BRIEF RESEARCH COMMUNICATION

# Risk Factors and Clinical Outcomes of *Stenotrophomonas maltophilia* Infections: Scenario in a Tertiary Care Center from South India

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## Abstract

*Stenotrophomonas maltophilia*, a gram-negative non-fermenter has evolved from a colonizer to a significant pathogen over the last decade. It resides in various ecological niches both inside and outside the hospital settings. Infections due to *S. maltophilia* can be life-threatening, especially in immunocompromised patients. *S. maltophilia* is intrinsically resistant to most of the antibiotics, which limits treatment options. There are several risk factors involved. The present study was done to assess the risk factors and clinical outcomes associated with *S. maltophilia* blood stream infections and non-blood stream infections.

**Keywords:** Infection control, Nosocomial infection, *Stenotrophomonas maltophilia*.

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## Highlights

*Stenotrophomonas maltophilia* is a crucial nosocomial pathogen. Accurate diagnosis and adequate caution in prescribing appropriate antibiotics are imperative. Adherence to infection control practices and close surveillance can reduce the alarming rise of this pathogen.

## Introduction

*Stenotrophomonas maltophilia* has gained prominence as a nosocomial pathogen in the last decade.[1] It is a gram-negative, non-fermenter and has evolved from a colonizer to an emerging pathogen. It is ubiquitous in nature and frequently colonizes fluids used in the hospital settings and invasive medical devices.[2]

This emerging opportunistic pathogen causes a wide spectrum of infections including respiratory tract infections, blood stream infections (BSIs), bone and joint infections, urinary tract infections, endocarditis, and meningitis.[3] *S. maltophilia* is associated with high morbidity and mortality, ranging from 21 to 69%, especially in immunocompromised patients.

Predisposing factors for *S. maltophilia* infection can be prolonged hospitalization, admission in the ICUs, mechanical ventilation, recent surgery, malignancies, immunosuppressive therapy, use of central venous catheters and urinary catheters, neutropenia, and prior use of broad-spectrum antibiotics.[4]

*S. maltophilia* is intrinsically resistant to most of the antibiotics which makes therapeutic options strongly limited. Trimethoprim–sulfamethoxazole (TMP–SMX) is the drug of choice. Fluoroquinolone can be used as an alternative.[5]

The present study was conducted to assess the risk factors and clinical outcomes associated with *S. maltophilia* BSIs and non-blood stream infections.

## Methods

All patients who tested positive for *S. maltophilia* in 1 or more cultures from various ICUs of the hospital from the year 2019 to 2021 were included in the study. Samples included were blood, sputum, endotracheal aspirate, bronchoalveolar lavage and pus. Patients who had only respiratory colonization were excluded from the study. Colonization was defined as positive respiratory sample without clinical or radiological signs of *S. maltophilia* pneumonia. All samples were collected and processed as per standard microbiological guidelines. Identification and antibiotic susceptibility testing was done using automated system (VITEK 2® COMPACT). Results were interpreted as per the Clinical Laboratory Standard Institute 2021 (CLSI) guidelines. Clinical data and patient's demographic details were collected from medical records department. All data were collated in Microsoft Excel for analysis. The results are expressed as the number of patients (%) for categorical variables and mean (±standard deviation) or median (IQR) for continuous variables.

## Results

In total, 50 patients with positive culture from the year 2019 to 2021 were included in the study. Of the 50 isolates, 22 were from blood (44%), 16 from respiratory samples (32%), and 12 from wound infections (24%). The mean age was 46 years. There were 34 male

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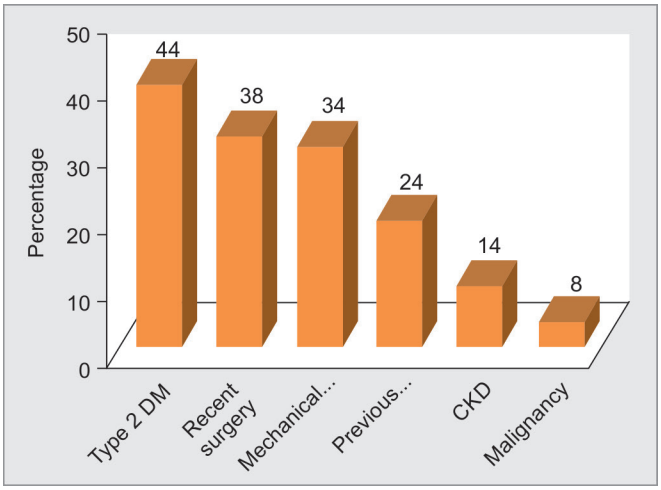


