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Clinico-Bacteriological Study of Pyoderma with Special Reference to Antibiotic Sensitivity in a Tertiary Care Rural Hospital.

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ABSTRACT

To study clinicobacteriological features of pyoderma with antibiotic succeptibility pattern in a tertiary care hospital. In this cross sectional study 150 patients were enrolled after considering various exclusion criterias. A detailed history was taken and clinical types of pyoderma were noted. Pus sample was collected from lesion and sent to microbiology department for gram stain, culture and antibiotic succeptibility pattern. Out of 150 patients, maximum patients i.e. 101[67.3%] had primary pyoderma and 49[32.7%] had secondary pyoderma. Folloiculitis [39.60%] and infected eczema [48.98%] were the common clinical types of primary and secondary pyoderma respectively. In primary pyoderma maximum growth of S. aureus, S. pyogens and coagulase negative S.aureus were major isolates from primary and secondary pyoderma. Other organisms being K. pneumonia, Acinetobactor, E.coli and Ps. aeruginosa. Among Staph. aureus species maximum sensitivity was observed to imipenum, linezolid, vancomycin and resistance to amoxyclav, ciprofloxacin and ofloxacin. Among Strep. pyogens maximum sensitivity was observed to vancomycin, amikacin, penicillin and resistance to amoxyclav, cotrimoxazole & tetracycline. Most of the organisms were highly sensitive to newer antibiotics while showing resistance to the routinely used conventional drugs.

Keywords: Primary pyoderma, secondary pyoderma, antibiotic sensitivity and resistance, pyogenic organisms.

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INTRODUCTION

Pyoderma is defined as a skin infection with pyogenic bacteria, generally Staphylococcus aureus, Streptococcus pyogenes or both [1]. Other bacteria's involved are mixed Gram positive and Gram-negative aerobic and anaerobic bacteria as well [2]. The Gram negative bacteria's include E.coli, Klebsiella spp., Enterobacter spp., Proteus spp., Pseudomonas spp. and Gram positive bacilli include Bacillus anthracis [3,4,5]. Pyodermas are classified into primary and secondary types. It is called primary when it occurs on normal skin which includes impetigo, folliculitis, furunculosis, carbuncle, ecthyma & sycosis barbae and secondary when it complicates other skin diseases which include infected scabies, infected eczemas, infected wounds and infected trophic ulcers [6]. Now-a-days, in clinical practice, antibiotics are indiscriminately used in pyoderma without knowing the causative organism and its antibiotic susceptibility. This has led to emergence of serious problems of drug resistance [7], treatment failure and frequent recurrences. This resistance is probably due to ability of microorganism to produce penicillinase [β lactamase] [8]. Thus it is important to know the causative organism and its antibiotic susceptibility pattern for effective treatment and to prevent indiscriminate use of antibiotics. The aim of the study was to know clinico-bacteriological characteristics and antibiotic susceptibility pattern of pyoderma in this region of Vidarbha. The objectives were 1) To study various clinical types of pyoderma. 2) To study the causative organisms responsible for pyoderma. 3) To study antibiotic sensitivity and resistance pattern of organisms responsible for pyoderma.

MATERIALS AND METHODS

This cross sectional study with a sample size of 150 patients was carried out in the Department of Dermatology, Venereology and Leprosy [D. V. L], Acharya Vinoba Bhave Rural Hospital and Microbiology Department, Jawaharlal Nehru Medical College, Sawangi, Wardha over a period of 2 years from August 2012 – August 2014. The ethical clearance was taken from Institutional Ethics Committee. Inclusion criterias were patients with pyoderma of all age groups, all types of primary and secondary pyoderma, recurrent pyoderma and patients of pyoderma associated with immunocompromised conditions & on immunosuppressive drugs. Exclusion criteria's were patients on topical and systemic antibiotics within 2 weeks duration, patients of resolving pyoderma. Written informed consent was taken from all the patients enrolled for the study. A detailed history was taken and clinical types of pyoderma were noted. Pus sample for the study was obtained from the lesions of pyoderma. It was processed in Microbiology department of Jawaharlal Nehru Medical College for detection of causative organism and antibiotic susceptibility. Organisms were identified by gram stain, culture & relevant biochemical tests. All the isolates were tested for their antibiotic susceptibility by commercially prepared discs 6mm in diameter available from Himedia laboratory private limited – Mumbai by using Kirby Bauer disc diffusion technique as per CLSI guidelines [9]. Statistical analysis was done by using descriptive and interferential statistics using chi-square test. Software used in analysis was SPSS 17.0 version and graph pad prism 5.0.

