

Breast Reconstruction Following Breast Cancer Surgery in Sudanese Women in Khartoum State 2022

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Abstract

Background: Breast reconstruction after cancer surgery is crucial for women's psychological well-being and quality of life. Many advances were made in reconstructive techniques allowing it to become a common practice worldwide.

Aim of the Work: The aim of this study is to determine the rate, type and timing of breast reconstruction in Sudanese women.

Patients and Methods: This is a descriptive cross-sectional multi-centric hospital-based study involving the medical records of all adult females with breast reconstruction following breast cancer surgery in Khartoum locality from June 2020 to June 2022.

Results: A total of 305 women had mastectomies during the two-year study period, 46 (14.8%) of them had unilateral breast reconstruction, the majority of which 30 (65.2%) were done using autologous techniques, while 11 breast (23.9%) had implant reconstruction, 5 (10.9%) had partial reconstruction using oncoplastic techniques. The most autologous technique used was LD flap reconstruction 21 breasts (70%), followed by TRAM flap in 8 (26.67%) and DIEP flap in 1 (3.33%) in 41 (89.13%) the reconstruction was done immediately.

Conclusion: In this study, the rate of post-mastectomy breast reconstruction is low with mostly immediate autologous technique used. Raising awareness about breast reconstruction and increasing cooperation with the general surgeons are some of the ways to resolve this issue.

Key Words: Breast reconstruction – Oncoplastic breast surgery – Latissimus Dorsi flap – TRAM.

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Introduction

According to the WHO, breast cancer is the most prevalent cancer in the world, with 7.8 mil-

lion women diagnosed between the years 2015 to 2020, of which 2.3 million women were diagnosed in the year 2020, and 685,000 global deaths [1].

Breast cancer has a significant social, psychiatric, sexual morbidity, in addition to concerns about survival, well-being, the disease has effects on self-esteem, sexuality, body image, and quality of life (QOL). It affects all aspect of life including work, marriage, and family. This can either be due to fear of having cancer or the feeling of mutilation following surgery or both, the option of breast reconstruction whether immediate or delayed decreased that sense of mutilation [2,3,4].

In 1998, the Women's Health and Cancer Rights Act provided global coverage for breast reconstruction following mastectomy in the United States. In 2010 the state of New York passed a law requiring surgeons to discuss the option of breast reconstruction with patients before breast cancer treatment, and to give information about insurance coverage, and even refer them to a hospital where reconstruction is available if necessary [5].

The rate of reconstruction following mastectomy varies according to age, ethnicity, insurance status and the presence of a specialized surgeon to do the procedure. It is affected mainly by the stage of the disease (The most predictive clinical factor) and the need for adjuvant therapy (radiation), it can either be immediate or delayed, autologous or implant based [5].

Worldwide breast reconstruction is a common practice; however, as a result of scarce resources and the small number of reconstructive surgeons, this type of surgery is not available in many African countries⁶. In Sudan, very limited data is present. one paper done by Abdelsamie Abdalla Mohamed in 2018, involved 147 patients with locally advanced breast cancer who received neo-adjuvant chemotherapy. 78 patients (53.1%) were managed

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with breast conservative surgery, while 64 (43.5%) patients had modified radical mastectomy, 25 patients (39.1%) of which the Latissimus Dorsi flap (LD) was used to close the defect following mastectomy, myo-cutaneous flap in 16 patients and muscle flap in 9 patients, while 5 patients developed progressive disease preventing cure [7].

This study aimed to determine the rate, type and timing of breast reconstruction done in Sudan.

