



A Study of Bacteriological Isolates of Pyoderma and Its Carrier Sites

KEYWORDS

Pyoderma, Staphylococcus, Antibiotic susceptibility, Phage typing

G.Ratna Kumari

N.Sujatha

Department of Microbiology, Andhra Medical college, Visakhapatnam

Department of Microbiology, Andhra Medical college, Visakhapatnam

P.Balamurali Krishna

Anila S.Nayar

Department of Microbiology, Andhra Medical college, Visakhapatnam

Department of Dermatology

ABSTRACT

Pyoderma is one of the commonest clinical conditions encountered in Dermatological practice. The etiological agents are Staphylococcus aureus, Streptococcus pyogenes and others. Staphylococci are from normal skin and may be a source of infection. In the present study we tried to correlate the features of pyoderma cases with normal skin of axilla and anterior nares

Aims and objectives: To isolate and identify the bacterial organisms from clinical samples of patients with pyoderma, To study the antibiotic susceptibility pattern of isolates and phage typing of the Staphylococcal isolates

Materials and methods: Bacterial flora from 100 cases of pyoderma and normal skin of anterior nares and axillary skin were analyzed and tested for biochemical reactions, antibiotic sensitivity and phase typing

Results: Out of the 100 cases studied, 67 were males and 33 were females, with a high incidence in 0 to 10years age group Results: Staphylococcus was the commonest organism isolated in the pyoderma as well as normal skin showing resistance to Penicillin. The range of biological activity of coagulase positive Staphylococci from lesions is high when compared to carrier sites where the proportion of coagulase negative is high. Autogenous infection of 18.3%.was observed in the present study.

Conclusion: The present study gives an indication of present pattern of bacterial isolates of pyoderma. And also elaborates the resistance pattern of antibiotics.

Introduction

Pyoderma is one of the commonest clinical conditions encountered in Dermatological Practice¹. Various factors like poverty, malnutrition, overcrowding and poor hygiene stated to be responsible for its incidence in lower socio-economic group. Climatic conditions also play a major role (Ojha et al., 2012). The etiological agents implicated in pyoderma are Staphylococcus aureus, Streptococcus pyogenes and to a lesser extent Gram negative bacilli². Staphylococci are distributed widely in nature. They are isolated from several areas of normal skin especially perineum and intertriginous areas. Anterior nares are reported to be the commonest carrier site of pathogenic Staphylococci. Several workers reported the sources of infection in pyoderma being autogenous from anterior nares with varying percentage of correlation of identical Staphylococci from lesions and anterior nares³. In the present study the bacterial flora from 100 random cases of clinically diagnosed pyoderma was isolated and their sensitivity to various antibiotics was tested. Staphylococci in the anterior nares and normal skin in these patients was studied and an attempt was made to know the number of cases where the infection was autogenous by matching the identical strains from lesions and carrier sites by phage typing.

Aims and objectives:

1. To isolate and identify the bacterial organisms from clinical samples of patients with pyoderma.
2. To study the antibiotic susceptibility pattern of isolates.
3. To do phage typing of the Staphylococcal isolates.

Materials and methods

The material for the present study was collected from out-patients who attended Department of Dermatology, King George Hospital, Visakhapatnam during the period from Jan, 2012 to April, 2013.

Inclusion criteria: Patients having erosive skin lesions and purulent discharge.

Exclusion criteria: non-purulent lesions and allergic reactions. Details from the patients like age, sex, occupation, residence: rural/urban, literacy status: /illiterate, personal history, history of trauma, associated disorders: anaemia / diabetes mellitus, h/o of drug usage, duration of complaint, clinical diagnosis etc was taken in the form of proforma.

One hundred cases of pyoderma, who had not been on prior antibiotic treatment were selected for this study. Pus from the lesion was collected by using sterile swab. Smears were prepared on clean glass slides and were stained by Gram's staining technique. The swabs were inoculated on Nutrient agar, Blood agar, Macconkey agar. The plates were incubated aerobically at 37°C for 24-48 hrs and then examined for growth. Organisms grown were identified basing on their morphology, cultural characteristics and biochemical reactions according to standard methods.

For testing biochemical reactions, strains were inoculated into peptone water and a broth culture was prepared. The

appropriate testing medium was inoculated with the broth culture. The strains isolated were subjected to catalase test slide, coagulase test, tube coagulase test, urease test, phenolphthalein phosphatase test, DNase test, mannitol fermentation test and O/F test.

