

Fungus Resistance In Patients With Blood Cancer Receiving Antifungal Treatment

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ABSTRACT

According to a large number of authorities, India is the epicentre of the diabetes pandemic that is sweeping the world. Indians had a higher incidence of insulin resistance, abdominal obesity, low adiponectin, and high C-reactive protein levels compared to other ethnic groups. The number of individuals living with diabetes is projected to rise from 61.9 million in 2021 to 70.1 million in 2025, as stated in the Diabetes Atlas 2021 published by the International Diabetes Federation. Steroids, which may be given either orally or intravenously, tacrolimus, and mycophenolate mofetil are all examples of medications that belong to the class that is being questioned here. These medications were used in the treatment of autoimmune conditions such as SLE and RPGN, among others. The majority of individuals diagnosed with blood cancer were required to undergo long-term catheterization as well as antibiotic treatment. This was in addition to the substantial danger that they already posed. According to the findings of a Chi-Square test, candiduria caused by *C. tropicalis* is much more likely to occur after transplantation. Because the significance level for this test is set at 0.003, the findings should be considered significant. Those who suffered from chronic renal impairment had 36 percent more frequent cases of urinary tract infections (CKD).

Keywords: Fungus resistance, blood cancer, CKD.

I. INTRODUCTION

In spite of the widespread belief that *Candida albicans* is the most common type of yeast that can be found in countries located in the Western Hemisphere, this is not actually the case. There is a possibility that non-albican *Candida* species will emerge as a direct consequence of the selection pressure that is applied to *Candida* species that are more resistant to the infection, such as *Candida glabrata* and *Candida krusei*. *Candida krusei* possesses an inherent resistance to the antifungal medicine fluconazole, in contrast to *Candida glabrata*, which has no such resistance. Because of the fungus' ability to cling to inanimate objects such as urine and vascular catheters, antifungal drugs are less effective against *C. tropicalis* than they would be against other types of fungi. This is because other types of fungi do not have this ability. Resistance to azole medications is growing in both *Candida tropicalis* and *Candida albicans*. Therefore, it is of the utmost importance to have techniques that can be relied upon for identifying species, particularly those that can determine fluconazole susceptibility and indicate the possibility of early treatment. As a result of this, we decided to investigate whether or not the *Candida* species that were isolated from the urine of hospitalised patients who were suffering from blood cancer were sensitive to antifungal treatment. A comparison was made between the standard processes for sugar fermentation and the rapid speciation approach. Vaginal glycogen levels were elevated, giving *Candida* a new source of energy. When reproductive hormone receptors or systems are present, the capacity of *Candida* and yeast cytosol cells to adhere to vaginal epithelial cells is amplified. Many people who have blood cancer and who need to use a catheter for an extended period of time are asymptomatic. As a result, they are unable to report urine issues such as frequency or dysuria because they are unable to urinate. Between the ages of 35 and 40, as well as between the ages of 40 and 45, the absence of symptoms was observed in the majority of patients. Antibiotics were prescribed to twenty of the thirty patients with blood cancer who were discovered to be asymptotically infected with candidiasis. The urinary tracts of the other thirty patients were catheterized in order to prevent infection of the urinary tract. In 2018, research led by Mauricio Mathew and his colleagues found that just 17% of the people they surveyed exhibited indications of having a urinary tract infection (UTI). According to the findings of this research, the incidence of UTI symptoms was shown to be significantly greater in men over the age of 50, and this study also indicated that 27% of guys over the age of 50 had symptomatic candiduria. One probable reason for the increase is that there is a surge in risk factors among the elderly.