Patients and Methods

This is a descriptive cross sectional multi-centric hospital-based study. It was conducted in four hospitals including both governmental and private sectors, all located in Khartoum State, Sudan. These four hospitals are namely Alshuhada Hospital, Alribat University Hospital, Alfaisal Hospital and Al Sharif Hospital. All Sudanese females with breast cancer who underwent breast reconstruction after breast cancer surgery from June 2020 to June 2022 were included in the study with inclusion criteria being 18 years and above and having unilateral or bilateral breast reconstruction. Insufficient records were excluded together with those who underwent prophylactic mastectomy and when the procedure wasn't done by a plastic surgeon. The sample covered all patients who underwent breast reconstruction after breast cancer surgery. Forty-six (46) patients met the inclusion criteria. Primary and secondary data were collected from medical records and through telephone interview using a structured pre-coded data sheet covering demographic data, type of reconstruction and complications after surgery. Data was analyzed using SPSS v. 24. Ethical clearance was obtained from State Ministry of Health's ethical committee and Hospitals' authorities. The confidentiality and privacy of the respondents'

questionnaires and information were provided by using coding system where each respondent is assigned with code, her name was not used, and the data will never be used for any purpose rather than the objectives of the study. The independent study variables were demographic data, comorbidities, chemotherapy, and radiation therapy. Chemotherapy and radiation therapy were defined as receipt before or after reconstruction.

The dependent: Stage of cancer according to American joint committee of cancer: Pathological and clinical stages 0, I, II, III, IV).

- Stage 0: TisN0M0 such as ductal carcinoma in situ (DCIS).
- Stage I: T1N0M0.
- Stage IIA: T0N1M0, T1N1M0, T2N0M0.
- Stage IIB: T2N1M0, T3N0M0.
- Stage IIIA: T0N2M0, OR T1N2M0, T2N2M0, OR T3N1M0, T3N2M0.
- Stage IIIB: T4 N0 M0, OR T4N1M0, OR T4N2M
- Stage IIIC: Any T, N3, M0.
- Stage IV: any T, any N, M1.

And the method of reconstruction (autologous reconstruction: LD flap (Fig. 1), PTRAM (Fig. 2), free DEIAP vs implant-based reconstruction: TE/Implant), complications of surgery defined as Any deviation from the ideal postoperative course that is not inherent in the procedure and does not comprise a failure to cure, early post-surgical complications that occurred within 6 weeks of the surgery. (seroma, wound dehiscence, partial flap loss, total flap loss, infection, pain), received radiation therapy (neoadjuvant or adjuvant therapy).



Fig. (1-A): LD flap donor site intra-operative and post-operative.



Fig. (1-B): Intra-operative tumor excision from the right breast.



Fig. (1-C): Post-operative picture following nipple sparing mastectomy with LD flap reconstruction.



Fig. (1-D): Two years following LD flap reconstruction.



Fig. (2-A): Pre-operative marking for TRAM flap for a patient post neo-adjuvant chemotherapy.

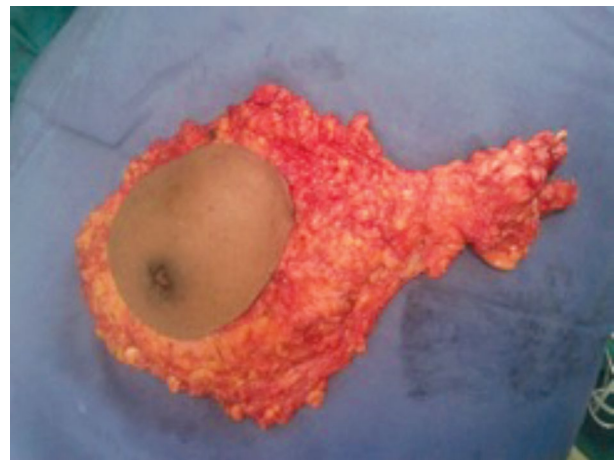


Fig. (2-B): Operative photo of left mastectomy and axillary dissection.

Fig. (2-C): Intra-operative harvesting of the TRAM flap.



Fig. (2-D): Post-operative pictures following TRAM reconstruction.

Results

Records of 1200 breast conditions were revised; only 305 patients had breast cancer. Of the 305 patients, only 46 patients had breast reconstruction surgery, which gives a proportion of 14.8%.

The mean age of the women who underwent reconstruction surgery is 41.69 years \pm 9.78 years. The older lady was 64 years and the younger one was 23 years. 19 (41.3%) were in group age 40-49 years. Fig. (3).

