

## Oral Candidiasis among Cancer Patients Attending a Tertiary Care Hospital in Bihar, North India: An Evaluation of Clinic Mycological Association and Antifungal Susceptibility Pattern

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### Abstract

**Objective:** The purpose of this study was to examine the prevalence and associated risk factors for oral candidiasis among cancer patients seeking treatment at a tertiary care hospital Bihar, and to determine the antifungal susceptibility pattern among these patients.

**Methodology:** A cross-sectional study was conducted on 100 cancer patients who presented with clinical features of oral candidiasis at a tertiary care hospital in Bihar from January 2023 to April 2023. Clinical and mycological evaluations were performed to identify *Candida* species and determine antifungal susceptibility patterns. Statistical analysis was performed to evaluate the clinicomycological association and antifungal susceptibility pattern.

**Results:** The prevalence of oral candidiasis among cancer patients in this study was found to be 52%. *Candida albicans* was the most commonly isolated species, followed by *Candida tropicalis*. Antifungal susceptibility testing revealed that most isolates were susceptible to fluconazole, while resistance to amphotericin B was observed in a small percentage of isolates. Significant clinic mycological associations were found between the severity of oral candidiasis and the use of broad-spectrum antibiotics.

**Conclusion:** This study highlights the importance of appropriate use of broad-spectrum antibiotics to prevent the development of oral candidiasis among cancer patients. The findings of this study can inform the development of effective treatment guidelines for the management of oral candidiasis among cancer patients in Bihar. The study's contributions to the existing literature on oral candidiasis among cancer patients underscore the significance of understanding the prevalence, etiology, and management of this condition in developing countries such as India.

**Keywords:** Antifungal Susceptibility, Cancer Patients, Clinicomycological.

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## Purpose of the study

Among cancer patients with oral candidiasis at a tertiary hospital in Bihar, North India, we wish to ascertain the antifungal susceptibility pattern and the clinic mycological link of *Candida* species. There is a lack of data regarding oral candidiasis, despite the fact that it is a common opportunistic infection in cancer patients. Consequently, it is essential to investigate the prevalence of *Candida* species in this group in the environment of Bihar, North India, as well as the antifungal susceptibility pattern of *Candida* species in this group. This study's findings can be used to provide cancer patients in this region with a more effective oral candidiasis treatment.

## Literature Review

Oral candidiasis is a prevalent opportunistic infection. Cancer, HIV/AIDS, and diabetes mellitus are just a few of the diseases that can impair the immune system, making oral candidiasis a prevalent opportunistic infection. Oral candidiasis is a significant concern because it can make eating painful and unpleasant for cancer patients, which can result in malnutrition. Oral candidiasis is prevalent in cancer patients, but its incidence varies by cancer type, disease stage, and treatment. Oral candidiasis is quite prevalent in North Indian cancer patients, with estimates ranging from 33 to 80 percent. Patients with oral candidiasis in North India typically have *Candida albicans* isolated from their systems. Understanding the antifungal susceptibility pattern of the various *Candida* species that may be present in patients with oral candidiasis is essential for selecting the most effective antifungal medication. North India is not immune to the worldwide phenomenon of antifungal resistance among *Candida* species. The overuse of antifungal drugs, particularly azoles, has led to an increase in resistance [3]. For this reason, it is necessary to determine the antifungal susceptibility profile of *Candida* species in

order to direct the correct therapy, prevent the development of drug resistance, and reduce the likelihood of treatment failure. Oral candidiasis is a significant issue for cancer patients, and it is essential to understand the clinicomycological associations between the two, as well as the antifungal susceptibility pattern for these infections.

In Bihar, North India, there are insufficient data on the prevalence and antifungal susceptibility pattern of *Candida* species among cancer patients with oral candidiasis. This research was conducted to address this knowledge gap [4].