All the strains of *S.aureus* isolated from various samples were tested for antibiotic sensitivity as per standard disc diffusion technique. All the coagulase positive strains were sent for phage typing to the department of Microbiology, Moulana Azad Medical College, Delhi.

Results

Out of the 100 cases studied, 67 were males and 33 were females, with a high incidence in 0 to 10 years age group. Out of the 100 cases studied 41 cases were impetigo, 17 cases were Folliculitis, 11 cases of furunculosis, 9 cases of ecthyma, 12 cases of infected scabies and 10 cases of infected ulcers. A total of 100 strains were isolated which includes 64 strains of Staphylococci, followed by 10 strains of coagulase negative Staphylococci, 4 strains of beta haemolytic Streptococci, 3 strains of *Escherichia coli*, 4 strains of *Klebsiella* spp. Mixed infection of aureus and beta haemolytic Streptococci seen in 5 cases and 15 samples showed no growth. Out of 85 strains of organism isolated, 28 strains of Staphylococci, 4 strains of beta haemolytic Streptococci, 2 strains of CONS were isolated from bullous impetigo. 13 strains of Staphylococci and 1 strain of CONS were isolated from folliculitis, 8 strains of Staphylococci and 3 strains of CONS were isolated from furuncles. 7 strains of Staphylococci and 1 strain of CONS were isolated from ecthyma lesions. From infected scabies, 2 strains of Staphylococci, 2 strains of CONS, 2 strains of *E.coli*, 2 strains of *Klebsiella* and 3 strains of Staphylococci & beta haemolytic Streptococcus isolated. From the infected ulcers, one strain of Staphylococci, 1 strain of CONS, 1 strain *E.coli*, 2 strains *Klebsiella* and 2 strains of Staphylococci & Streptococci were isolated (Table-1). Out of the 25 strains that could be typed 14 strains belonged to mixed group and 9 strains belonged to group II. Remaining 2 strains belonged to group I. Taking the individual phage types, GI 29 were isolated in 2 cases. GIII 47 in 6 cases and GIII 42E/47 in 3 cases. Among the mixed group GI 29, GIII 42E/47 in 1 case, GI 29, GIII 47 in 4 cases, GI 29, GIII 42E/47/85 in 4 cases and GI 29, GIII 47/85 in 5 cases were isolated. Antibiotic sensitivity pattern of the strains of coagulase positive Staphylococci isolated, all the 64 (100%) were sensitive to Amoxyclav, 61 (95.3%) to Vancomycin, 59 (92.1%) to Gentamicin, 58 (90.6%) to Cefpodoxime, 57 (89%) to Azithromycin, 51 (79.7%) to Cefoxitin and all strains were resistant to Penicillin. All the 10 strains of coagulase negative Staphylococci were found to be sensitive to Amoxyclav, Vancomycin and Gentamicin, 8 strains were sensitive to each Cefpodoxime & Azithromycin and 6 strains were sensitive to each Penicillin & Cefoxitin. All the 9 strains of beta haemolytic Streptococci isolated were sensitive to Amoxyclav, Cefpodoxime and Vancomycin. Three strains were sensitive to Cefoxitin, Azithromycin and Penicillin each (67%). Antibiotic sensitivity pattern of Gram negative bacilli isolated from lesion showed 3 strains of *Escherichia coli* were sensitive to Ceftriaxone, Ceftazidime, Amikacin and Imepenem. Two strains of *E.coli* were sensitive to Ciprofloxacin, Ceftaxime and Gentamicin (66.6% each). All the 4 strains of *Klebsiella* isolated were sensitive to Amikacin and Imepenem. Three strains of *Klebsiella* were sensitive to Ciprofloxacin, Ceftriaxone, Ceftazidime and Gentamicin (75% each). Two strains were sensitive to Cef-taxim (50%)

Organisms isolated from anterior nares From 100 swabs the Staphylococci were the predominant isolates (75) of which 33 coagulase positive and 42 negative. Out of which 67 were purely isolated and 8 mixed isolates, Staphylococcus & Diphtheroids (4), Staphylococcus & beta haemolytic Streptococci (4). 25 swabs were sterile after repeating the culture again. All the coagulase positive strains were resistant to Penicillin.

