

BREAST ABSCESSES REQUIRING REPEAT INTERVENTIONS AND THEIR ASSOCIATED RISK FACTORS: A PROSPECTIVE, SINGLE CENTRED STUDY

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Abstract: *The primary objective of the present study was to identify the frequency of breast abscesses requiring repeated intervention and to determine the risk factors associated with breast abscesses requiring repeated intervention. This observational study was conducted at surgical unit 5, Dr. Ruth K. M. Pfau Civil Hospital Karachi from January 2023 to June 2023. Patients' demographics and other study-related information were recorded in the predesigned study performa. Afterward, the patient's baseline blood workup was sent, and an ultrasound of the abscess was performed. Incision and drainage of the breast abscess were performed under general anesthesia by a year 4 general surgery resident. The average age of the 169 participants was 35 years with an average BMI of 25kg/m². The average days observed for presenting the symptoms in study participants were 8 days. In the present study, 55.6% were lactating participants, 28.4% had diabetes, 16.6% were smokers, 11.8% had hypotension, 4.7% had ischemic heart disease, and 4.1% were pregnant. One incision and drainage needed participants (n=135), and repeated incision and drainage needed participants (n=34). 20% of our patients underwent repeated Incision and Drainage for breast abscess, where statistically significant risk factors included advancing age, diabetes, and smoking. In conclusion, our research shows patients with advancing age, diabetes and history of smoking should be given paramount focus when treating breast abscess as they have higher chances of failed treatment with incision and drainage and disease recurrence.*

Keywords: Abscess, Risk Factors, Microorganisms, Incision and Drainage

Introduction

Breast infection, or Mastitis, is a common illness frequently affecting lactating women and is one of the main reasons for women to stop breastfeeding. Mastitis most commonly affects women aged 18-50 years (McPherson et al., 2000) and it remains a significant cause of female morbidity due to high incidence of recurrence resulting in chronic infections, pain, and scarring. Breast abscess commonly develops as a sequela of untreated mastitis with localization of inflammatory exudate within breast tissue (Shaikh et al., 2014). In developing countries, breast abscess is a common cause of morbidity in lactating women with a reported incidence of 10.2% in Pakistan (Kahn, 2013). While in developed countries, its incidence is much lower due to better hygienic conditions, nutrition, early treatment with antibiotics, and improved living standards (Manzoor et al., 2022). Breast abscesses commonly affect lactating mothers and are classified as lactational breast abscess with an overall incidence of 0.4 to 11 percent among lactating mothers (Dener and İnan, 2003). Risk factors for which include maternal age >30 years, first pregnancy, gestational age ≥41 weeks, and tobacco use (Berens, 2001; Dener and İnan, 2003; Kvist and Rydhstroem, 2005). Breast abscesses occurring among non-lactating women are classified as non-lactational, and any severe pathology like breast cancer should always be ruled out when a non-lactational female presents with signs and symptoms of breast abscess (Toomey and Le, 2017). Non-puerperal breast masses encompass a more comprehensive range of ages, from the late second to the eighth decade of life, where peak incidence is often in the fourth decade (Kasales et al., 2014). Non puerperal

abscesses are more resistant to treatment, and previous retrospective studies have reported that the recurrence rate can be as high as 40% to 50% (Meguid et al., 1995; Watt-Boolsen et al., 1987).