**Fig. 1:** Risk factors associated with *Stenotrophomonas maltophilia* infection

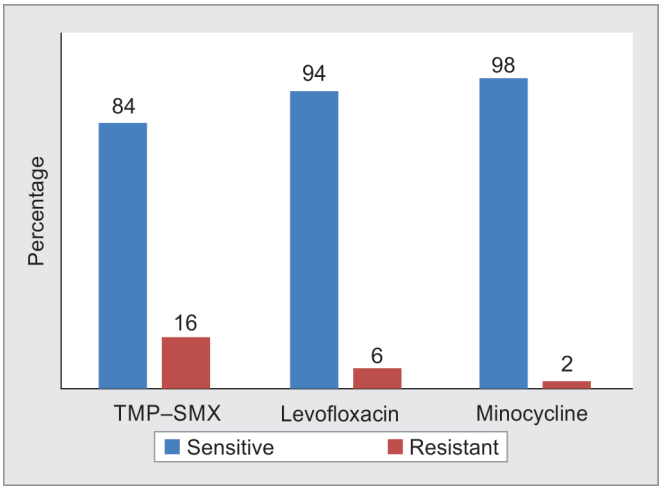


**Fig. 2:** Antimicrobial susceptibility pattern

(68%) and 16 female (32%) patients. Mean length of hospitalization was 16 days. The most common underlying condition was type 2 diabetes mellitus (44%) followed by chronic kidney disease (14%) and malignancy (8%). Of the 4 patients with malignancy, one had hematological malignancy and three had solid organ malignancies. About 17 patients (34%) were on mechanical ventilation. About 19 patients (38%) had undergone surgery during their stay in hospital. About 12 patients (24%) had history of previous hospitalization. Catheter-related blood stream infection (CRBSI) was present in 2 patients (4%). Polymicrobial infection was seen in 13 of patients (26%). The most common pathogens concurrently found with *S. maltophilia* included *Klebsiella pneumoniae* in 6 patients, *Enterococcus faecalis* in 3 patients, *Escherichia coli* in 2 patients, *Acinetobacter baumannii* in 2 patients, and *Pseudomonas aeruginosa* in 1 patient. Of the 50 patients, only 3 succumbed to the illness. The cause of death cannot be ascertained to *S. maltophilia* alone as 2 out of 3 had polymicrobial infection.

From the cultures, 8 isolated *S. maltophilia* strains (16%) were resistant to TMP–SMX, 3 strains (6%) were resistant to Levofloxacin, and 1 strain (2%) was resistant to Minocycline. The minocycline-resistant strain was resistant to both TMP–SMX and Levofloxacin.

## Discussion

Next to *P. aeruginosa* and *Acinetobacter* spp., *S. maltophilia* is the third most common non-fermenting gram-negative bacilli responsible for healthcare-associated infections worldwide.[6] It resides in various ecological niches both inside and outside the hospital settings.[2] In our study, *S. maltophilia* infection was much more common in patients above 50 and it showed a male preponderance which was in accordance with other studies.

Well-established risk factors for infection include lengthened hospitalization requiring invasive procedures, admission in an Intensive Care Unit (ICU), indwelling catheters, mechanical ventilation, recent exposure to antibiotics, corticosteroid or immunosuppressant therapy, underlying malignancy, and organ transplantation.[3,4,7] Most common risk factors contributing to *S. maltophilia* infection in this study were presence of comorbidities like type 2 diabetes mellitus, chronic kidney disease and malignancy, mechanical ventilation , prolonged hospital stay, recent surgery, and previous hospitalization (Fig. 1).

About 16–38% of cases of *S. maltophilia* bacteremia have been reported to be polymicrobial and it is associated with a worse prognosis compared to mono bacterial infection.[8] In our study, out of 3 patients who died, 2 had polymicrobial infection with *K. pneumoniae*.

The mortality rate from our study was 6%, which is significantly lower than other studies which show an attributable mortality of 22–75%.[3] The mortality rate was not high, probably due to low virulence of the organism and the fact that the underlying condition of the patient is more contributory to the outcome than *S. maltophilia* infection. A study from St. Luke's University Health Network in the United States that attributable mortality due to *S. maltophilia* is over-estimated, as most of the time, the patients are affected by other underlying comorbid conditions, and death cannot be directly attributed to the infection.[9]

Intrinsic resistance to aminoglycosides and routinely used carbapenems is seen in *S. maltophilia*. Presence of co-infection makes treatment all the more cumbersome. Various studies have recommended TMP–SMX as an initial therapeutic option for serious *S. maltophilia* infections.[2] A 5 years (2007–2012) analysis of antimicrobial susceptibility from a North Indian study on 125 clinical isolates of *S. maltophilia* showed that minocycline and levofloxacin exhibited the highest susceptibility rate followed by TMP–SMX (83%).[10] Antimicrobial susceptibility patterns were similar to other Indian studies and is depicted in Figure 2.

Environmental source of the infection could not be traced as the organisms were isolated in different ICUs and from different time periods.

## Conclusion

*Stenotrophomonas maltophilia* is a crucial nosocomial pathogen, and clinicians should be made aware of its implications. Isolation of *S. maltophilia* in immunosuppressed and debilitated individuals and isolation from a sterile site with signs and symptoms suggestive of infection should not be ignored. Timely diagnosis and adequate caution in prescribing appropriate antibiotic is imperative as it can lead to selection of resistant strains. Furthermore, strict adherence to infection control practices and close surveillance can reduce the alarming rise of this pathogen.

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