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Original Research Article

Aerobic microbiological profile and antimicrobial sensitivity pattern of breast abscess in a tertiary care hospital, Kashmir

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ABSTRACT

Background: Breast abscess is a painful condition of a breast which manifests as a lump, primarily caused by infection. Breast abscess usually develops after mastitis during lactation and commonly affect the women between 18 to 50 years of age group. The breast abscess being one of the common medical condition encountered in women, it becomes very important to have the knowledge of latest trends seen in microorganisms isolated and antibiotics which can be useful for empirical treatment.

Purpose: To study microbial profile and antibiogram of bacteria isolated from pus samples of breast abscess.

Materials and Methods: A total of 84 samples of pus were received and processed during a period of one year. Antimicrobial susceptibility was done according to CLSI guidelines.

Study Design: Prospective study.

Results: Out of total 84 samples of pus from lactational and non-lactational breast abscess, 73 bacteria were isolated. *Staphylococcus aureus* 58(79.4%) was predominant organism both in lactational and non-lactational breast abscess, 53.4% being methicillin resistant *Staphylococcus aureus* (MRSA) and 46.6% being methicillin sensitive *Staphylococcus aureus* (MSSA). Gram negative bacteria constituted only 10.9% of total bacteria isolated.

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1. Introduction

Breast abscess is a localized collection of purulent material within breast and is one of the common clinical condition seen in females.¹ Breast infections are the most common benign breast problem during pregnancy and the puerperium.² The incidence is highest in the first few weeks postpartum, decreasing gradually after that.³ The infection can affect skin overlying breast which can be primary or secondary to mastitis or lesion in skin. Breast abscess can be Lactational or non-lactational with lactational breast abscess predominant in women of reproductive age group and non-

lactational breast abscess predominant in perimenopausal age group.^{4,5} The acute puerperal mastitis is usually first step for onset of lactational breast abscess with incidence of 2.5% - 33%.⁴ The portal of entry for bacteria is usually a fissure at base of nipple so that infection occurs most often in early weeks of puerperium.⁶ About 90% of non-lactational breast abscesses are sub-areolar.⁷ Non-lactational, sub-areolar abscesses tend to occur in women toward the end of their reproductive years.⁸ These abscesses have a chronic course, often with recurrent obstruction of the ducts with keratin plugs and have a tendency to form extensive fistulas.^{7,9} Diabetes mellitus and smoking are two very important risk factors for periductal mastitis and non-lactational abscesses.^{10,11} The non-lactational breast

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abscesses may be caused by rare granulomatous, bacterial or fungal etiologies.^{8,12}

The most common organism in lactational breast abscess is *S.aures* originating from baby's nasopharynx and mother's skin, though other Gram positive and Gram negative bacteria are also involved.¹³ Some of breast abscess are polymicrobial with isolation of both aerobes and anaerobes. The anaerobes are usually isolated from chronic and recurrent cases of breast abscess.^{14,15} The unusual pathogens may be responsible for breast abscess such as Mycobacterium, Actinomycetes, Brucella, Fungi.¹ Salmonella typhi is a well-recognized cause of breast abscesses in countries where typhoid disease is prevalent.¹⁶ The breast abscesses caused by atypical organisms may be initial presentation of HIV infection. The etiology may vary in lactational and non-lactational breast abscesses but both are characterized by squamous metaplasia of epithelium of milk sinuses with partial blockage of lactiferous duct resulting in entrapment of micro-organisms.

The treatment modalities for breast abscess generally consists of conservative management in form of analgesics, antibiotics and regular breast emptying (esp. in lactating). If conservative treatment fails then percutaneous drainage or sometimes surgical incision and drainage may be required. USG guided drainage is less minimal and presently the preferred management for breast abscess.^{17,18}

2. Material and Methods

This prospective study was conducted from January 2019 to December 2019 in microbiology department of SKIMS Medical college during which 84 samples of pus from patients of Breast abscesses were received.

The pus samples were received in tightly closed universal containers at department of microbiology and were processed by standard laboratory techniques. The specimens were examined by Gram stained smears and inoculated on routine culture media, Blood agar and MacConkey agar. The inoculated culture plates were incubated at 37°C for 18-24 hrs. If growth was not observed after 18-24hrs then incubation of culture plates was extended upto another 24 hrs before declaring sterile. The isolated individual colonies were observed for colour, shape, size, margins, elevation and hemolytic pattern. The isolated organisms were identified by spot tests viz catalase test, coagulase test (slide coagulase and tube coagulase), Oxidase test, Indole test, Methyl red test, VP test, Citrate test, Urease test, Triple sugar iron test, and other conventional biochemical methods.^{19,20} The antibiotic sensitivity tests of isolated organisms were done on Muller-Hinton agar by Kirby Bauer disc diffusion technique. Post incubation the zones of inhibition were measured and interpreted according to methods recommended by Clinical and Laboratory Standards Institute. The *S.aures* was tested for methicillin resistance