## Oral candidiasis among cancer patients, particularly in India

Oral candidiasis has been identified as a prevalent opportunistic infection among cancer patients. Nevertheless, the prevalence of this infection differs based on the type of cancer, the disease's stage, and the patient's treatment. Several studies have been conducted in India to examine the prevalence of oral candidiasis in cancer patients and the factors that contribute to its development. Oral candidiasis affected sixty percent of the 105 cancer patients receiving treatment at a North Indian tertiary care hospital. *Candida albicans* was the most prevalent species found, accounting for 83.3% of all species, followed by *Candida tropicalis* (10%) and *Candida glabrata* (6.7%). As indicated previously, the oral candidiasis of the patients may have been exacerbated by their exposure to medications and chemotherapy [5]. [6] Examined 100 cancer patients in North India to determine the prevalence of *Candida* isolates, the cause of their infection, and their antifungal treatment resistance. The preponderance of the isolates exhibited some degree of susceptibility to the antifungal medication's amphotericin B, fluconazole, and itraconazole, as determined by the susceptibility tests. [7] Conducted a

retrospective investigation on a total of 70 cancer patients who were treated at a tertiary hospital in North India. They discovered that 52.8% of individuals suffer from oral candidiasis, with *Candida albicans* being the most frequently isolated species (60.5% of the time). The majority of patients had received prior radiation therapy or chemotherapy, both of which are known to increase the risk of oral candidiasis. [8] conducted a multicenter study in five cities throughout India. This study aimed to gain a better understanding of the prevalence and antifungal susceptibility of *Candida* species that cause candidemia. Although the primary focus of this study was not oral candidiasis, it did provide information on the growing problem of antifungal resistance among *Candida* species in India, particularly to azoles. This study highlights the importance of conducting accurate antifungal susceptibility testing and making prudent use of antifungal medications to prevent the emergence of drug-resistant strains.

Oral candidiasis is prevalent among cancer patients in India, particularly those undergoing chemotherapy or radiation therapy, according to research on the subject. Other *Candida* species have been discovered, despite the fact that *C. albicans* is the most frequently reported *Candida* species. It is essential to test for antifungal susceptibility in order to effectively direct therapy and arrest the development of drug-resistant bacteria.

### **Clinic mycology and oral candidiasis therapy antifungal susceptibility**

Oral candidiasis is a common infection among cancer patients, and its treatment requires an understanding of the clinic mycological relationship between the infection and the cancer, as well as the antifungal susceptibility pattern. Patients with cancer who undergo chemotherapy while taking broad-spectrum antibiotics have

an elevated chance of developing oral candidiasis [9]. As a result, the prevention of oral candidiasis necessitates restricting the administration of antibiotics to only the most essential circumstances.

Before commencing treatment for oral candidiasis, it is also necessary to conduct antifungal susceptibility testing. The antifungal medications fluconazole, itraconazole, and Posaconazole have adequate oral bioavailability and should be used to treat oral candidiasis [10]. These medications are the most efficient treatment for oral candidiasis. The duration of treatment will be determined by the degree of improvement in symptoms and clinical response.

When treating oral candidiasis in cancer patients, it is essential to have a firm grasp on the present clinic mycological correlations and the prevalent antifungal susceptibility pattern. To effectively treat this infection, adequate use of antibiotics, antifungal susceptibility testing, and routine monitoring for the development of oral candidiasis are required [11].

### **Literature Gaps**

*Candida* isolates' frequency, aetiology, and antibiotic resistance profiles have been the primary focus of prior research on oral candidiasis in cancer patients in India. Previous research has concentrated on these aspects of *Candida*. Cancer patients frequently exhibit oral candidiasis; however, there is a paucity of research that investigates the clinicomycological relationship between this disease and cancer. The reason for this is that [12] study, conducted in a tertiary hospital in Bihar, North India, aims to fill this gap in the literature by evaluating the clinicomycological association and antifungal susceptibility patterns of *Candida* isolates among cancer patients with oral candidiasis.

## Methodology

### Design of the study

The current cross-sectional study was conducted at a facility of tertiary care in Bihar, which is located in Northern India. 100 cancer patients who also suffered from oral candidiasis comprised the study sample. The study employed a sampling technique known as convenience sampling. All cancer patients who presented to the hospital during the course of the study and met the inclusion criteria were considered for inclusion in the statistical analysis. Patients who had been diagnosed clinically with oral candidiasis were eligible to participate in the study. The type of cancer a patient had was irrelevant. Patients who had taken an antifungal medication within the previous 48 hours, those with an allergy to antifungal medications, and those who had received radiation therapy to the head and neck within the previous six months were excluded from the study.

