DOI: 10.21088/jmrr.2395.6623.12126.2

Journal of Microbiology and Related Research
Volume 12 Number 1, January - June 2026

ORIGINAL ARTICLE

Microbial Profile of Pyogenic Infection Causing Isolates from Hospitals in Raipur

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HOW TO CITE THIS ARTICLE:

Pooja Kumari Sahu, Dhananjay Tandon, Rupal Purena et. al, Microbial Profile of Pyogenic Infection Causing Isolates from Hospitals in Raipur. J Microbiol Relat Res. 2026; 12(1): 17–22.

ABSTRACT

Introduction: Pyogenic infections are caused by pyogenic bacteria, characterized by the formation of pus. These infections can affect various body parts, including the skin, soft tissues, eyes, burns, bones, and joints.

Aim: This study aims to isolate and identify bacterial pathogens from pyogenic human infections and analyze the demographics (age and gender) most affected.

Methods: Pus sample was collected from 162 patients received from various clinics. The samples were immediately inoculated onto MacConkey agar and blood agar plates and incubated at 37° C for 24 hours. After incubation, Gram staining and biochemical tests were performed to characterize the bacterial isolates.

Results: Among the 162 patients, 102 were male (63%) and 60 were female (37%). Out of the 162 pus samples processed, 95 (58.6%) were culture-positive, while 67 (41.4%) showed no bacterial growth. The distribution of 95 culture-positive isolates included: Gram-negative *Klebsiella pneumoniae* (6), *Escherichia coli* (35), *Acinetobacter spp.* (4), and *Pseudomonas aeruginosa* (8). Gram-positives were *Staphylococcus aureus* (25), *Streptococcus* spp. (6), *Enterococcus* spp. (6). Fungal isolates were *candida* spp. (2). This study highlights a significant prevalence of pyogenic infections, with a higher incidence among males aged 21– 60 years and females aged 21–50 years. The most frequently isolated pathogens were and, emphasizing the need for effective infection control measures and targeted antibiotic therapy.

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Received: 07-03-2026 **Accepted:** 10-05-2026

KEYWORDS
• Pyogenic Infection • Pus Sample • Age and Gender Demography

INTRODUCTION

Pyogenic infections are caused by pyogenic bacterial characterized by the formation of pus, Pus is a combination of dead white blood cells, dead tissue, that are thick, yellowish - white, green, brown, milky fluid, that causes pain, itching, redness, and swelling, usually smells bad. These infection can affect various body parts include, Skin, soft tissue, or bodily part, eye infection, burn infection, bone and joint infection. The invasion and multiplication of pyogenic bacteria trigger a severe inflammatory response. In order to cause pus and abscesses, these infections produce leukocidins and specific cellular or toxic metabolites that kill neutrophils, a type of white blood cell.1 Impetigo, cellulitis, folliculitis, sepsis, cellulitis, osteomyelitis, septic arthritis, are common pyogenic infection. Staphylococcus aureus, Streptococcus pneumoniae, Escherichia coli, Pseudomonas spp., Enterococcus spp. Acinetobacter spp., Klebsiella pneumoniae, Candida spp. are the common etiological agent.[2,3]

The color of the pus is determined by the bacterial pigments, which can range from white, yellow or green.[4] Worldwide, pyrogenic infections are the main culprits for high rates of illness and death, as well as extended hospital stays and impairment.[5] Despite improvements in microbiological methods, antibiotics, and surgical therapy, pyogenic infections are remain common in impoverished nations and are very difficult to cure.

About 417 people per 100,000 die in India every year as a result of infectious illnesses.6 Unseen enemies of humanity, microbes wreak havoc on human and other living things' bodies.[7] Bacterial diseases are still the leading cause of death and sickness. Many different kinds of microorganisms call human skin home.[8] Injuries such as burns, bites, small cuts, crush injuries, gunshot wounds, and pyogenic infections composed of pus, a fluid that may be white or yellow and contains dead leukocytes, cellular debris, and devitalized tissue are caused by microbiological pathogens. Clinical pus samples were taken from patients suspected of having a pyogenic human infection.[9,10]

MATERIALS AND METHODS

Sample Collection

This study was carried out in the Dr. Micro lab & research Centre, Raipur, Chhattisgarh from 1 July 2024 to 15 October 2024. The pus samples collected from various clinical departments using sterile swab sticks and sterile syringe. In all, 162 pus samples were collected.