Women with diabetes, chronic illness, AIDS, and impaired immune systems are more susceptible to developing mastitis (Amir et al., 2006). Lactational breast abscesses are often caused by *Staphylococcus aureus* and *Streptococcal* species; methicillin-resistant *S. aureus* is becoming increasingly common. Typically, non-lactational breast abscesses result from a mixed flora with *S. aureus*, *Streptococcus*, and anaerobic bacteria (Agrawal et al., 2018; Leung, 2016). Studies conducted to determine the incidence of repeat procedures for breast abscess have reported the figures between 12.9-37% (David et al., 2018; O'Hara et al., 1996), with one such retrospective series stating that only a smoking history and the presence of a nipple ring correlate with the likelihood of a repeat procedure in women with breast abscesses (O'Hara et al., 1996). Another retrospective study of 68 participants showed that 54% required multiple surgical interventions, and 22 of them were heavy smokers (Gollapalli et al., 2010). The studies mentioned above are conducted in an urban setting within developed countries where their reported risk factors for repeated surgical interventions are almost not found in our population. So, we intend to study the frequency of breast abscesses requiring repeat interventions and its associated risk factors. Our study will be conducted in a tertiary care hospital attended predominantly by a rural population of low socioeconomic status with almost no prompt access to primary health care services and very unhygienic living conditions.

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Methodology

After the ethical approval from institutional review, this observational study was conducted at surgical unit 5, Dr. Ruth K. M. Pfau Civil Hospital Karachi, from January 2023 to June 2023. An anticipated sample size of a minimum of 169 primary benign breast abscess cases was included in the study with a 95% confidence interval. The sample has been calculated using OpenEpi software’s ‘Sample size calculation for frequency in population’ function with an estimated 12.5% repeat incision and drainage rate based on a previously published report (David et al., 2018). Through convenience sampling technique, Patients with a clinical diagnosis of breast abscess requiring Incision and Drainage and Abscess size >5 cm were included in the present study. Patients with more than one breast abscess and patients having septicaemia at presentation were excluded from the study. Patients’ demographics and other study-related information were recorded in the predesigned study performance. Afterward, the patient’s baseline blood workup was sent, and an ultrasound of the abscess was performed. Incision and drainage of the breast abscess were performed under general anesthesia by the year four general surgery resident. The incision was given on the dependent region according to the size and location of the breast abscess, and pus with or without tissue was sent for microbiological culture and sensitivity (C&S) and histopathology. The patient was then started on empirical antibiotic therapy while awaiting culture results. Once the result of pus C&S was available, the antibiotic therapy was adjusted accordingly. The patient was then kept on follow-up to assess the treatment progress of their breast abscess and any potential need for repeat incision and drainage. The study endpoint was either the resolution of breast abscess or mortality. The data of the study was analyzed through SPSS version 26, where continuous data was presented as mean ± SD and categorical data as respective frequencies. Data was evaluated by further statistical tests such as chi-square, t-test, etc., according to the nature of the gathered data. A p value of ≤ 0.05 will be considered statistically significant.

Results

Table 1 shows the clinical parameters of the study participants. Median and interquartile ranges for continuous variables are reported because of skewed distribution per the Kolmogorov-Smirnov test. The median age of the 169 participants was 35 years, with an average BMI of 25kg/m². The median days observed for the presentation of the symptoms in study participants were eight days. The median size of abscesses observed in the study participants was 100mL. The median total leucocyte count in the study participants was 15x10⁹/L. In the present study, 55.6% were lactating participants, 28.4% had diabetes, 16.6% were smokers, 11.8% had hypotension, 4.7% had ischemic heart disease, and 4.1% were pregnant. 20% of our patients underwent repeated Incision and Drainage for breast abscess, where statistically significant risk factors included advancing age, diabetes, and smoking, as also shown in Table 1.

The presented data in figure 1 outlines the distribution of culture organisms and outcomes in a medical context. Among the identified culture organisms, Methicillin-Sensitive Staphylococcus Aureus (MSSA) is the

predominant pathogen, accounting for 64.5% of cases, followed by Methicillin-Resistant Staphylococcus Aureus (MRSA) at 18.9%. Other bacterial strains include Klebsiella (5.3%), Staphylococcus epidermidis (5.3%), and Pseudomonas (5.9%). These percentages provide insights into the prevalence of different bacteria implicated in the condition under consideration