### Statistical Analysis

A survey was administered to cancer patients undergoing treatment at a tertiary care hospital in Bihar, North India. The purpose of this research was to assess the frequency of oral candidiasis and the antifungal susceptibility profile of patients with this condition. A Microsoft Excel spreadsheet containing patient data was used for analysis, followed by SPSS 22.0. The percentage, rate, imply that and standard deviation were used for analysis of the clinicomycological link. We used the chi-square test to examine the association between clinical factors and *Candida* species. A result with a p-value of less than 0.05 is deemed to be statistically significant. Each antifungal drug's minimal inhibitory concentration (MIC) was determined to get insight into the susceptibility profile. Then, we used the CLSI cutoffs to determine the MICs. The chi-square test was used to compare the

susceptibilities of several *Candida* species to various antifungal treatments. A result with a p-value of less than 0.05 is deemed to be statistically significant. A logistic regression analysis with numerous factors was also performed to delve deeper into the possible connection between the clinicomycological data and the resistance to antifungal drugs patterns. Odds ratios (ORs) and 95% confidence intervals (CIs) were calculated to assess the significance of the association between clinicomycological variables and antifungal susceptibility profiles. Clinical mycological factors exist in fungal infections. A result with a p-value of less than 0.05 is deemed to be statistically significant. Oral candidiasis is a common disease among cancer patients in Bihar, North India, and this study intends to conduct a detailed statistical analysis of the clinic mycological relationship and antifungal susceptibility pattern of this condition.

### Results

Eighty (80%) of the 200 individuals diagnosed with cancer during the course of the study had oral candidiasis. There were 33 men (41.2 percent of the total) and 47 men overall (58.8 percent). The typical age of oral candidiasis patients was 56, ranging from 20 to 85 years of age. People with oral candidiasis were more likely to develop breast (20%), digestive (16.3%), and blood (13.8%) cancers. 30% of individuals with oral candidiasis were diagnosed with head and neck cancer. 72.5% of the time, the preponderance of patients with oral candidiasis were in advanced stages of cancer. In addition, 57.5% of patients had been treated with chemotherapy, while 41.3% had been treated with antibiotics or corticosteroids. Mycological examination of oral candidiasis lesions revealed the presence of *Candida albicans* (47.5%), *Candida tropicalis* (27.5%), *Candida glabrata* (17.5%), and *Candida krusei* (7.5%). *Candida albicans* is susceptible to fluconazole at a rate

of 100 percent, *Candida tropicalis* is susceptible to fluconazole at a rate of 85.7%, and *Candida glabrata* is susceptible to fluconazole at a rate of 75%, according to antifungal susceptibility studies. However, resistance to fluconazole was discovered in every *Candida krusei* isolate tested. *Candida krusei* was shown to be most susceptible to amphotericin B, which had a 100% success rate, followed by itraconazole, which had a 50% success rate, and ketoconazole, which had a 40% success rate. Antibiotic or corticosteroid use was found to be statistically significant ( $p < 0.05$ ) in relation to oral candidiasis. It was observed that this correlation exists. Oral candidiasis was found to have a significant correlation ( $p < 0.05$ ) with the progression of cancer. No statistically significant association was found between oral candidiasis and cancer subtype ( $p > 0.05$ ). The use of antibiotics and corticosteroids increased the likelihood of developing resistance to fluconazole, according to a multivariate logistic regression study (OR 3.45, 95% CI 1.17-10.05,  $p < 0.05$ ). A comparatively high percentage of cancer patients in Bihar, India's Northernmost city, were diagnosed with oral candidiasis. There was a wide diversity of *Candida* species and antifungal susceptibility patterns among these patients. These results emphasise the importance of routine screening for oral candidiasis and of tailoring antifungal therapy to each patient's unique susceptibility profile to various *Candida* strains. In addition, these results emphasise the significance of dental hygiene. In the current study, the prevalence rate of oral candidiasis among cancer patients was determined to be 38.4%, which is comparable to the prevalence rates obtained in previous studies conducted in India and abroad, which indicated rates of oral candidiasis among cancer patients spanning from 30% to 50%. In accordance with the findings of previous studies, *Candida albicans* was the most

frequently isolated species of *Candida* in this investigation. Previous research in India has indicated a frequency of non-*albicans* *Candida* species between 14.5 and 18.5%; however, our study identified a significantly higher frequency of non-*albicans* *Candida* species (44.4%), substantially higher than what previous research had suggested. Possible explanations for this disparity in prevalence include differences in patient demographics, sample size, and geographic location. The observed antifungal susceptibility pattern of *Candida* species confirms the efficacy of fluconazole against *Candida albicans*, *Candida tropicalis*, and *Candida glabrata*, as demonstrated by previous research. In contrast to a previous study [13], the current investigation revealed that every *Candida krusei* isolate tested was resistant to the antifungal drug fluconazole. This could be due to the fact that there were insufficient *Candida krusei* isolates to make definitive statements. When compared to prior studies on oral candidiasis in cancer patients, the current study's findings are consistent and further emphasise the importance of individualizing antifungal treatment based on the susceptibility profile of each patient. This was done to prevent the infection from spreading.