Isolation and Morphological characterization

Incubation at 37°C for 24-48 hours followed inoculation of the pus samples onto MacConkey agar and blood agar plates. When no signs of growth were seen on blood agar and MacConkey agar medium after 48 hours of incubation, the samples were deemed negative. The next step in the process was to select the bacterial colonies that tested positive after incubation. To distinguish between Gram-positive and Gram-negative bacteria, microscopic analysis was carried out using Gram staining.[11]

Biochemical tests

Confirmation of the isolated colonies was done by different biochemical tests such as catalase, coagulase, urease, oxidase, IMViC tests which were performed as per standard protocol.[12]

RESULTS

Isolation of microbial colony

102 (62%) samples were from male patient and 60 (37%) sample were from female among 162 pus sample. Samples were taken from patients of different age group i.e. >10 to <60 years. Most commonly was from 21-60 years (76%) as shown in **table 1 & 2**. 95 (58%) samples were positive in MacConkey agar and blood agar (**Figure 1**), whereas 67 (41%) samples were negative for growth.

Table 1: Gender distribution of sample population

Gender	Frequency	Percent
Female	60	37
Male	102	63
Total	**162**	**100**

Table 2: Age distribution of sample population

Age in years	Gender		Total
	Female	Male	
<10	0	4	4
11-20	7	11	18
21-30	16	21	37
31-40	15	16	31
41-50	14	18	32
51-60	5	19	24
>61	3	13	16
Total	**60**	**102**	**162**