by using Cefoxitin (30µg) disc. ESBL production was tested among Gram negative bacilli by double disc diffusion method as recommended by Clinical and Laboratory Standards Institute.²¹ The panel of antimicrobials included are Ampicillin (10µg), Amoxycylav (20/10µg), Amikacin (30µ), Clindamycin (20µg), Cefazolin (30µg), Ceftriaxone (30µg), Cefipime (30µg), Ceftazidime (30µg), Cefoxitin (30µg), Ciprofloxacin (5µg), Cotrimoxazole (25µg), Erythromycin (15µg), Gentamicin (30µ g), Gentamicin (120µ), Imipenem (10µg), Linezolid (30µg), Tetracycline (30µg), Piperacillin-Tazobactam 100/10µg), Teicoplanin (30µ), Vancomycin (30µg).

3. Results

The mean age of patients was 30.3yrs (range 17-51yrs). The majority of patients belonged to age group of 24-35 yrs (54.6%), two patients were above age of 50 yrs. Out of 84 samples 69 (82.1%) showed growth, with total number of isolates 73. The polymicrobial growth was observed in 3(3.5%) samples. The polymicrobial growth was seen only in non-lactational breast abscess. Table 1 Total number of Gram positive isolates were 65(89.4%) and Gram negative isolates were 8(10.9%). The majority of the isolates were Gram positive bacteria among which *S.aures* (79.4%) was predominant bacteria isolated. Among the 58 *S. aureus* isolates, methicillin sensitive isolates (MSSA) were 27(46.5%) and methicillin resistant isolates (MRSA) were 31(53.4%). Besides *S.aures* the other Gram positive bacteria isolated were Enterococcus(3) and Coagulase negative Staphylococcus(4). Table 2 The Gram negative bacteria isolated are *E.coli*, *Pseudomonas aeruginosa*, *Proteus* spp., and *Acinetobacter* spp. All the Gram negative bacteria were isolated from cases of non-lactational breast abscess.

All the isolates of Gram positive bacteria were resistant to Ampicillin. The methicillin sensitive Staphylococcus *aures* (MSSA) were 100% sensitive to Teicoplanin, Linezolid and Vancomycin. The sensitivity of MRSA for Teicoplanin and vancomycin was 100%, 30 out of 31 isolates of MRSA (96.7%) were sensitive to linezolid. Out of 11(18.9%) isolates of *S.aures* which were positive for D test (inducible/ constitutive resistance), 7 isolates were of MRSA and 3 isolates were of MSSA. All the isolates of Coagulase negative Staphylococcus were methicillin sensitive. (Table 2) The Gram negative bacteria isolated are *E.coli*(4), *Pseudomonas aeruginosa*(2), *Proteus*(1) and *Acinetobacter*(1) which accounted for 10.9% of total isolates. Two isolates of *E.coli* were ESBL producers. All the isolates of Gram negative bacteria were resistant to ampicillin and all isolates were sensitive to Imipenem. Most of Gram negative bacteria isolated were resistant to Ciprofloxacin. All Gram negative bacteria were sensitive to aminoglycoside antibiotic except one isolate of *E.coli* (Table 3).

Table 1: Distribution of isolates in lactational and Non-lactational Breast abscess. Acinet= Acinetobacter spp.

Lactational Breast abscess		Non-lactational Breast abscess	
<i>S.aures</i>	45	<i>S.aures</i>	11
Enterococcus spp.	3	<i>E.coli</i>	2
CONS	3	Pseudomonas	2
		Proteus	1
		Polymicrobial	<i>S.aures+ E.coli</i>
			<i>S.aures+ E.coli</i>
			CONS+ Acenit
Total	51	Total	22

Table 2: Bacterial isolates from 84 pus samples of breast abscess.