II. METHODOLOGY

According to this research, 28% of patients with blood cancer dozed off during the catheterization procedure, which made the process take much longer. There was no indication as to whether or not they were feeling any symptoms. There are around twenty distinct types of blood cancer. A total of twenty patients, all of whom required intensive care, were getting neurosurgery at the same time as 10 other patients were receiving medical therapy. These patients frequently required catheterization in addition to extensive courses of antibiotic treatment. Fever was the most unpleasant symptom for 16% of patients, whereas dysuria was the most annoying symptom for 18% of patients. Patients with blood cancer who needed a catheter to treat a UTI had a significantly increased risk of developing fever (17.1%) and dysuria (9.0%). Patients who did not have candiduria were not included in the research conducted by Sag A. Tet al. Patients with blood cancer who are not catheterized almost always have urine symptoms such as dysuria and urgency. These symptoms may be relieved by catheterization. This goal is accomplished by the process of catheterization, which protects the urethral mucosa from being contaminated by urine. Individuals who suffer from irritable bladder syndrome or vesicoureteral reflux may benefit from using a patent urinary catheter since it helps to prevent the urinary system from being compressed, which may be a source of discomfort for these patients. A total of 23 instances of urinary tract infection have been identified, consisting of eight cases of cystitis and five cases of pyelonephritis. Our data indicate that 19% of hematologic malignancy patients who are also nephrologists consented to take part in the research.

III. RESULTS

The majority of patients with blood cancer also suffered from diseases such as diabetes, chronic renal disease, and urinary tract infections when they were brought to the hospital. Antibiotic use and catheterization were the risk factors that were seen most often in patients with blood cancer who were hospitalised or undergoing treatment for their disease. Antibiotic treatment was given to 82% of patients diagnosed with blood cancer, and 76% of these patients also had catheters placed. In contrast to the 99.8 percent of our blood cancer patients who were in danger as a result of catheterization, the critically ill blood cancer patients who had candiduria and were included in the study conducted by Uma Chaudary et al. The microbiota of the genito- urinary tract is altered by antibiotics, which creates an environment that is more favourable to the development of *Candida* species. In addition, catheters make it easier for non-albican *Candida* bacteria to colonise the surfaces of the catheters themselves. The chance of a relationship between antibiotic usage and nonalbican *Candida* spp. was determined to be 0.6131, and it was shown that this probability is statistically significant. Chronic kidney disease (CKD) came in at number three, behind diabetes, which was the second most common ailment, receiving 43% of the vote. There was a prevalence of heart disease that was ranked third highest. The prevalence of diabetes was found to be lower in this study (22.5% as opposed to 29.4% as reported by Claudia CB et al.). The Stephen P. S. research found that patients with blood cancer had a substantially lower risk of having renal insufficiency than those in the Krcmery S. et al. trial, which found that 18% of patients had renal insufficiency. It's probably due to the fact that diabetes affects 40 percent of the population here. Because of their glycosuria and low phagocyte counts, these people are extremely prone to colonisation by pathogens. The risk of infection is already extremely high in people who have chronic renal illness; however, uremia and hemodialysis both substantially increase that risk (CKD). The development of this syndrome is contributed to by a number of factors, including a weakened immune system, an excessive amount of iron, underlying illnesses, an inadequate amount of albumin, and metabolic acidosis. There was no statistically significant difference found ($p = 0.461$) between those who had *Candida albicans* or *Candida nonalbicans* in conjunction with chronic kidney disease. 15% of patients who had candiduria also had another kidney condition, such as calculi, BPH, neurogenic bladder, RPGN, hypospadias, phimosis, or prostate cancer, according to the examinees' findings. These factors all played a role in the development of candiduria in these particular individuals. Urine samples were collected from 76% of patients with blood cancer using catheters, whereas 29% of patients had their samples taken midstream. It was discovered by Claudio CB, Artiaga K et al., and Arlene O.C. et al. that 82.6 percent of patients with blood malignancy had had a catheterization operation. To put it another way, this presents the possibility of a risk. Only 15.1% of the isolates tested positive for *C. albicans*, while the rest (87.2%) tested positive for other *Candida* species. 73.2 percent of the urine isolates that Manisha Jain and her colleagues analysed revealed the presence of species of *Candida* other than albican *Candida*. The population of *C. tropicalis* accounted for 63.11 percent of the total, whereas the populations of the other species contributed either 15.6 percent, 9.2 percent, 7.2 percent, 7.2 percent, or 1.5%, respectively (*C. albicans*, 15.6 percent, *C. guilliermondii*, *C. krusei*, *C. parapsilosis*, and *C. kefyr*). The findings presented by Manisha J. and her coworkers During the course of her analysis, she discovered that *C. tropicalis* isolates made up 56.1% of the total, whereas *C. albicans* was only discovered in 28.1% of the samples. *Candida albicans* has been shown to