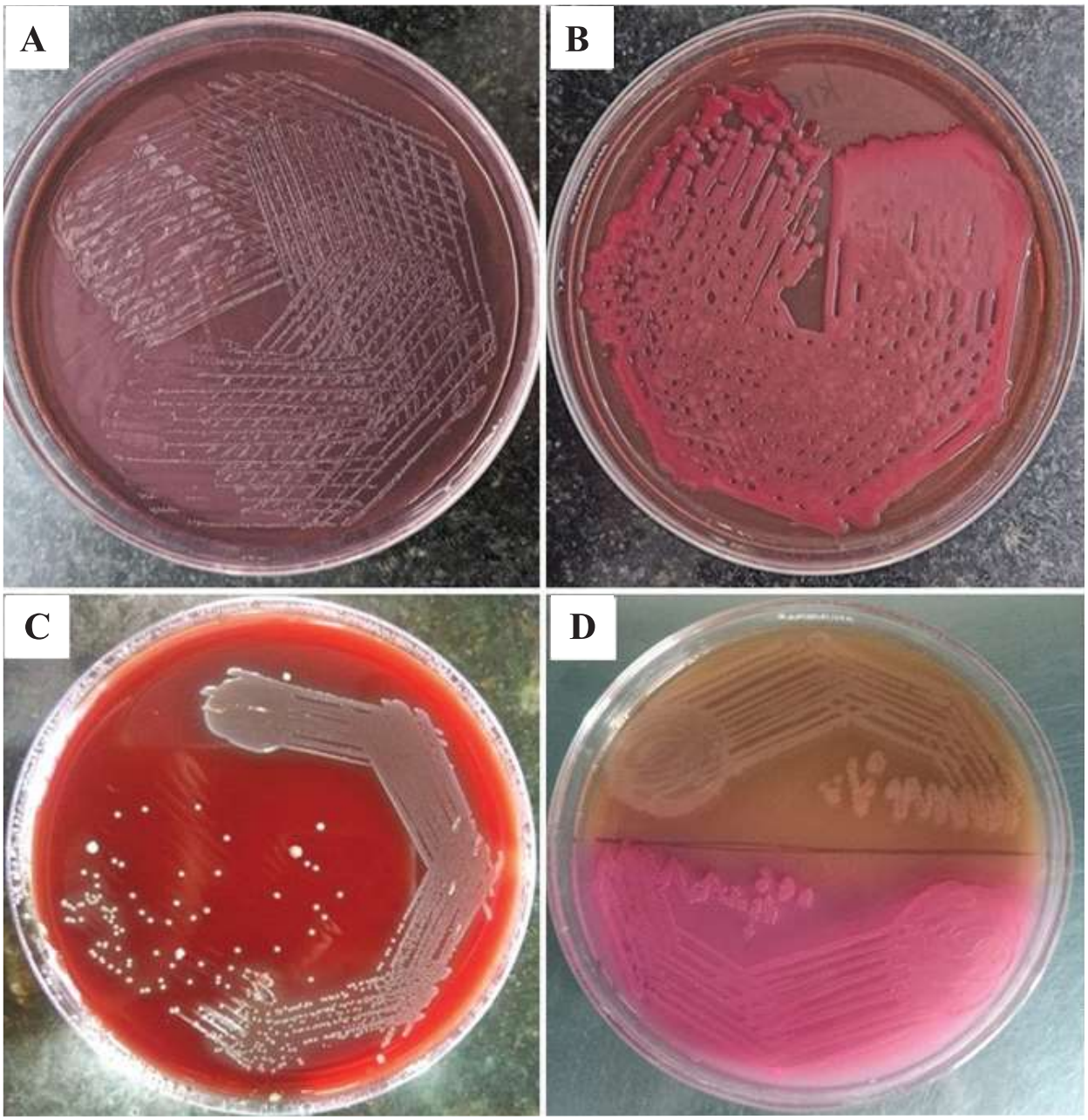

Figure 1: Isolation of microbial colonies from pus sample on MacConkey and Blood agar media; **(A)** Acinetobacter species late lactose colony on MacConkey agar; **(B)** Klebsiella spp. lactose fermentation on MacConkey agar; **(C)** Staphylococcus spp. caused β-hemolysis on blood agar; **(D)** Escherichia coli caused lactose fermentation and pseudomonas spp. Non lactose fermenter.

Biochemical tests

The biochemical result revealed that out of 95 positive samples, Escherichia coli & Staphylococcus aureus were more dominant. *Escherichia coli* (34), *Staphylococcus aureus* (25), *Streptococcus pneumonia* (6),

Pseudomonas spp. (8), *Enterococcus spp.* (6), *Acinetobacter spp.* (4), *Klebsiella pneumonia* (1), *Candida spp.* (2) were recorded (**Table 3 and figure 3)**. The images of biochemical test of Staphylococcus sp. and Pseudomonas spp. have been illustrated **in figure 2.** The male group are more infected comparing to female. Highest number of patients belonged to 21-60 years in male, and 21-50 years in female. In male *Escherichia coli* (16) and female (18) growth, in male *Staphylococcus aureus* (16) and female (9).

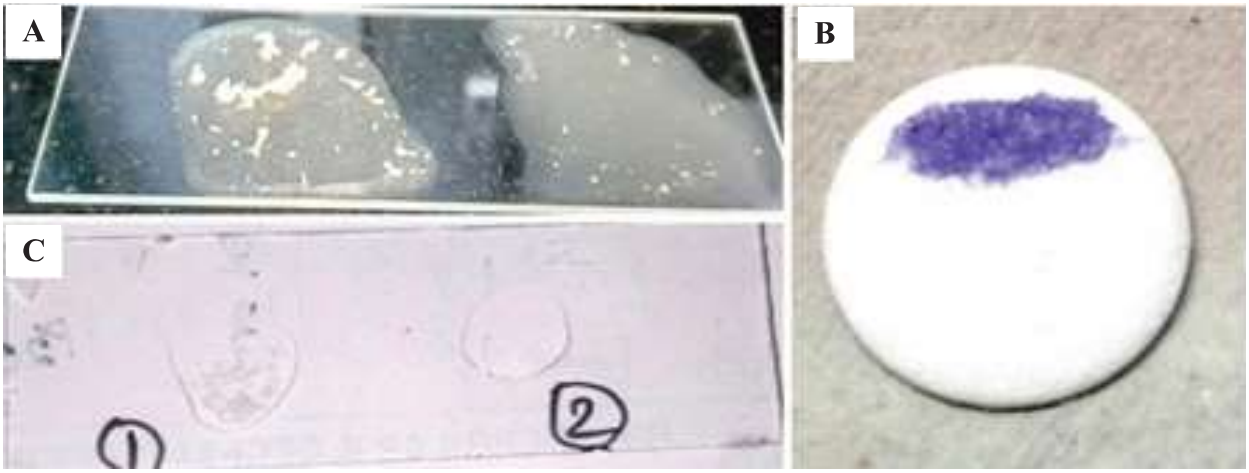

Figure 2: Biochemical Tests; **(A)** Coagulase positive as seen by clot formation in *Staphylococcus* spp; **(B)** Oxidase positive seen in *Pseudomonas* spp; **(C)** Catalase test positive in (*Staphylococcus* spp.), indicated by bubble formation.