OBSERVATION AND RESULTS

In present study, maximum patients i.e. 65[43.33%] were in 20-49 years age group followed by 29[19.33%] patients in ≥ 50 years age group and 28[18.67%] patients each in 0-9 years and 10-19 years age group respectively with mean age of 28.73% $^{\pm}$ 19.98 years. Maximum patients i.e. 95[63.33%] were males and 55[36.67%] were females. Majority of patients i.e. 97[64.67%] belonged to middle class followed by 51[34%] in lower class and 2[1.33%] in upper class. Out of 150 patients, maximum patients i.e. 101[67.3%] had primary pyoderma and 49[32.7%] had secondary pyoderma [Graph 1]. Among 101 patients of primary pyoderma, folliculitis was seen in maximum patients i.e. 40[39.60%] followed by furuncle in 33[32.67%], impetigo contagiosa in 10[9.90%], ecthyma in 8[7.92%], erysipelas in 3[2.97%], cellulitis and carbuncle in 2[1.98%] patients each and bullous impetigo, sycosis barbae and paronychia in 1[0.99%] patient each [Table 1]. Among 49 patients of secondary pyoderma, infected eczema was seen in maximum patients i.e. 24[48.98%] followed by pemphigus vulgaris with secondary infection in 5[10.20%], infected dermatophytosis and infected ulcer in 3[6.12%] each, herpes zoster with secondary infection, mycetoma with secondary infection and infected scabies in 2[4.08%] each, vasculitis with secondary infection, irritant contact dermatitis with secondary infection, tuberculosis, hidradenitis suppurativa, pediculosis with secondary infection, toxic epidermal necrolysis with secondary infection, infected pyoderma gangrenosum and infected keloid in 1[2.04%] each [Table 1].

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Graph 1: Distribution of patients according to type of pyoderma

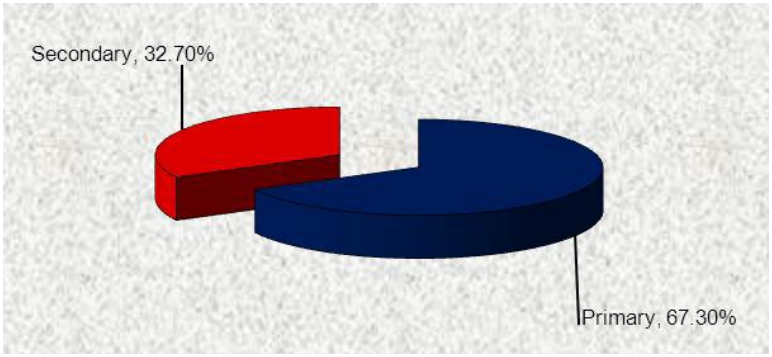

Table 1: Distribution of clinical types of primary pyoderma and underlying diseases associated with secondary pyoderma

Clinical types of primary pyoderma	No of cases (%)		Underlying diseases associated with secondary pyoderma	No of cases (%)	
	N0	%		N0	%
Bullous Impetigo	1	0.99	Infected Eczema	24	48.98
Impetigo Contiagosa	10	9.90	Infected dermatophytosis	3	6.12
Furuncle	33	32.67	Pemphigus vulgaris with secondary infection	5	10.20
Follicuitis	40	39.60	Herpes Zoster with secondary infection	2	4.08
Carbuncle	2	1.98	Vasculitis with secondary infection	1	2.04
Erysipelas	3	2.97	Irritant Contact Dermatitis with secondary infection	1	2.04
Sycosis Barbae	1	0.99	Mycetoma with secondary infection	2	4.08
Paronychia	1	0.99	Infected Ulcer	3	6.12
Ecthyma	8	7.92	Tuberculosis (at the site of pleural tap)	1	2.04
Cellulitis	2	1.98	Hidradenitis suppurativa	1	2.04
			Pediculosis with secondary infection	1	2.04
			Toxic epidermal necrolysis with secondary infection	1	2.04
			Infected Pyoderma Gangrenosum	1	2.04
			Infected Keloid	1	2.04
			Infected Scabies	2	4.08
Total	101	100	Total	49	100