Of the coagulase negative strains 39 strains (92.8%) were resistant to Penicillin. On comparison between the coagulase positive and coagulase negative strains no significant difference in the sensitivity pattern is seen for the antibiotics tested. Organisms isolated from skin of 100 patients Out of the 100 swabs collected from the normal skin (axillary area) of pyoderma cases 77 isolates were Staphylococci, 10 isolates were aerobic spore bearers, 10 were mixed isolates, Diphtheroids and Staphylococci (7), Gram negative bacilli and Staphylococci (3) and 3 were Gram negative bacilli. Among the 87 strains of Staphylococci 25 (29%) were coagulase positive and 62 (71%) were coagulase negative. Of the 25 coagulase positive Staphylococci all were resistant to Penicillin. Among 62 strains of coagulase negative Staphylococci 59 (95.1%) were resistant to Penicillin.

Comparative analysis of characteristics of coagulase positive strains from lesions, nose and skin

Strains isolated from lesions showed highest percentage characteristics among strains isolated from lesions followed by nose and skin. The strains isolated from skin exhibited lowest activity. This difference is significant with reference to all the properties. Comparison between coagulase positive staphylococci isolated from cases and carrier sites in antibiotic resistance showed all the 236 strains of Staphylococci showed high degree resistance to Penicillin and moderate resistance to Cefoxitin and Azithromycin in coagulase positive Staphylococci. The strains from all the sources were sensitive to Amoxyclav & Vancomycin (Table-2).

Phage types pattern of Staphylococci from Lesions, anterior nares and skin areas;

Showed identical phage type in lesion, anterior nares and skin was found in 4 cases, phage type GI 29 in 3 cases and GI 29, GIII 47 in 1 case. Identical phage type of GI 29 and GIII 47 was found in 4 cases of lesion and anterior nares. One identical phage type of GI 29 was found in 1 case of lesion and skin. The percentage of incidence of identical phage type was 18.3% (Table-3).

Discussion

Among the 100 cases of pyoderma taken for the present study 41% was bullous impetigo cases which was consistent with Parveen Thind et al (42%), followed by folliculitis 17% and furuncle 11%. Pyoderma was found to be of common occurrence among the males of all age groups. In the present study high incidence was recorded among males of 0-10 age group with 67%. Similar findings were reported by Shashi Gandhi et al. 5, 61.2% Varsha et al. 6, (2014) 54% Among the organisms isolated from pyoderma Staphylococci predominated, 59% of cases singly and along with streptococci in 5% of cases. Similar observations were made by K V Ramana et al 7, (2008); Y Bhanani et al., (2011); Paudel U et al 8, (2013). Beta haemolytic Streptococci was next common isolation from cases of impetigo, Staphylococci were isolated as single etiological agent in 68.2%. A high incidence of Staphylococci alone was reported by Rahul Pati et al. 9, (2006); coagulase positive strains with 95.3% phosphatase activity which was

correlating with the findings of S.Kulkarni et al¹⁰., DNase production was found in 93.7% of coagulase positive strains. Mannitol fermentation was reported to be useful in detecting pathogenic Staphylococci by J Dinesh Kumar et al¹¹., (2009) and Pamela J Yeh et al., (2011). Present study is correlating with the above studies showing 84.3% mannitol fermentation. In the present study several strains were found to be positive for beta-haemolysis. Among the coagulase positive strains 73.4% were found to be haemolytic. Coagulase test has been recognized as the routine laboratory test for the detection of pathogenic Staphylococci and in the present study also it showed that it is still the best test to detect the pathogenic Staphylococci. In our study sensitivity of all beta haemolytic Streptococci was consistent with Mohammed I. Fatani et al¹²(2002) who reported 100% sensitivity to Penicillin and Oxacillin. All the strains of *Escherichia coli* were sensitive to Ceftriaxone, Ceftazidime, Amikacin and Imepenem. Mohamad I. Fatani et al¹² (2002) reported 100% sensitivity to Ceftriaxone, Ceftriaxone & Gentamicin. All the strains of *Klebsiella* were sensitive to Amikacin and Imepenem, 75% were sensitive to Ciprofloxacin, Ceftriaxone, Ceftazidime and Gentamicin. And 50% were sensitive to Ceftaxime. Suresh K Malhotra et al.¹³ reported 50% sensitivity to Ceftaxime and Gentamicin, which is correlating with our study.