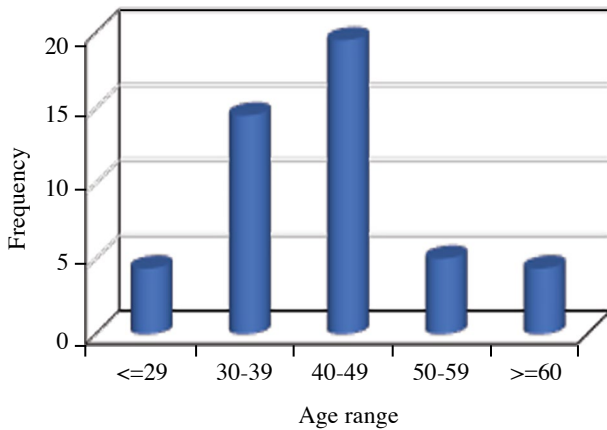


Fig. (3): Shows the age group distribution among breast reconstruction patients.

Thirty-nine (84.7%) patients reside in Khartoum state and nearby locality (urban areas), seven (15.25%) patients from rural areas.

Thirty-one (67.39%) women had stage II breast cancer, 12 (26.1%) had stage III cancer, 2 (4.34%) had stage I cancer and 1 (2.17%) had stage 0. Table (1).

Tables (1): Shows the frequencies of different stages of breast cancer among breast reconstruction patients.

	Stage of cancer	
	Frequency	Percent
0	1	2.2
IA	2	4.3
IIA	14	30.4
IIB	17	37
IIIA	5	10.9
IIIB	4	8.7
IIIC	3	6.5
Total	46	100.0

The majority did not have comorbidities 36 (78.3%) patients, only two (4.3%) patients had diabetes, 1 (2.2%) patient had thyroid disease, 7 (15.2%) had hypertension.

Modified radical mastectomy has been performed in 13 (28.3%), skin sparing mastectomy in 10 (21.7%), simple mastectomy in 9 (19.6%), nipple sparing mastectomy in 9 (19.6%), therapeutic mammoplasty in 3 (6.5%), and wide local excision in 2 (4.3%). Fig. (4).

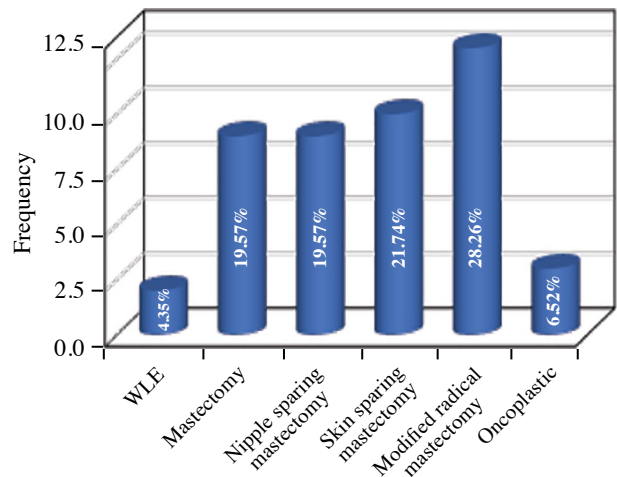


Fig. (4): Shows the type of breast cancer surgery among breast reconstruction patients.

The most common technique used was autologous reconstruction in 30 breasts (65.2%), while 11 breast (23.9%) had implant reconstruction, 5 (10.9%) had partial reconstruction using oncoplastic techniques. Fig. (5).

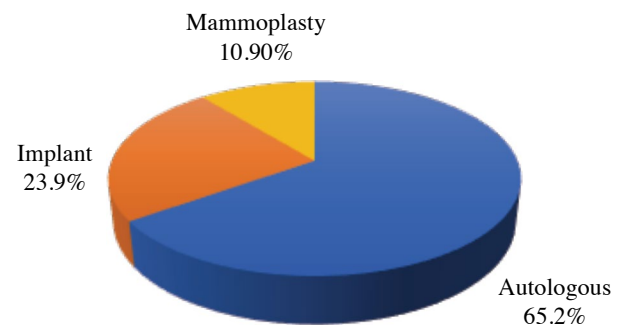


Fig. (5): Shows type of breast reconstruction used.

The LD flap was the most frequent type of autologous reconstruction used in 21 breasts (70%), followed by TRAM flap in 8 (26.67%) and DIEP flap in 1 (3.33%). Fig. (6).