Table 1: clinical parameters of the study participants

Variable	Patients (n=169)
Age (years)	35 (30-40)*
Weight (Kg)	63 (58-84)*
BMI (kg/m ²)	25.4 (23.3-33.6)*
Days of symptoms before presentation (days)	8 (7-10)*
Size of abscess, (mL)	100 (70-120)*
TLC (x 10 ⁹ /L)	15 (14-18)*
Total Hospital stay (Days)	1 (1-2.5)*
Hypertension	20 (11.8)†
Diabetes	48 (28.4)†
Ischemic Heart Disease	8 (4.7)†
Smoking	28 (16.6)†
Lactation	94 (55.6)†
Pregnancy	7 (4.1)†
Culture Organism	
MRSA	32 (18.9)†
MSSA	109 (64.5)†
Klebsiella	9 (5.3)†
Staph. Epidermidis	9 (5.3)†
Pseudomonas	10 (5.9)†
Outcome	
Resolution	166 (98.2)†
Sepsis	3 (1.8)†

*= Median (Interquartile Range), †= n (%) Median and interquartile ranges were reported because of the skewed distribution of these variables.

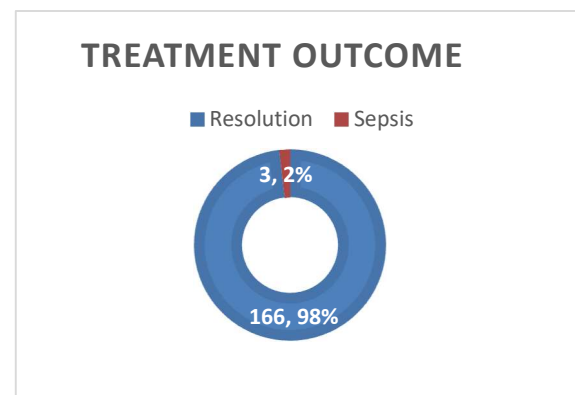


Figure 2 Treatment outcome of the study population

Table 2 provides a comparative analysis of risk factors associated with single incision and drainage (I&D) procedures (n=135) versus repeated I&D procedures (n=34). The median age of individuals in the single I&D group is 33 years (IQR: 29-39), while the repeated I&D group has a higher median age of 45 years (IQR: 36.75-49.25), with a statistically significant difference (p < 0.01) determined by the Mann-Whitney U test. Regarding comorbidities, the prevalence of diabetes is markedly higher in the repeated I&D group (76.5%) compared to the single

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I&D group (16.3%), as indicated by a significant chi-squared test result ($p < 0.01$). Similarly, smoking shows a significantly higher prevalence among individuals in the repeated I&D group (55.9%) compared to the single I&D

group (6.7%), with a chi-squared test result ($p < 0.01$). The table emphasizes statistically significant differences, providing critical insights into risk factors associated with repeated I&D procedures.

Table 2: Comparison between risk factors associated with repeated incision and drainage.

Variable	Single I&D (n=135)	Repeated I&D (n=34)	p-value
Age, years	33 (29-39)*	45 (36.75 - 49.25)*	<0.01 [#]
Diabetes	22 (16.3)†	26 (76.5)†	<0.01‡
Smoking	9 (6.7)†	19 (55.9)†	<0.01‡

*= Median (Interquartile Range), †= n (%), # = Mann Whitteny U test, ‡ = chi squared test
Only statistically significant differences between the study groups are reported.