Type of Bacteria	Isolates n=73
Gram Positive Bacteria	
<i>S.aures</i>	
1. MRSA	31
2. MSSA	27
Coagulase negative Staphylococcus	4
Enterococcus	3
Gram Negative Bacteria	
<i>E.coli</i>	4
Pseudomonas	2
Acinetobacter	1
Proteus	1

Table 3: Antibiotic sensitivity pattern of Gram positive bacteria isolated from breast abscess. n= number of isolates, %S=Percentage sensitivity

Antibiotics	MSSAn=27 %S	MRSAn=31 %S	Enterococcusn=3 %S	CONSn=4 %S
Ampicillin	0	0	0	0
Amoxyclav	25.9	0	0	25
Amikacin	-	-	66.6	-
Cefazolin	70.3	0	-	75
Clindamycin	77.7	74.1	-	100
Ciprofloxacin	29.6	25.8	0	50
Cotrimoxazole	55.5	51.6	-	50
Erythromycin	59.2	58	-	75
Gentamicin	96.2	93.4	-	100
Gentamicin(HL)			66.6	
Tetracycline	69.2	61.2	-	75
Teicoplanin	100	100	100	100
Linezolid	100	96.7	100	100
Vancomycin	100	100	100	100

Table 4: Antibiotic sensitivity of Gram negative bacteria isolated from breast abscess: n= number of isolates.

Antibiotic	<i>E.coli</i> n=4	Proteus n=1	Pseudomonas n=2	Acenitobacter n= 1
Ampicillin	R	R	-	R
Amikacin	3/4	S	S	S
Ceftazidime	2/4	S	S	R
Cefepime	2/4	S	S	R
Ceftriaxone	1/4	S	-	-
Ciprofloxacin	1/4	R	R	R
Colistin	-	-	-	S
Cotrimoxazole	1/4	S	-	R
Gentamicin	-	-	S	S
Piperacillin-Tazobactam	2/4	S	S	S
Imipenem	4/4	S	S	S
Polymyxin B	-	-	S	-

4. Discussion

The breast abscess is very painful condition with localization of abscess most commonly to upper and outer quadrant which may occur with untreated mastitis characterized by redness, heat, swelling and pain.^{11,22} *Staphylococcus aureus* colonizes lesional and normal appearing skin of patients and is isolated from 2-25% of healthy skin.²³ Lactational breast abscess was predominant in our study as documented in various other studies also.^{24,25} *S.aureus* was predominant bacteria isolated in lactational as well as in non-lactational breast abscess which is in concordance with other studies.^{26,27} In our study methicillin resistant *Staphylococcus aureus* (MRSA) isolated were 53.4%, while in other studies it was observed that percentage of MRSA isolated vary from 18-58%.²⁸⁻³⁰

The other studies have reported good percentage of *Staphylococcus* susceptible to cotrimoxazole while in our study only 55.5% MSSA and 51.6% MRSA were sensitive to cotrimoxazole.³¹ All the isolates of Gram positive bacteria were highly sensitive to Gentamicin and reasonable sensitivity was observed in this study for Clindamycin ranging from 74 to 100% among different isolates of Gram positive bacteria. Coagulase negative *Staphylococcus* though usually considered as contaminants of pus samples are one of prominent organisms in pathogenesis of breast abscess as documented in study of Ashkan Moazzzez et al.²⁶ In our study out of 4 Coagulase negative *Staphylococcus*, 3 were isolated from lactational breast abscess and 1 was isolated from non-lactational breast abscess. The number of Gram negative bacteria grown were 8 which were 10.6% of total isolates. The limitation of present study is that the sensitivity pattern of Gram negative bacteria can not be commented upon as only eight Gram negative bacteria were isolated, another limitation of our study is that the anaerobic culture was not done, many studies reported isolation of anaerobic bacteria in breast abscess,^{26,32} which signify the importance of anaerobic bacteria in etiology of breast abscess. The knowledge of antimicrobial resistance pattern is must to start empirical treatment in breast abscess till culture reports are available. In present study 15(18%) samples showed no growth, we can presume that out of these culture negative samples and also from some culture positive samples could have grown anaerobic organisms as well. In our study mixed growth was seen in non-lactational breast abscess, it has been documented by other studies also that mixed flora is commonly seen in non-lactational breast abscess than lactational breast abscess.^{1,24} Antibiotics are being used with aspiration (USG guided or catheter drainage) consistently for breast abscess.^{18,33} Tetracycline and ciprofloxacin are not preferred in lactational breast abscess because of adverse effects as these are secreted in milk.

5. Conclusion

Staphylococcus aureus was isolated in majority of cases, both in lactational and non-lactational breast abscess. The failure of empirical β -lactam antibiotic treatment should prompt a treatment with antibiotics active against MRSA. In non-lactating breast abscess Gram negative bacteria and anaerobic bacteria are responsible for many cases so while starting antibiotic therapy due consideration should be given to cover these bacteria. The anaerobic culture from pus samples of breast abscess is must, as high percentage of anaerobic organisms have been reported in many studies. The knowledge of microbial profile and antibiogram of bacteria is essential in determining the empirical therapy for breast abscess.

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7. Conflict of Interest

The authors declare they have no conflict of interest.

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