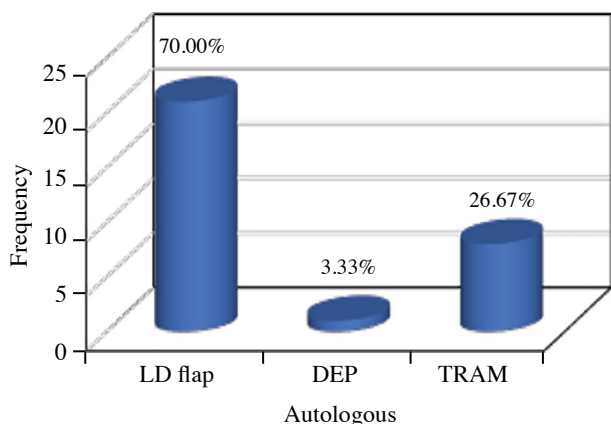


Fig. (6): Shows type of autologous tissue used among breast reconstruction patients.

In 41 breasts, (89.13%) reconstruction was done immediately, while only 5 breast (10.9%) had delayed reconstruction. Fig. (7).

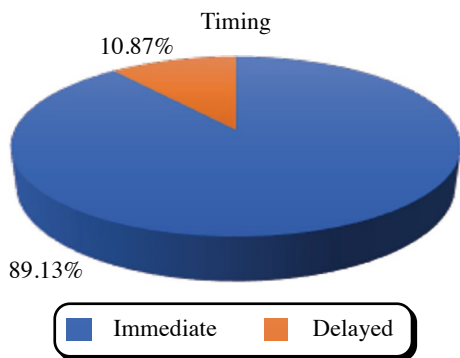


Fig. (7): Shows the timing of reconstruction among patients.

Thirty-six (78.3%) patients reported no complications, three patients (6.5%) developed infection, while two (4.3%) patient developed seroma, two patients (4.3%) had partial loss of the flap, 1 patient had total loss of the flap, 1 patient reported pain. There was no reported implant associated complication among patients underwent breast implant reconstruction. Fig. (8).

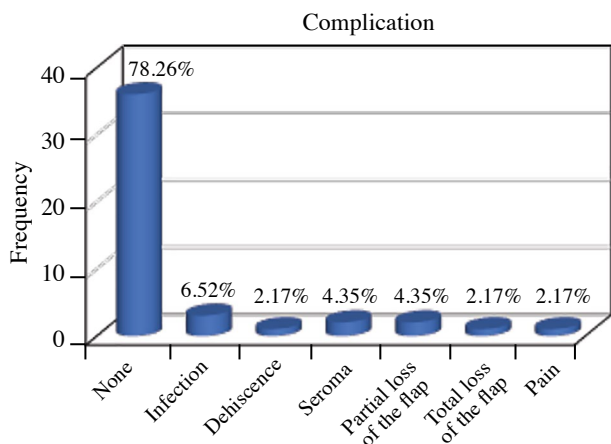


Fig. (8): Shows the complications among breast reconstruction patients.

In 80.48% of the immediate breast reconstruction group, there were no postoperative complications, while in delayed breast reconstruction group 60% had no postoperative complication. There was a statically significant association between complications and timing of reconstruction, with a *p*-value of 0.003.

Among patients who had autologous breast reconstruction 76% had no complications. In the group of patients that had LD reconstruction 80.95% had no complication, while 9.52% developed infection, one patient had donor site seroma and another had donor site dehiscence. In the group who had TRAM flap, 50% had post-operative complications, two patients had partial flap loss 1 (12.5%) patient had seroma. There was a total flap loss in the patient who was reconstructed using DIEP flap. There was a statistically significant association between autologous breast reconstruction and complications with a (*p*-value 0.000).

In the group of patients who underwent modified radical mastectomy, 15.4% had implant reconstruction, while 84.6% had autologous reconstruction. Patients who had simple mastectomy; 11.1% had implant reconstruction, 88.8% had autologous reconstruction. The group of patients who had nipple and skin sparing mastectomy, 42.1% had implant reconstruction, 57.9% had autologous reconstruction. There was a statistically significant association between the type of breast surgery and type of reconstructions with a *p*-value .000).