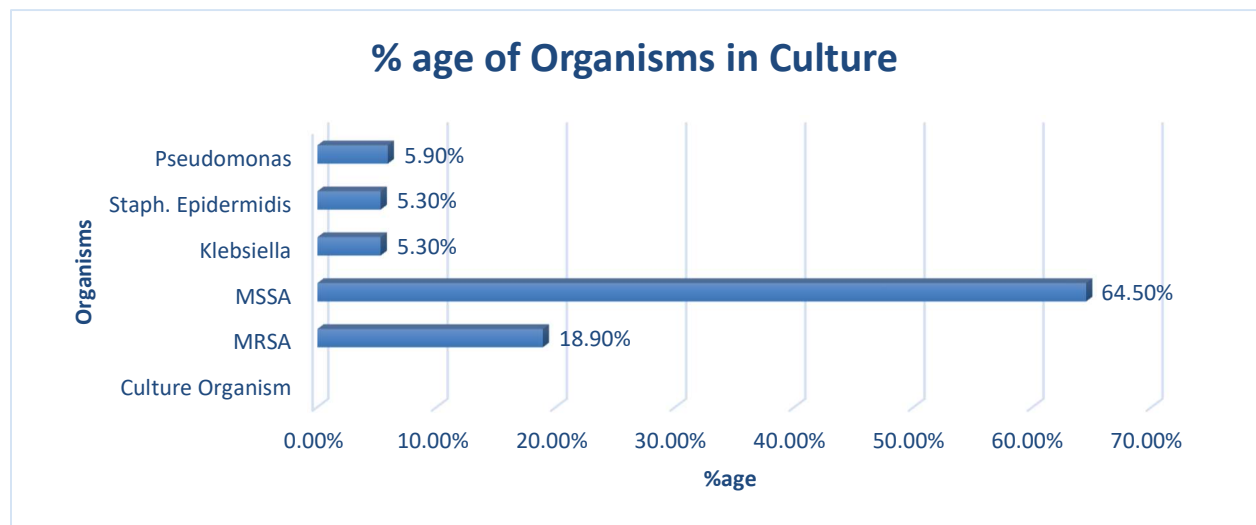


Figure 1: percentages of microorganisms in breast abscess of the study population

Discussion

Our study shows that parameters, including clinical characteristics, imaging features, microbiological profile, and antibiotic regimen, connect with the chance of a repeat surgery in women with breast abscesses. This lends credence to studies that find a correlation between a person's smoking history and adverse outcomes such as a higher risk of recurrence (O'Hara et al., 1996; Ohta et al., 1998). Nipple rings have also been linked to less favorable results in the past. Clinical characteristics like as race, obesity, diabetes, and lactation have also been identified as correlates of outcomes. There has been a lot of focus on past smoking habits as a predictor of abscess recurrence. Anaerobic and mixed infections are more common among smokers, a fact that might affect clinical care since standard cultures tend to underestimate anaerobes. As a result, smokers who also have anaerobes may get inadequate treatment, increasing their risk of relapse. Smoking may directly or indirectly affect the retroareolar epithelium or the hormones that stimulate breast milk. In addition, squamous metaplasia is more common among smokers because their plasma b-carotene levels are lower. Smoking reduces production of interleukin-8, which stimulates neutrophil chemotaxis at an inflamed location (Ohta et al., 1998). Up to 25% of people with abscesses may be smokers. There is a correlation between smoking and sub-areolar non-lactating abscesses, with 70% being linked to more than ten cigarettes daily.

There is no proof that smoking causes nonlactating abscesses. Younger women are more susceptible to certain dangers, and smoking is one of them (Rizzo et al., 2010). The relevance of acquiring cultures in studies with small cohorts is emphasized by the fact that a wide range of organisms, including coagulase-negative *Staphylococcus aureus*, anaerobes, Mycobacteria, Streptococcus, and Gordonia, have all been linked to the development of nipple ring syndrome (Bengualid et al., 2008). Although other research has shown worse results for diabetic patients, this is the case in our sample. Recurrence of breast abscesses has been linked to diabetes and other risk factors. Nonlactating mothers with diabetes accounted for 64% of all cases, while African Americans accounted for 89% of all cases of nonlactating abscesses (Yamamoto et al., 2006). In agreement with many other research, ours confirms the vast variety of microorganisms recovered in abscess cultures (Trop et al., 2011) but also ensures *S. aureus* is the most prevalent causal bacterium overall (Ferrara et al., 1990). Coagulase-negative, in addition to being most frequent in a postmenopausal population, *S. aureus* has been linked to breast implants. The prevalence of MRSA in our sample matches that seen in the scientific literature. *S. aureus* is the most prevalent pathogen in nonlactational abscesses, with MRSA accounting for up to 50% of the *S. aureus* in certain studies (Moazzez et al., 2007) and for up to 19% of the *S. aureus* in our sample, which included both lactational and nonlactational abscesses. Some studies cite