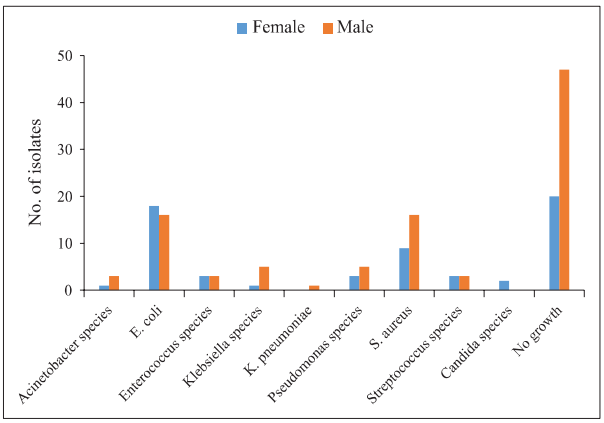

Figure 3: The figure illustrates the gender wise distribution of culture isolates

Table 3: Gender wise culture isolates distribution

Culture Isolates	Female	Male	Total
Acinetobacter species	1	3	4
E. coli	18	16	34
Enterococcus species	3	3	6
Klebsiella species	1	5	6
K. pneumoniae	0	1	1
Pseudomonas species	3	5	8
S. aureus	9	16	25
Streptococcus species	3	3	6
Candida species	2	0	2
No growth	20	47	67
Total	**60**	**102**	**162**

Table 4: Age wise distribution of culture isolates

Culture isolates	Age in Years							
	<10	**11-20**	**21-30**	**31-40**	**41-50**	**51-60**	**>61**	**Total**
Acinetobacter species	0	0	1	0	1	1	1	4
Candida species	0	0	0	0	1	1	0	2
E. coli	1	3	9	10	6	4	1	34
Enterococcus species	0	0	3	0	2	0	1	6
Klebsiella pneumoniae	0	1	2	2	0	1	1	6
No growth	1	11	16	15	21	13	9	67
Pseudomonas species	0	0	2	1	0	3	2	8
Staphylococcus aureus	2	3	6	4	4	5	1	25
Streptococcus species	0	0	2	2	1	1	0	6
Total isolates	**4**	**18**	**37**	**31**	**32**	**24**	**16**	**162**

DISCUSSION

In this study total 162 patients were taken, pyogenic infection were more seen in male 102 (63%) and females 60 (37%). Research by Kalita *et al*[1] research shows pyogenic infection were more seen in males (61.43%) and females (38%). The research found that *E. coli* and *S. aureus* had the highest numbers of growth, while *K. pneumoniae* had the lowest proportion at 1.0%. These bacteria were most often isolated from individuals with skin and soft tissue illnesses.

Rameshkannan *et al.*[13] found that *E. coli* was the most often isolated bacteria from pus samples as well. This research is comparable to one by Zhang *et al.*[14], who found that *E. coli*, *S. aureus*, and *K. pneumoniae* were the most common bacteria.

In this study, male and Females under the age group of 21-60 (75.8%) simple are Highest number of patients belonged in this group, more prone than the other age group. Female in the age group of 21-50 are more prone infections, while male in the 21-60 age group are more prone infections. In male age group of >61 years have been isolated 13 isolates. This could be due to 21-60 years age group people are more exposed as they are working group. Below this is school going children and above 60 is mostly retired person.

Research by Rijal *et al.*[15] revealed more numbers of patients (34.31%) were from 21-40 years of age group. They also showed almost similar rate of culture positivity. In this study highest numbers of samples were received from the patients of age group more than 50 years followed by 21-30 years.

CONCLUSION

In developing countries, pyogenic infections are still prevalent and difficult to treat, despite improvements in medical science and technology. Effective treatment requires identifying and managing the underlying cause of the inflammation. For many pyogenic infections, Treatment for many pyogenic infections involves a draining the infected area, either through aspiration or surgery, and prescribing targeted antibiotics.

Statement of Declaration

Conflict of Interest: The authors have no conflict of interest.

Funding: There was no any type of funding support for this study.

Ethical Issue: There are no use of human or any animal in this study.

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