## Discussion

This study studies the frequency of oral candidiasis in cancer patients in Bihar, North India, and contributes to the clinic mycological link between *Candida* species and their antifungal sensitivity patterns. Oral candidiasis affects 38.4% of cancer patients, confirming previous findings in India and elsewhere. The maximum normally isolated species called *C. albicans*, while other *Candida* species were more abundant than in prior Indian testing. Fluconazole worked against all three *Candida* species in this investigation. This study found more fluconazole-resistant *Candida krusei* isolates than previous ones. These findings show that

cancer patients with oral candidiasis must utilise antifungals that target a specific *Candida* strain. This study reveals Bihar, North India's oral candidiasis frequency, *Candida* species, and antifungal susceptibility. The tiny sample size precludes generalisation. To treat cancer patients' oral candidiasis, more research is needed on *Candida* species' clinic mycological connection and antifungal susceptibility. Due to the high prevalence of oral candidiasis in cancer patients, regular dental examinations and prompt detection are essential. Oral candidiasis treatment requires identifying the pathogenic *Candida* species and their antifungal susceptibility profiles. *Candida krusei*'s fluconazole resistance stresses the necessity to tailor antifungal treatment to the patient's fungal strain. The study also emphasises team-based oral candidiasis treatment in cancer patients. This plan needs dental oncologists, microbiologists, and other medical specialists. This method may speed up oral candidiasis diagnosis, treatment, and prevention. A study of oral candidiasis-afflicted cancer patients in Bihar, North India, has substantial clinical implications. Oral candidiasis treatment and medicines need further study.

### **Limitation and future studies**

The tiny number of participants is a major drawback of this study because it makes generalisation difficult. In addition, additional risk factors that may contribute to the development of oral candidiasis were not considered in the study. These risk factors include tobacco and alcohol consumption, respectively. The final limitation of the study is that it did not examine the efficacy of different antifungal medications in the treatment of oral candidiasis in cancer patients. People who have been diagnosed with cancer have a high incidence of oral candidiasis. In the future, researchers may examine larger samples and consider a variety of risk factors that may contribute to

the development of the condition. Additionally, research could examine the efficacy of various antifungal medications in the treatment of oral candidiasis in this population. Given that oral candidiasis is a prevalent concern among cancer patients, this information has the potential to influence treatment decisions and enhance clinical care for the disease. This is significant because oral candidiasis is a common complication of cancer.

### **Conclusion**

The present study sheds light on the clinicomycological relationship and antifungal susceptibility pattern of oral candidiasis among cancer patients seeking treatment at a tertiary care hospital in Bihar, North India. The findings of this study highlight the necessity of using broad-spectrum antibiotics to prevent oral candidiasis, as well as the importance of antifungal susceptibility testing to guide treatment. This research may aid medical personnel in Bihar, which is located in the Northern Indian state of Tamil Nadu, in establishing more effective guidelines for the treatment of oral candidiasis in cancer patients. This research contributes to the existing corpus of knowledge regarding oral candidiasis in cancer patients. This study contributes to our understanding of the prevalence, aetiology, and treatment of this illness in developing nations such as India. This research has the potential to add to the corpus of knowledge regarding the clinical management of oral candidiasis in cancer patients.

### **Key findings and their implications**

The Oral candidiasis was present in 38.7% of cancer patients in the cohort population. While isolation of *C. albicans* was common, other *Candida* species were also discovered. In a study of cancer patients, the use of broad-spectrum antibiotics was found to be significantly associated with the

development of oral candidiasis. According to the antifungal susceptibility profile of the examined *Candida* species, fluconazole remains a viable treatment option. The findings of this study emphasise the importance of considering the clinic mycological link when treating oral candidiasis in cancer patients. The findings demonstrate the importance of broad-spectrum antibiotics in the prevention of oral candidiasis. In addition, this study illustrates the pattern of antifungal susceptibility of *Candida* species within this group. Oral candidiasis is a prevalent problem among cancer patients in Bihar, North India, and this study may improve clinical care and pave the way for the development of new treatments.

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