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Pseudomonas aeruginosa as the second most common organism after aerobic bacteria. In contrast, others cite anaerobic bacteria or a combination of both as the second most common cause of illness. Sub-areolar non-lactating abscesses that recur frequently commonly include anaerobes (Versluijs-Ossewaarde et al., 2005). According to the available research, the microbial composition of non lactational/nonrecurrent vs. recurrent primary breast abscesses is different, with more *Staphylococcus* in the former and more diverse flora in the latter (Bharat et al., 2009).

Conclusion

In conclusion, our research shows patients with advancing age, diabetes and history of smoking should be given paramount focus when treating breast abscess as they have higher chances of failed treatment with incision and drainage and disease recurrence.

Declarations

Data Availability statement

All data generated or analyzed during the study are included in the manuscript.

Ethics approval and consent to participate

Approved by the department Concerned.

Consent for publication

Approved

Funding

Not applicable

Conflict of interest

The authors declared absence of conflict of interest.

Author Contribution

BUSHRA JAWAID (RESIDENT)

Coordination of collaborative efforts.

Conception of Study, Development of Research Methodology Design, Study Design, Review of manuscript, final approval of manuscript

FARHAN ZAHEER (PROFESSOR)

Manuscript revisions, critical input.

HASSAN SHAHAB (RESIDENT)

Coordination of collaborative efforts.

KOMAL (RESIDENT)

Data entry and Data analysis, drafting article

SUMBLA SALMAN (RESIDENT)

Manuscript revisions, critical input.

Data acquisition, analysis.

BUSHRA SHAKEEL (RESIDENT)

Data acquisition, analysis.

Coordination of collaborative efforts.

References

Agrawal, S., Yadav, V. S., Srivastava, A., Kapil, A., and Dhawan, B. (2018). Breast abscess due to *Salmonella paratyphi* A: Case reports with review of literature. *Intractable & Rare Diseases Research* 7, 130-133.