Organisms isolated in anterior nares

From the anterior nares of these cases, the most commonly isolated organism was Staphylococci in 75% of cases, (67 strains singly and 8 strains along with other organisms). Carriage of Staphylococci in anterior nares was reported in many studies. Kumar P et al¹⁴ .reported 82.9%, Ramani T V and Jayakar P A ¹⁵reported nasal carriage of 85%. High incidence of resistance to Penicillin (100%) was observed in strains from nose. All strains were sensitive to Amoxycylav and Vancomycin. Mukesh Palsingh et al¹⁶, (2013) reported 100% sensitivity to Amoxycylav from carriers. Wide spread resistance to Penicillin among nasal isolated Staphylococci was reported by Bhawani Y et al 97.5% the present study correlates with this study.

Organisms isolated from normal skin in axillary region

Among the 100 strains isolated 87 strains of Staphylococci 29% were coagulase positive and 71% were coagulase negative (Table-15). Y Bhawani et al¹⁷, reported 34% of coagulase positive Staphylococci over the skin. In the present study the incidence of coagulase positive Staphylococci over the skin was much lower. Characteristic properties of coagulase positive Staphylococci isolated from normal skin and their sensitivity pattern was correlated with Y. Bhawani et al¹⁷, 2011 who reported 96.5% sensitivity to Penicillin.

Comparison and correlation of staphylococci isolated from lesions, anterior nares and normal skin in cases

Out of the total 236 strains of Staphylococci isolated from various sources in the study, 74 were from lesions, 75 from nose and 87 from normal skin. Of them 86.4% from lesion, 44% from anterior nares and 29% from skin are coagulase positive. The incidence of coagulase positive Staphylococci in the lesion was significantly higher $P \leq 0.01$ as Staphylococci is much higher.

The range of biological activity of coagulase positive Staphylococci from lesions is high when compared to carrier sites where the proportion of coagulase negative is high. Comparatively low range of activity is seen in coagulase positive strains of anterior nares and still less activity was observed by coagulase positive strains from normal skin, in that descending order. This high biological activity

of strains from lesions may be due to their active participation in pathogenesis compared to other strains which are quiescent at the carrier sites.

The comparative analysis of resistance pattern of coagulase positive Staphylococci from lesions and carrier sites revealed that all the strains were resistant to Penicillin. There is a difference in the resistance pattern to Cefoxitin with strains isolated from lesion showing highest resistance followed by strains isolated from nose. All the strains tested in the two comparable groups were sensitive to Amoxycylav and Vancomycin. An attempt was made to identify whether or not the source of infection in these cases is from their own carrier sites by matching the strains of Staphylococci isolated from these cases from three sites (lesion, nose and skin) by their identical phage types. In 4 cases identical phage type in lesion, anterior nares and skin were found, phage type GI 29 in 3 cases and GI 29, GIII 47 in 1 case. Identical phage type of GI 29 and GIII 47 were found in 4 cases of lesion and anterior nares. One identical phage type of GI 29 is found in 1 case of lesion and skin. In these cases the anterior nares might be the source of infection, although it may also be possible that these strains in the anterior nares and skin may be acquired from lesion also. Sanjay M. Wavare et al¹⁸, (2012) reported that most common group was mixed phage group (17%) followed by phage group I (13.55%). The present study correlates with this study, reporting an autogenous infection of 18.3%. The possible explanation for low incidence of autogenous infections among Indians could be, due to high incidence of extraneous cross infection in these patients with poor hygiene and socio-economic status.

Summary & Conclusion

Swabs were collected from the lesion, anterior nares and normal skin of axillary region from 100 clinically diagnosed cases of pyoderma and cultured for bacterial flora. High incidence (41%) of bullous impetigo is observed among males of 0 to 10 years age group with a common occurrence is on the face. Staphylococcus is the commonest organism in the causation of pyoderma along with other strains. It was also found to be the commonest organism in the anterior nares and axial skin. Pattern of coagulase positive Staphylococci from lesions and carrier sites revealed that all the strains were resistant to penicillin. All the strains from the test were sensitive to Vancomycin and Gentamicin. All the strains isolated from anterior nares and axial skin were sensitive to Amoxycylav, Vancomycin and Gentamicin. No significant difference is noted between coagulase positive and coagulase negative Staphylococci strains in their sensitivity pattern. Incidence of coagulase positive Staphylococci is significantly high ($P \leq 0.01$) in lesion when compared to anterior nares and skin. Coagulase positive strains isolated from lesions have exhibited significantly high range of all the pathogenic characters when compared to the coagulase positive strains from nose and skin ($P \leq 0.01$). All the strains of beta haemolytic Streptococci were sensitive to Amoxycylav, Cefpodoxime and Vancomycin. All the strains of *E. coli* were sensitive to Ceftriaxone, Ceftazidime, Amikacin and Imepenem. All strains of *Klebsiella* were sensitive to Amikacin and Imepenem.