There were no postoperative complications reported in patients who had comorbidities. There is no statistically significant association found between presence of morbidity and presence of complications, *p*-value 1. 000.

The majority of complications were in the age group between (40-49) years 31.6% of the patients developed post-operative complications, while 28.6% of the patient in the age group (30-39) had postoperative complications. No post-operative complications reported in other age groups. There is no statistically significant association between the age of the patients and the presence of complications, *p*-value 0.979.

Ten patients (21.7%) developed complications, 3 patients (30%) were in stage IIa, while 2 patients (20%) were in stage IIb, IIIa, IIIb each, while 1 patient (10%) was in stage IIIC. There is no statistically significant association between the stage of cancer and the presence of complications, *p*-value 0.4.

In delayed reconstruction group 60% were in stage II, 40% were in stage III. 65.9% of immediate reconstructions were in stage II, 24.4% were in stage III. There is no statistically significant association between the stage of cancer and the timing of surgery *p*-value 0.7.

Discussion

Breast reconstruction following breast cancer surgery has become a common practice nowadays due to its known role to decrease the psychological trauma that follows mastectomy.

This study aimed to identify the rate of breast reconstruction in Khartoum State in centers that offered management of breast conditions.

Out of 305 cases of breast cancer identified in the time from August 2020 till August 2022, 46 had breast reconstruction surgery (14.8%). This rate is in the range of international reports as the rate of reconstruction is variable worldwide, with rates as low as (1%) and as high as (53.4%) [8-13].

This variation in reconstruction rate is probably due to various reasons related to both health sector and the patients. Retrouvey et al., after reviewing 99 articles to identify the barriers of access to breast reconstruction found that breast reconstruction was highest in teaching hospitals, private hospitals, and national breast cancer institutes, with lower rate in rural geographic location and due to lack of patient awareness. The rate also varies according to physician attitude toward breast reconstruction [14]. In another study done in west Africa by Kavitha Ranganathan, a survey conducted on 10 plastic surgeons, the majority of them related the lack of reconstruction to limited access, experience and resources to the reconstruction facility, in addition to lack of awareness and concerns about the cost among patient undergoing breast reconstruction [15].

Thirty-nine (84.7%) patients of reconstruction were from urban area, 15.25% of reconstruction were from rural area. This difference seems logical as patients from urban areas has better access to plastic surgery services and has more awareness about their options of treatment. It is comparable to study conducted by Ryan C. DeCoster et al., he found that the rate of breast reconstruction was higher in urban (31.1%) than rural areas (13.4%) [16]. Claudia Regis et al., found that increased variation across different areas regarding breast reconstruction was partially attributable to the number of plastic surgeons available [17]. A cohort study by Paris D Butler included 65,246 women treated across (67) health service area level, The plastic surgeons density per 100,000 populations directly related to the immediate breast reconstruction rate [18].

In this study, the mean age of the patients who underwent breast reconstruction surgery is 41.69 years \pm 9.78 years, which is similar to a study conducted by Qinghong Qin et al., [19]. Most women were in the group age of 40-49 years, which is consistent with a study done by Woo Jin Song et al., [9].

In our study, the rate of breast reconstruction varied according to the geographical location, with the majority of patient 25 (54.3%) residing in Khartoum state. This is probably due to the lack of appropriate set up and skillful personnel at remote areas. This geographical variation was noticed in several similar studies. In a paper by Sarah E. Hart et al., stated that in USA reconstruction rates vary greatly by geographical location with rates as low as 18% in North Dakota and as high as 80% in Washington, DC. Patients in the South, Midwest, and West regions have lower rates of reconstruction, which was explained by difference in density of plastic surgeons and mal distribution across the states. Patients living in urban areas or in areas with higher incomes are more likely to undergo reconstruction [20].