In patients of primary pyoderma, maximum growth of S. aureus was isolated in 62[61.39%] followed by coagulase negative staphylococcus (CONS) in 9 [8.91%] and S. pyogenes in 7[6.86%]. Other organisms isolated were K. pneumoniae and Acinetobacter[Table 2]. In patients of secondary pyoderma, maximum growth of S. aureus in 22[44.90%] was isolated followed by S. pyogenes in 5[10.20%] and CONS 1 in [2.04%]. Other organisms isolated were K. pneumoniae, Enterococcus, E.coli and Ps. aeruginosa [Table 3]. Among Staphylococci species [S. aureus and CONS] isolated in pyoderma, maximum sensitivity was observed to imipenum, linezolid, vancomycin, amikacin, clindamycin and tetracycline and maximum resistance to penicillin, amoxyclav, ciprofloxacin and ofloxacin on average considering isolate from pyoderma [primary, secondary pyoderma in single and mixed isolate together]. Among S. pyogenes isolated in pyoderma, maximum sensitivity was observed to vancomycin, amikacin, penicillin, erythromycin, ofloxacin and ciprofloxacin and maximum resistance to amoxyclav, cotrimoxazole, tetracycline, ofloxacin and ciprofloxacin on average considering isolate from pyoderma [primary, secondary pyoderma in single and mixed isolate together].

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Table 2: Distribution of microorganisms isolated on culture in primary pyoderma

Organism Grown	No of patients	Percentage (%)
SINGLE ISOLATE		
Staphylococci	71	70.30
***S. aureus**	62	61.39
CONS	9	8.91
S. pyogenes	7	6.86
K. pneumoniae	2	1.96
MIXED ISOLATE		
S. aureus + K. pneumoniae	1	0.98
S. aureus + ab	2	1.96
CONS + S. pyogenes	2	1.96
S. aureus + S. pyogenes	1	0.98
No growth	14	13.73
Contaminants	1	0.98
Total	101	100.00

S.aureus- Staphylococcus aureus, CONS- Coaguase negative staphylococcus, K. pneumoniae- Klebsiella pneumoniae, ab- Acinetobacter, S. pyogenes- Streptococcus pyogenes.

Table 3: Distribution of microorganisms isolated on culture in secondary pyoderma

Organism Grown	No of patients	Percentage (%)
SINGLE ISOLATE		
Staphylococci	23	46.94
S. aureus	22	44.90
CONS	1	2.04
S. pyogenes	5	10.20
Ps. aeruginosa	1	2.04
K. pneumoniae	1	2.04
MIXED ISOLATE		
S. aureus + K. pneumoniae	1	2.04
S. aureus + E.coli	1	2.04
CONS + S. pyogenes	2	4.08
S. aureus + E	1	2.04
S. aureus + S. pyogenes	2	4.08
No growth	11	22.45
Contaminants	1	2.04
Total	49	100.00

S. aureus- Staphylococcus aureus, CONS- Coagulase negative staphylococcus, K. pneumoniae- Klebsiella pneumoniae, Ps. aeruginosa- Pseudomonas aeruginosa, S. pyogenes- Streptococcus pyogenes.

Among K. pneumoniae isolated in pyoderma, maximum sensitivity was observed to amikacin, ciprofloxacin, imipenum and ceftriazone. It showed maximum resistance to ceftazidime and tetracycline on average considering isolate from pyoderma [primary, secondary pyoderma in single and mixed isolate together]. Among Ps. aeruginosa isolated in pyoderma, sensitivity was observed to amikacin, ciprofloxacin, imipenum, piperacillin, ceftazidime, netelin and tazobactum and resistance was seen to ceftriazone. Among E.coli isolated in pyoderma maximum sensitivity was observed to amikacin, ciprofloxacin, imipenum, cotrimoxazole, tetracycline and ceftazidime. Among Acinetobacter isolated in pyoderma, maximum sensitivity was observed to amikacin, ciprofloxacin, imipenum, tetracycline, ceftriazone and vancomycin and resistance was seen to cotrimoxazole and ceftriazone.

DISCUSSION

The results of the present study were discussed and compared with results of various studies. Graph 1 showed that maximum number of patients i.e. 101 [67.3%] had primary pyoderma and 49 [32.7%] had secondary pyoderma. Ghadage DP et al [3] in their study reported that 65.87% patients as primary pyoderma

and rest 34.13% as secondary pyoderma. Paudel U et al [10] in their study observed primary pyoderma in 60% and secondary pyoderma in 40% patients.