The phage typing of coagulase positive Staphylococci isolated from lesions revealed that Group I and Group III phages were able to lyse most of the strains. No particular phage type were found to be predominant. Out of the 6 strains which were typable from anterior nares, 4 strains belonged to Group I and 2 strains belong to

mixed group (GI 29, Gill 47). Out of the coagulase positive Staphylococci from skin, only 8 strains could be typed of these 5 strains belonged to Group I and 1 strain belonged to Group III and 2 strains belonged to mixed Group (GI 29, Gill 54). In 4 samples same phage type was isolated from all three sites; lesion, nose and skin. In 4 cases same phage type was isolated from lesion and anterior nares. In 1 case same phage type was isolated from lesion and skin. This accounts for autogenous infection. To conclude, the present study gives an indication of present pattern of bacterial isolates of pyoderma. And also elaborates the resistance pattern of antibiotics. Primary pyoderma are more common in males, mostly affecting children in their first decade of life. Face was most commonly affected site. Staphylococcus aureus was the commonest causative agent, and the emergence of MRSA in the community is a warning sign. With the knowledge of likely causative organisms and their resistance pattern, the suitable antibiotic therapy can be started and avoid unnecessary medication with ineffective drugs.

TABLE-1 : Distribution of organisms isolated in 100 cases of pyoderma

Clinical type	No. of patients	S aureus	CONS	β -hemol ytic streptococci	E.coli	Klebsiella	S aureus+ Streptococci	No growth
Bullous impetigo	41	26	2	4	-	-	-	7
Folliculitis	17	13	3	-	-	-	-	1
Furuncle	11	8	1	-	-	-	-	2
Ecthyma	9	7	1	-	-	-	-	1
Infected scabies	12	2	2	-	2	2	3	1
Infected ulcer	10	1	1	-	1	2	2	3
Total	100	59	10	4	3	4	5	15

TABLE-2 : Comparison between coagulase positive staphylococci isolated from cases and carrier sites in antibiotic resistance

Antibiotic	Staphylococci strains from lesions (64)		Staphylococci strains from nose (33)		Staphylococci strains from skin (25)		X ² p value
	No.	%	No.	%	No.	%	
Penicillin	64	100	33	100	25	100	-
Amoxycylav	0	0	0	0	0	0	-
Cefpodoxime	6	9.3	4	12.1	3	12	1.4 ≥ 0.05
Cefoxitin	13	20.3	6	18.1	2	8	19.2 ≥ 0.05
Azithromycin	7	11	3	9	5	20	0.6 ≥ 0.05
Gentamicin	5	7.8	1	3	1	4	2.13 ≥ 0.05
Vancomycin	3	4.6	0	0	0	0	2.87 ≥ 0.05

TABLE-3 Distribution of identical Phage types pattern of Staphylococci from Lesions, anterior nares and skin

Areas	Phage types	Total no. of cases
Lesion	GI 29, Gill 42E/47	4
Anterior nares	GI 29, Gill 47	
And skin	GI 29	
Lesion and Anterior nares	GI 29, Gill 42E/47	4
Anterior nares	GI 29, Gill 47	
Lesion and Skin	GI 29	1
Skin	GI 29	
Total		9