Thirty-one (67.39%) women had stage II breast cancer, 12 (26.1%) had stage III cancer, 2 (4.34%) had stage I cancer and 1 (2.17%) had stage 0. This is comparable to a study conducted by Adelaida Avino et al., were 57 patients were enrolled a 22 patients presented stage II cancer, stage III appeared in 18 cases, and stage IV was described for one patient. Another study done by Hiroki Ito where 412 cases were enrolled, most of cases were in stage II (36.9%), stage I (29.4%), stage III (5.3%) [21,22].

The delayed presentation is probably due to the absence of screening programs, in addition to factors related to the culture in our country with tendency to hide breast conditions.

In this study, thirteen (28.3%) women had modified radical mastectomy, 10 (21.7%), patients had skin-sparing mastectomy, 9 (19.6%) patients had simple mastectomy, and 9 (19.6%) patients had nipple sparing mastectomy. Which is similar to study conducted by Hiroki Ito that included 412 patients, 193 (47%) of cases had total mastectomy, 123 (30%) patients had nipple sparing mastectomy, 96 (23%) patients had skin sparing mastectomy [22].

This can be attributed to the late presentation of the cases in addition to surgeon attitude and choice of surgery.

Autologous techniques constitute most of the reconstruction used in 30 women (65.2%), while 11 women (23.9%) had implant reconstruction, and only 5 (10.9%) had partial reconstruction using oncoplastic techniques. This distribution is in contradiction to several studies like the one done in Korea by Jae-Won Kim in which a total of 7,088 patient had reconstruction, including 4,702 (66.34%) cases of implant reconstruction and 2,386 (33.66%) cases of autologous breast reconstruction [23]. A study done by Edwin G Wilkins et al., 2234 patients were included, 1615 (72.3%) of patient had implant and 27.7% were autologous reconstruction [24]. Belong Yang et al., declared that Implant-based reconstruc-

tion accounted for more than 80% of all reconstructive operations in 35.5% (39/110) of hospitals that routinely performed reconstruction [25].

Michael M. Jonczyk in a cohort study found that patients undergoing mastectomy alone decreased (69–53%); Mastectomy and reconstruction with muscle flap decreased (9–2%); and Mastectomy and reconstruction with implant placement increased (20–40%) [26]. This could be due to multiple variables including unavailability of implant in Sudan, with the additional cost of importation of the implant, also the preference of the surgeons, the paucity of breast centers and specialized surgeons and the awareness of patients regarding the feasibility of implant as reconstructive method as such procedures are considered primarily cosmetic.

Out of the 30 female, The LD flap the most frequent type of reconstruction used in 21 patients (70%), followed by TRAM flap in 8 (26.67) and DIEP flap in 1 (3.33%). This coincides to a study by Belong Yang et al., in which the LD was the most common type of autologous reconstruction in 79% of hospitals, 87/110) [25]. In comparison with a study conducted by Katelyn G Bennett et al., 1525 patients were included, 65.1% of them underwent expander reconstruction and 34.9% underwent autologous reconstruction. The most frequent type of flap was DIEP in 390 (16.6%). 112 (4.8%) received implant reconstruction, 95 (4.1%) free TRAM flap, 85 (3.6%) pedicle TRAM flap, 71 (3.0%) LD flap, and 65 (2.8%) SIEA flap [27].

Reconstructive microsurgery in terms of set up, skills and training is still scarce in Sudan. Similar rates are observed in nearby developing region. Chihena H Banda et al., measured the outcome of free flap in Africa among a total of 1376 free flaps in 1327 patients in the period from 1976 to 2020. Breast reconstruction represent only 2% [28].

In 41 patients (89.13%) reconstruction was done immediately, while only 5 patients (10.9%) have delayed reconstruction which is comparable to a study conducted by Alfred P. Yoon where A total of 1957 patients included, 92.2% of them had immediate reconstruction and only 7.8% offered delayed reconstruction [29]. In Edwin et al., study 2224 cases were included at University of Michigan, 92.9% had immediate reconstruction [24]. In another study conducted in China by Belong Yang et al., about 67.6% of cases underwent immediate reconstruction and 32.4% underwent delayed surgery [25].

Immediate breast reconstruction is gaining more popularity nowadays over the classical practice of delayed approach, Susini T et al., pointed that currently immediate breast reconstruction is presented to most women that are planned for a mastectomy, in his paper conducted from 2004 to

2016 he found that rate of IBR has increased from 49.1% to 72.2% [30].