In the present study primary pyoderma was seen in 67.3% and secondary pyoderma in 32.7% which is in accordance with the above mentioned studies, accounting for more than 60%. This might be due to timely management of primary skin disorders and trauma. Patil R et al [11] in their study noted maximum cases of folliculitis [58.8%] followed by furunculosis [33.3%] in primary pyoderma. Paudel U et al [10] in their study of 75 cases of pyoderma, folliculitis was seen in 44.44% followed by furunculosis in 37.78%, impetigo contagiosa in 8.89%, ecthyma in 6.67% and bullous impetigo in 2.2%. Kulkarni V et al [12] in their study observed 37% cases of impetigo followed by folliculitis 24.86% and ecthyma 11%. In the present study among primary pyodermas, folliculitis, furunculosis and impetigo were more prevalent. These findings are more or less in accordance with most of the above studies. Hazarika N [13] in her study of primary pyoderma in 120 children, observed maximum growth of S. aureus in 119[74.38%] followed by β hemolytic Streptococci in 19[11.88%], S. aureus and Streptococci in 16[10%], CONS in 4[2.5%], Ps. aeruginosa and no growth in 1[0.63%] each. Gandhi S et al [14] in their study of primary pyoderma, the most common organism isolated was S. aureus 155 [77.5%] followed by Klebsiella spp. 10 [5%], β-hemolytic Streptococci and E. coli 6 [3%] each and Ps. aeruginosa 4 [2%]. There was no growth in 19 [9.5%] samples.

The causative organisms for primary pyoderma were S.aureus and S. pyogenes. Other organisms like K. pneumonia, E. coli, Enterococcus, Ps. aeruginosa, Proteus, Acinetobacter also acts as a pathogen but their role is minor. S. aureus seems to be the predominant spp. isolated in primary pyoderma as observed in present and above mentioned studies. The higher rates of S. aureus isolation in present and all of the above studies under review might be due to prolong staphylococcal carriage on the skin as compared to other pyogenic organisms. The findings of the present study regarding organisms isolated in primary pyoderma are more or less in accordance with above mentioned studies with S.aureus and S. pyogenes as predominant spp. Malhotra SK et al [5] in their study of 61 cases of pyoderma, secondary pyoderma was seen in 49 patients. Among those patients, S. aureus was isolated in 25[51.02%] followed by CONS in 6[12.24%], no growth in 5[10.20%], K. pneumoniae in 4[8.16%], S. pyogenes, Enterococci, E.coli, and mixed isolate [CONS and S. pyogenes, S. aureus and Enterococci] in 1[2.04%] each.

Kulkarni V et al [12] showed highest sensitivity of S. aureus to linezolid [100%] followed by vancomycin [86.32%], amikacin [85.26%], tetracycline [82.11%], cotrimoxazole [70.53%] and clindamycin [69.47%] and resistance to penicillin [90.53%] followed by ampicillin and ceftriazone [73.68%] each. CONS were maximum sensitive to vancomycin and linezolid [100%] followed by tetracycline [81.25%] and resistance to penicillin [75%]followed by cefotaxime [68.75%], ceftriazone [65.63%], ampicillin and ceftazidime [62.5%] each.

Patil R et al [11] in their study, noted S. aureus was sensitive to vancomycin [100%] followed by gentamicin [69%] and ciprofloxacin [58%] and were resistant to penicillin [87.2%] followed by erythromycin [42.9%]. Malhotra SK et al [5] observed that S. aureus *w*as highly susceptible to amikacin [100%] followed gentamicin [66%] and ciprofloxacin [52.4%] and were resistant to erythromycin and gatifloxacin [38.1%] each followed by ampicillin [33%] and cephalexin [28%]. CONS strains were sensitive to amikacin [77.7%] and gentamicin [66.6%]. It showed relatively low susceptibility to ampicillin [55.5%], erythromycin [44.4%] and gatifloxacin [33.3%] respectively. Tan HH et al [15] in their study, noted that S. aureus had a high rate of resistance [89.5%] to penicillin and ampicillin but was very sensitive [93%] to cloxacillin, cephalexin and cotrimoxazole. The incidence of erythromycin resistance was 18.7%. Nagmoti MJ et al [16] reported that Staphylococci showed highest resistance to ampicillin [85%], followed by penicillin [78%], tetracycline [40%] and ciprofloxacin [15%]. The present study showed maximum susceptibility of Staphylococci species to imipenum, linezolid, vancomycin, amikacin, ciprofloxacin, clindamycin and cotrimoxazole and resistance to penicillin, amoxyclav, ciprofloxacin and ofloxacin. The drug sensitivity pattern in this study showed a high resistance of S. aureus to penicillin. This is due to the emergence of penicillinase producing strains. These findings are more or less in accordance with the susceptibility pattern mentioned in above studies. Most of organisms are highly sensitive to the newer antibiotics like vancomycin, imipenum and linezolid while showing low susceptibility or resistance to the conventional antibiotics. Ahmed K et al [17] observed that β haemolytic streptococcus was highly sensitive to ofloxacin 41[95.3%] followed by erythromycin 38[88.3%] and gentamicin 36[88.7%]. Mathew SM et al [18] observed that S. pyogenes isolates were resistant to streptomycin [14.8%] and tetracycline [14.8%]. 100% sensitivity to gentamicin followed by 98.1% to erythromycin, 90.7% to penicillin and 85.2% to tetracycline was noted. Malhotra SK et al [5] in their study noted that streptococci were