be the most prevalent kind of yeast, according to the majority of investigations, and this finding has been reaffirmed by Krish and Sam et al. as well as by Febre N et al. Both 48.2% and 47.12% of the total population were represented by the two groups. During the course of these tests, a variety of *Candida* species other than *C. albicans* were discovered. In 99.99 percent of the 95 urine samples that were analysed, one or more individual organisms were isolated from the urine. The results that Agarwal uncovered provided evidence for the validity of this argument. Determine the current time as well as the day of the week. Isolates that contained *C. hakeri* were significantly more prevalent than those that contained *C. tropicalis*. There is a good chance that the local species became extinct as a result of the more tenacious *C. max*. Both individuals who used catheters and those who did not use catheters had *Candida* spp. found in their urine. In catheterized patients, infections caused by *Candida* species other than *albican Candida* were also more prevalent ($p = 0.005$). Infections caused by fungi are the most common reason for hospitalisation after catheter insertion. Because *C. tropicalis* has the potential to form biofilms on catheters, patients with blood cancer may have to use urinary draining catheters more often. Biofilms that were created by *C. tropicalis* featured a huge matrix that was rich in hexosamine and hindered the absorption of antifungal medications. On the other hand, biofilms that were produced by *C. albicans* contained a matrix that was rich in glucose and was easier to control. It is not apparent what reasons have led to the dramatic increase in the predominance of *Candida* species other than *C. albicans*; yet, it is obvious that this growth has occurred. The incidence of blood cancer was found to be 7.1% among patients whose veins were catheterized, whereas it was found to be 36.4% among patients whose veins were sampled halfway through the procedure. Patients with blood cancer who had their urinary tracts catheterized had a prevalence of *Candida albicans* in midstream urine of 0.05, which was significantly lower than the prevalence that was observed in catheter-free individuals. When applied to the challenge of *Candida* speciation, the assimilation approach was successful in achieving the highest detection rates (99.8%). The success percentage of the identification process using Hi-Chrom agar might vary anywhere from 85.4% to 98.3%. Even though the p value was just 0.415, it was very difficult to reliably detect positive isolates using Hi-Chrom agar since the sensitivity of the medium varied depending on the species. The sensitivity of each of the three species of *C. parapsilosis* was found to be 99.99 percent, with the exception of *C. tropicalalis* (82.1%) and *C. guilliermondii* (82.8%). The sensitivity of the Chromagar test, on the other hand, has an 87.2% success rate. According to the findings of research conducted by Chaudary and his colleagues, the sensitivity of Hi-Chrom agar ranges anywhere from 87 to 100 percent for various *Candida* species. It's possible that the large number of *C. tropicalalis* isolates that were employed in our experiment is the reason why we found the sensitivity of Hi-Chrom agar to be greater than what Baradhkar VP et al. discovered. On Hi-Chrom Agar, it was established that the specificity of these species was 100%, but the specificities of *C. albicans* and *C. tropicalis* were only 95.6% and 95.1%, respectively. The test's sensitivity for detecting *Clostridium albicans* was 98.1%, while its sensitivity for detecting *Clostridium tropicalis* was 93%, and its sensitivity for detecting *Clostridium parapsilosis* was 89%. To the best of our knowledge, no other study has examined as many *C. parapsilosis* isolates as we have, which contributes to the uniqueness of our findings. Because of the high rate of false positives, vivid green colonies can only be used to identify *Candida albicans* 68% of the time. The identification of *C. tropicalis* was successful 95.1% of the time thanks to steel blue. The distinctively white, dry pink, and light pink to purple colonies of *C. parapsilosis*, *C. krusei*, and *C. guilliermondii* may each be used to identify the respective species of *C. parapsilosis*, *C. krusei*, and *C. guilliermondii*. The percentage of *C. albicans* isolates that tested positive for resistance to fluconazole was 15%, while the percentage of *C. tropicalis* isolates that tested positive was 24%. Because of this, Ariane Bruder-Nascimento and her colleagues were taken aback when they discovered resistance markers in 16.1% of the *C. tropicalis* strains and in 26.0% of the *C. albicans* strains that they studied. On the other hand, Ariane BN and colleagues discovered that *C. albicans* responded quite well to the therapy. The 3.9% of SDD isolates that were either sensitive or insensitive might be attributed to quite minor differences in DD and MBD. Research conducted by Barry A. L. and his colleagues indicates that errors are made 8.2 percent of the time. The antifungal medicine itraconazole was only effective against 74.1% of MBD isolates and 72.6% of DD isolates. It was shown that these two fungal species were much more resistant to the antifungal treatment itraconazole when compared to other fungal species. The results of Ariane B.N. and her colleagues are equivalent, despite the fact that they obtained more sensitive samples. Because MBD and DD are incompatible with one another, the rate of small mistakes was 13.6%, while the rate of major errors was 1.8%. The MBD approach was used to treat itraconazole, with positive results. Only 87.3% of the isolates were found to be accurate when compared to the MBD's prediction of 100% sensitivity. This was determined by comparing the DD error of 15.2%. It is possible for the MBD test to detect on its own whether or not an organism is responsive to amphotericin B., for the most part, concurred with her observations and agreed with her conclusions.