In Johns Hopkins hospital, Siotos C et al., did a cohort study on 1459 patients, out of which 984 (67.4%) had immediate reconstruction [31].

It was concluded by Avino A et al., that the exact timing of the reconstruction should be decided by team consisting of a plastic surgeon, an oncologist and a radiotherapist [21].

At Seoul National University Hospital, Ki Yong Hong found that the total number of reconstructions increased 13-fold from 2005 to 2016. The number of immediate breast reconstruction (IBR) cases out of all cases of total mastectomy increased from 4% in 2005 to 52.0% in 2016. While delayed breast reconstruction (DBR) cases increased from 8.8% (20 cases) in 2012 to 18.3% (76 cases) in 2016.32.

Thirty-Six (78.3%) patients reported no complications; eight (21.7%) patients reported complications in the autologous group. No implant complications were reported which is comparable to a study done by Edwin G. Wilkins et al., where implant reconstruction had the lowest complication rate (24.7%) [24]. Another study done by Justyna Jonczyk et al., revealed that implant reconstruction had the lowest complication rate (18.8%) while reconstructions with autologous tissues were related to the highest risk for complications [6]. Qinghong Qin et al., also stated that flap-based reconstruction had the highest rate of complication compared to other types [19].

Yet, the nil complication report in implant group in our study could be due to the short length of follow-up, the small number of patients in the study and the unavailability of implants in Sudan. Moreover, a study conducted by Nicolas L Berlin, which analyzed the complication rate postoperatively, showed that the complication rate was varied between hospitals [33].

There were postoperative complications in 19.51% following immediate breast reconstruction, while in delayed breast reconstruction group 40% had postoperative complication. There was significant association between complications and timing of reconstruction, with a *p*-value of 0.003. This is in contrast to a study conducted by Panel Dany Y who found women receiving immediate breast reconstruction were significantly more likely to experience surgical complications [34]. In another study conducted by Katelyn G Bennett et al., patients underwent delayed reconstructions were significantly less likely to develop any complication compared with women receiving immediate reconstructions [27].

This difference could be due to lower immunity status of our patients in the delayed group follow-

ing adjuvant radiotherapy/chemotherapy or due to the small number of delayed reconstructions in the study.

In this study there is no significant association found between presence of morbidity and presence of complications, p -value 1.000 which is similar to cohort study done by Justyna Jonczyk on 61 patients there is no significant association between number of comorbidities and severity of postoperative complications [6]. And it is contradict to study conducted by Qinghong Qin, 151 patients was enrolled there was an association between the presence of comorbidity in form of D.M and the post-operative complications [19]. This can be justified by small size sample and few number of comorbidities.

The study revealed no significant association between the age of the patients and the presence of complications, p -value 0.979 which is similar to study conducted by Katherine B Santosa et al., A total of 1,531 patients were studied 494 younger, 803 middle-aged, and 234 older. Age was not a significant predictor of complications [35].

There is no significant association between the stage of cancer and the presence of complications, ($p=0.4$). This is could be due to small sample size and most of the patients were in stage II (not an advance stage).

In the group of patients who received delayed reconstruction, 60% were in stage II, while 40% were in stage III. While in the group of patients who had immediate reconstruction 65.9% were in stage II, 24.4% were in stage III. There is no significant association between the stage of cancer and the timing of surgery.

Timing of reconstruction following breast cancer ablative surgery is highly influenced by many surgeon and patient factors. Among these the availability of plastic surgeon at the time of surgery, awareness of general surgeon about the importance of reconstruction, the presence of appropriate setting for breast reconstruction for example breast implants, microscopes and suture materials, patients factor like awareness of options of reconstruction and stage of cancer and the need for radiotherapy.

Conclusion:

This study focused on post-mastectomy breast reconstruction in Sudan, the reconstruction rate was low with mostly immediate autologous techniques used.

Raising awareness about breast reconstruction, increasing cooperation with the general surgeons, the availability of some equipment needed such as surgical microscopes and breast implants, in addition

to improving training of reconstructive surgeons are some of the ways to resolve this issue.

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