- Amir, L. H., Garland, S. M., and Lumley, J. (2006). A case-control study of mastitis: nasal carriage of *Staphylococcus aureus*. *BMC Family Practice* 7, 1-9.
- Bengualid, V., Singh, V., Singh, H., and Berger, J. (2008). *Mycobacterium fortuitum* and anaerobic breast abscess following nipple piercing: case presentation and review of the literature. *Journal of Adolescent Health* 42, 530-532.
- Berens, P. D. (2001). Prenatal, intrapartum, and postpartum support of the lactating mother. *Pediatric Clinics* 48, 365-376.
- Bharat, A., Gao, F., Aft, R. L., Gillanders, W. E., Eberlein, T. J., and Margenthaler, J. A. (2009). Predictors of primary breast abscesses and recurrence. *World journal of surgery* 33, 2582-2586.
- David, M., Handa, P., and Castaldi, M. (2018). Predictors of outcomes in managing breast abscesses—A large retrospective single-center analysis. *The Breast Journal* 24, 755-763.
- Dener, C., and İnan, A. (2003). Breast abscesses in lactating women. *World journal of surgery* 27, 130-133.
- Ferrara, J., Leveque, J., Dyess, D., and Lorino, C. (1990). Nonsurgical management of breast infections in nonlactating women. A word of caution. *The American Surgeon* 56, 668-671.
- Gollapalli, V., Liao, J., Dudakovic, A., Sugg, S. L., Scott-Conner, C. E., and Weigel, R. J. (2010). Risk factors for development and recurrence of primary breast abscesses. *Journal of the American College of Surgeons* 211, 41-48.
- Kahn, Z. M. (2013). The frequency of various causes of breast lumps in females presenting to surgical OPD in a tertiary care hospital. *Annals of Pakistan Institute of Medical Sciences* 9, 26-9.
- Kasales, C. J., Han, B., Smith Jr, J. S., Chetlen, A. L., Kaneda, H. J., and Shereef, S. (2014). Nonpuerperal mastitis and subareolar abscess of the breast. *American Journal of Roentgenology* 202, W133-W139.
- Kvist, L. J., and Rydhstroem, H. (2005). Factors related to breast abscess after delivery: a population-based study. *BJOG: An International Journal of Obstetrics & Gynaecology* 112, 1070-1074.
- Leung, S. S. (2016). Breast pain in lactating mothers. *Hong Kong Medical Journal* 22, 341.
- Manzoor, A., Rashid, I., Waqar, S., and Shah, S. A. (2022). Comparison of Needle Aspiration and Incision & Drainage in the Management of Lactational Breast Abscess. *Journal of The Society of Obstetricians and Gynaecologists of Pakistan* 12, 32-37.
- McPherson, K., Steel, C., and Dixon, J. (2000). Breast cancer—epidemiology, risk factors, and genetics. *Bmj* 321, 624-628.
- Meguid, M. M., Oler, A., Numann, P. J., and Khan, S. (1995). Pathogenesis-based treatment of recurring subareolar breast abscesses. *Surgery* 118, 775-782.
- Moazzez, A., Kelso, R. L., Towfigh, S., Sohn, H., Berne, T. V., and Mason, R. J. (2007). Breast abscess bacteriologic features in the era of community-acquired methicillin-resistant *Staphylococcus aureus* epidemics. *Archives of Surgery* 142, 881-884.
- O'Hara, R., Dexter, S., and Fox, J. (1996). Conservative management of infective mastitis and breast abscesses after ultrasonographic assessment. *Journal of British Surgery* 83, 1413-1414.
- Ohta, T., Yamashita, N., Maruyama, M., Sugiyama, E., and Kobayashi, M. (1998). Cigarette smoking decreases interleukin-8 secretion by human alveolar macrophages. *Respiratory medicine* 92, 922-927.
- Rizzo, M., Gabram, S., Staley, C., Peng, L., Frisch, A., Jurado, M., and Umpierrez, G. (2010). Management of breast abscesses in nonlactating women. *The American Surgeon* 76, 292-295.

[Citation: Jawaid, B., Zaheer, F., Shahab, H., Komal, S., Salman, S., Shakeel, B. (2024). Breast abscesses requiring repeat interventions and their associated risk factors, a prospective, single centred study. *Biol. Clin. Sci. Res. J.*, 2024: 657. doi: <https://doi.org/10.54112/bcsrj.v2024i1.657>]

- Shaikh, B., Shah, A. A., Sohu, K. M., and Solangi, R. A. (2014). Needle aspiration in the treatment of breast abscess. *Rawal Med J* **39**, 58-60.
- Toomey, A., and Le, J. K. (2017). Breast Abscess.
- Trop, I., Dugas, A., David, J., El Khoury, M., Boileau, J.-F., Larouche, N., and Lalonde, L. (2011). Breast abscesses: evidence-based algorithms for diagnosis, management, and follow-up. *Radiographics* **31**, 1683-1699.
- Versluijs-Ossewaarde, F. L., Roumen, R. M., and Goris, R. (2005). Subareolar breast abscesses: characteristics and results of surgical treatment. *The breast journal* **11**, 179-182.
- Watt-Boolsen, S., Rasmussen, N. R., and Blichert-Toft, M. (1987). Primary periareolar abscess in the nonlactating breast: risk of recurrence. *The American journal of surgery* **153**, 571-573.
- Yamamoto, D. S., Viale, P. H., and Hurst, M. (2006). Picture this. Does every breast lump need to be worked up despite previous diagnoses? *Clinical Journal of Oncology Nursing* **10**.



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