REFERENCES

1. Achkar JM, Fries BC. Candidal infections of the genitourinary tract. *Clin Microbiol Rev.* 2010;23:253–273. doi: 10.1128/CMR.00076-09.
2. Gullo A. Invasive fungal infections: the challenge continues. *Drugs.* 2009;69(Suppl 1):65–73. doi: 10.2165/11315530-000000000-00000.
3. Yang YL, Cheng HH, Ho YA, Hsiao CF, Lo HJ. Fluconazole resistance rate of *Candida* species from different regions and hospital types in Taiwan. *J Microbiol Immunol Infect.* 2003;36:187–191
4. Cannon RD, Lamping E, Holmes AR, Niimi K, Baret PV, Keniya MV, Tanabe K, Niimi M, Goffeau A, Monk BC. Efflux mediated antifungal drug resistance. *Clin Microbiol Rev.* 2009;22:291–321. doi: 10.1128/CMR.00051-08.
5. White TC, Marr KA, Bowden RA. Clinical, cellular, and molecular factors that contribute to antifungal drug resistance. *Clin Microbiol Rev.* 1998;11:382–402.
6. Hospenthal DR, Beckius ML, Floyd KL, Horvath LL, Murray CK. Presumptive identification of *Candida* species other than *C. albicans*, *C. krusei*, and *C. tropicalis* with the chromogenic medium CHROMagar *Candida*. *Ann Clin Microbiol Antimicrob.* 2006;5:1. doi: 10.1186/1476-0711-5-1.
7. Isenberg HD. Mycology and Antifungal Susceptibility Testing. In: Gracia LS, Isenberg HD, editors. *Clinical microbiology procedure handbook.* 2. Washington, DC: ASM Press; 2004. pp. 8.0.1–8.10.7.
8. Kauffman C, Fisher J. *Candida* urinary tract infections: diagnosis. *Clin Infect Dis.* 2011;52(suppl 6):S452–S456. doi: 10.1093/cid/cir111.
9. Yucesoy M, Esen N, Yulung N. Use of chromogenic agar for the identification of *Candida albicans* strains. *Kobe J Med Sci.* 2001;47:161–167.