic system. The second theory, related to increased endocrine response, namely increased secretion of peptides, may contribute to lymphedema and tissue inflammation[39].

Clinical studies have also provided evidence that obesity and postoperative weight gain are significant risk factors for the development of lymphedema. Research by Dominick (2013) and Huang (2012) found that the risk of lymphedema increased almost sixfold as body weight increased[8,9]. This is also following research conducted by Can et al., that obesity positively correlates with lymphadenopathy. Based on research, it is said that women with obesity have a 3.6 times higher risk of developing lymphadenopathy in the second postoperative year[10]. Although the etiology is unclear, several theories have been discussed regarding the association between obesity, lymphedema, and breast cancer surgery. This condition will lead to new research for advanced studies in assessing the underlying pathomechanism.

The theory that is still the basis today in explaining the effect of obesity on lymphedema is that the first is damage to the lymphatic system. An increase in body fat mass can cause an imbalance between fluid volume and lymphatic transport capacity.[11]. This is related to a significant increase in intracellular and extracellular fluid directly proportional to the increase in BMI[12]. This is also related to the increase in fat and the role of subcutaneous tissue as a source of lymphatic fluid[13]. Second, a high body mass index causes chronic venous insufficiency and impairs lymphatic return, resulting in lymphedema[14]. Third, the increased endocrine response contributes to the development of lymphedema and inflammation in the tissues. When combined with surgery that contributes to damaging the lymphatic system tissue, these three things will increase the risk of lymphedema [11].

As the survival rate of breast cancer patients increases due to the development of diagnostic and therapeutic techniques, lymphedema after breast cancer surgery is an essential complication because it affects the patient's quality of life in the long term. If not diagnosed and treated in the early postoperative period, effective management will be challenging to achieve and lead to chronic morbidity. It is therefore vital to avoid or minimize this condition. Therefore, the results of this study can be helpful in health services for breast cancer patients in Indonesia, especially in preventing and managing lymphedema after Modified Radical Mastectomy surgery.

Conclusion:

Obesity is a risk factor for the incidence of lymphedema 3,8 times in breast cancer patients after Modified Radical Mastectomy surgery at Sanglah Hospital, Denpasar.

Conflict of interest

No potential conflict of interest relevant to this article was reported.

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