sensitive to ampicillin, erythromycin, cephalexin, ciprofloxacin, gatifloxacin and linezolid [100%] each while sensitivity to gentamicin and amikacin was seen in [50%] each. In present study, drugs like vancomycin, amikacin and penicillin showed maximum susceptibility for S. pyogenes. Mathew et al showed 90.7% sensitivity to penicillin for group A streptococci. In present study, penicillin showed 77.85% sensitivity for S. pyogenes. Ghadage DP et al showed 70% sensitivity to amikacin for group A streptococci.In present study, amikacin showed 85.18% sensitivity for S. pyogenes. Susceptibility pattern for S. pyogenes in present study for cotrimoxazole, tetracycline, ofloxacin and ciprofloxacin were more or less in accordance with above mentioned studies.

Malhotra SK et al [5] observed that Klebsiella was sensitive to amikacin [75%] followed by gentamicin [50%], ciprofloxacin [50%] and cefotaxime [50%] but showed relatively low susceptibility to gatifloxacin [25%] and cephalexin [25%]. Klebsiella spp. was resistant to ceftriaxone, ciprofloxacin, cefotaxime and cephalexin [50%] each. Kulkarni V et al [12] showed that Klebsiella spp. were sensitive to imipenum [93.5%] followed by amikacin [87.5%] and were resistant to ceftriaxone and gentamicin [64.06%] each, cefotaxime and ampicillin [60.94%] each. The susceptibility pattern for K. pneumoniae in present study is more or less in accordance with the above mentioned studies. Kulkarni V et al [12] noted that Pseudomonas spp were sensitive to imipenum [100%] followed by amikacin and carbenicillin [80%] and were resistant to ampicillin [100%] followed by cefotaxime, ceftazidime, ceftriaxone and cefepime [80%] each. Ghadage DP et al [3] showed that Pseudomonas species were sensitive to amikacin [72%] and carbenicillin [57%]. The susceptibility pattern for Ps. aeruginosa in present study is more or less in accordance with the above mentioned studies. Khare et al [19] showed that E.coli was susceptible to gentamicin [100%] followed by streptomycin, kanamycin and cotrimoxazole [84.6%] each and less susceptible to penicillin and erythromycin. Susceptibility pattern of E. coli for cotrimoxazole in present study is approximately in accordance with Khare et al. Paudel U et al [20] showed that Enterococcus strain was 100% sensitive to ciprofloxacin and cotrimoxazole each followed by erythromycin and oxacillin [80%] each. It showed 100% resistance to ampicillin followed by cephalexin [60%]. Susceptibility pattern of Enterococcus for erythromycin in present study is approximately in accordance with Paudel U et al. Ghadage DP et al [3] in their study 100% sensitivity to amikacin, ciprofloxacin, clindamycin, gentamicin and norfloxacin was noted for Acinetobacter. Susceptibility pattern of Acinetobacter in present study is approximately in accordance with Ghadage DP et al. The percentage of bacterias isolated other than S.aureus and S. pyogenes are too small to comment upon their susceptibility pattern. In all the above mentioned studies there is variability in drugs used to study the sensitivity pattern of organisms responsible for pyoderma. Majority of the drugs used in present study and above mentioned studies showed more or less equal susceptibility pattern but the percentage of susceptibility pattern of various drugs used showed variability which could be explained on the basis that the sensitivity and resistance pattern depends upon the trend of antibiotic used in that geographic area. If particular systemic antibiotic is used for long duration then organism may show low susceptibility or resistance against that anthibiotic.

SUMMARY AND CONCLUSION

In present study, pyoderma was more prevalent among adults and elderly male patients of middle and lower socio-economic class. Majority of patients had primary pyoderma with folliculitis and furuncle being the most frequently observed clinical type. Among secondary pyoderma, infected eczema was more commonly seen. S. aureus and S. pyogenes were the predominant organisms isolated, others being K. pneumoniae, E. coli, Enterococcus, Acinetobacter and Ps. aeruginosa. Most of the organisms were highly sensitive to newer antibiotics while showing low susceptibility or resistance to routinely used conventional drugs.

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