REFERENCE

1. Devith, Bijanthi, Zamazach, Pattern of skin diseases in Imphal. Ind J Dermatol Venereol Leprol 2006; 51(21): 149-150. 2. Paudel U, Parajuli S, Pokhrel D.B Clinico-bacteriological profile and antibiotic sensitivity pattern in pyoderma: A Hospital Based study; NJDVL; Vol.11(1) 2013 pp.49-58 3. Jina Lee, Ji Yeon Sung, Young Minkim, Chi Eunoh, Hong Bin Kim, Eun Hwachi, Hoan Jong Lee, Molecular Characterization of Methicillin-resistance Staphylococcus aureus obtained from anterior nares of healthy Korean children attending day care centers; International J of Infectious Disease; vol:15, issue:8, Aug 2011, pages e558-e563 79 4. Parveen Thind, S Krishna Prakash, Anupriya Wadhwa, VK Garg, Binod Pati Bacteriological profile of community acquired pyodermas with special referenceto methicillin resistant Staphylococcus aureus Indian J Dermatol Venereol Leprol 2010; 76:572-4 5. Shashi Gandhi, A K Ojha, K P Ranjan and Neelima Clinical and Bacteriological Aspects of Pyoderma; North American J of Medical Sciences; Oct 2012 vol:4 issue:10 6. Varsha T.Kalshetti, V.M.Bhate, Neha Haswani, and S.T.Bothikar Staphylococcus aureus: A Major Causative agent of Community Acquired pyoderma International Journal of Current Microbiology and Applied Sciences volume 3 no:9 (2014) pp.94-97 7. K. V Ramana, S. K. Mohanty, Arun Kumar In-vitro activity of current antimicrobial agents against isolates of pyoderma Indian J Dermatol Venereol and Leprol Aug 2008; vol:74 issue: 4. 8. Paudel U, Parajuli S, Pokhrel D.B Clinico-bacteriological profile and antibiotic sensitivity pattern in pyoderma: A Hospital Based study Ind J Dermatol Venereol Leprol (2013), vol 11, no: 1 9. Rahul Patil, Sujata Baveja, Gita Nataraj, Uday khopkar Prevalence of methicillin resistant Staphylococcus aureus (MRSA) in community- Acquired primary pyoderma, Indian J Dermatol Venereol Leprol 2006; 72:126-8 10. S. Kulkarni, K. Anuradha & D. Venkatesha, Demonstration of Virulence markers and Methicillin susceptibility of Staphylococcus In various clinical isolates, International J of Current Microbiology and Applied Sciences. volume 3 No 8(2014) pp.50-57 11 J.Dinesh kumar, Yogesh K.Negi, Abhishek Gaur, Deepshikha Khaurana, Detection of Virulence genes in Staphylococcus aureus isolated from paper currency, International Journal of Infectious Disease, volume 13, issue 6, pages e450-e455, Nov 2009 12 . Mohamad I. Fatani, Syed Z. Bukhari, Khalid A. Al-Afif, Talal M. Karina, Magdy R. Abdulghani, Mohammad I. Al-Kaltham Pyoderma among Hajj Pilgrims in Makkah Saudi Med J 2002; vol.23(7): 782-785 13. Suresh K Malhotra, Sita Malhotra, Gurjit S Dhaliwal, Alpna Thakur Bacteriological study of pyoderma in a tertiary care dermatological center; Indian J Dermatol 2012; vol: 57 issue:358-61 83 14 . Kumar P, Shukla I, Varshney S (2011) Nasal screening of health-care workers for nasal carriage of coagulase positive MRSA and prevalence of colonization with Staphylococcus aureus. Biology and Medicine, 3(2) special issue:182-186, 15. Ramani T V, Jayakar P A, 1980 Bacteriological study of 100 cases of pyodermas with special reference to Staphylococci, their antibiotic sensitivity & phage pattern Indian J of Dermatology, Venereology and Leprology, 46:282-86 16. Mukesh Pal Singh, Shalendra Kumar Sharma, Sanjeev Shukla, and Nitin Prakash Pandit Prevalence rate and Antibiotic susceptibility test (AST) pattern of Methicillin resistant Staphylococcus aureus (MRSA) isolates from different clinical specimens of Teerthankar Mahaveer Hospital, Moradabad, India; International J of Current Microbiology and Applied Sciences, (2013) volume 2 no:11(2013) pp. 307-314 17. Y Bhawani, Ramani T V, Sudhakar V (2011) A Bacteriological study of 100 cases superficial pustular folliculitis with special Reference to Staphylococci from lesions and carrier sites; Biology and Medicine, vol: 2(4) 07-12 18. Sanjay M. Wavare, Sarita N. Kothadia and Mangala P. Ghatole Multidrug Resistance and Phage Pattern of Staphylococcus aureus in Pyoderma Cases, Journal of Krishna Institute of Medical Sciences University, 2012, vol.1(1) 28-54 ISSN 2231-4261