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ORIGINAL ARTICLE

# Comparison of epidemiology and treatment outcome of patients with candidemia at a teaching hospital in Northern Taiwan, in 2002 and 2010

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*Background:* The incidence of candidemia varied between hospitals and different study periods. Few, if any, studies provide the reasons. This hospital-based population study aimed to describe and compare the patient population hospitalized in 2002 and 2010 and determine the disease-specific incidences of candidemia and evaluate the impact of time to initiate antifungal therapy on 30-day mortality.
*Patients and methods:* All patients hospitalized at a 2300-bed teaching hospital in Taiwan in 2002 and 2010 were analyzed for the distribution of age, sex, and type of underlying diseases (maximum of six diagnoses). All patients with blood isolates that were collected in 2002 and 2010 and yielded *Candida* species were included for analysis of the demographic and clinical characteristics, distribution of *Candida* species, length of hospital stay before candidemia, stay in the intensive care units at onset of candidemia, time of initiating systemic antifungal agent, antifungal regimen, and 30-day crude mortality.
*Results:* In 2010, the hospitalized patients were older ($p < 0.001$), had a higher Charlson Comorbidity Index ($p < 0.001$), and more underlying disease/status, including chronic pulmonary

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diseases, moderate-to-severe renal diseases, leukemia, lymphoma, and gastrointestinal malignancies ($p < 0.001$) than those seen in 2002. Multivariate analysis identified the following host factors were associated with the occurrence of candidemia in 2010: neonate (adjust odds ratio [OR], 3.67), 45—64 year (OR, 2.18) and the elderly (OR 2.64), compared with young adult (20—44 year); patients with moderate-to-severe renal diseases (OR, 8.08), leukemia (OR, 4.58) and lymphoma (OR 3.98) and gastrointestinal malignancies (OR 2.80). The incidence density of candidemia was 0.34 and 0.41 per 1000 patient-days in 2002 and 2010, respectively ($p = 0.04$). The majority of characteristics of patients with candidemia and disease-specific incidences of candidemia did not differ between 2002 and 2010. Despite more patients in 2010 receiving antifungal therapy on the same day or 1 day after onset (27.5% vs. 41.2%, respectively, $p = 0.002$), the 30-day mortality remained high (45.9% in 2002 and 44.4% in 2010). Moreover, time to initiate antifungal therapy had no impact on 30-day mortality.
*Conclusion:* This hospital-based population study demonstrated that the incidence density of candidemia was high and increased in 2010 compared with 2002, which was at least in part due to the increase in the proportion of patients at a higher risk of candidemia. Although antifungal therapy was initiated earlier in 2010, the 30-day mortality remained high.


## Introduction

*Candida* species are important pathogens causing healthcare-associated infections and are associated with high mortality, excess lengths of hospital stay, and medical costs.[1,2] A nation-wide surveillance data in Taiwan showed that *Candida* species was the leading pathogens of healthcare-associated infections in the intensive care units (ICUs) of the medical centers and ranked second in regional hospitals in 2010.[3] The incidence of bloodstream

**Table 1** Characteristics of patients hospitalized at National Taiwan University Hospital in 2002 and 2010

| Parameters | 2002 | 2010 | *p* value |
|---|---|---|---|
| Number of acute care beds | 2200 | 2300 | — |
| Total number of admissions | 66,763 | 79,710 | — |
| Total number of patient-days | 632,318 | 691,692 | — |
| Age, y | 47.3 ± 23.6 | 51.2 ± 22.9 | <0.001 |
| Sex, male (%) | 34,514 (54.58) | 39,669 (57.35) | <0.001 |
| Charlson Comorbidity Index | 2.10 ± 3.45 | 3.18 ± 4.33 | <0.001 |
| Underlying disease/status, *n* (%) | | | |
| Congestive heart failure | 1264 (18.93) | 2595 (32.56) | <0.001 |
| Cerebrovascular diseases | 3230 (48.38) | 3682 (46.19) | 0.04 |
| Chronic pulmonary diseases | 2629 (39.38) | 3372 (42.30) | 0.005 |
| Connective tissue diseases | 828 (12.40) | 2002 (25.12) | <0.001 |
| Moderate-to-severe liver diseases | 4076 (61.05) | 3302 (41.43) | <0.001 |
| Moderate-to-severe renal diseases | 3568 (53.44) | 3063 (38.43) | <0.001 |
| Diabetes mellitus without end organ damage | 5447 (81.59) | 10,530 (132.10) | <0.001 |
| Diabetes mellitus with end organ damage | 918 (13.75) | 1177 (14.77) | 0.10 |
| Any tumor[a] | 13,330 (199.66) | 26,312 (330.10) | <0.001 |
| Lymphoma | 865 (12.96) | 1776 (22.28) | <0.001 |
| Leukemia | 1186 (17.76) | 1779 (22.32) | <0.001 |
| Gastrointestinal malignancy[b] | 1250 (18.72) | 3377 (42.37) | <0.001 |
| Metastatic solid tumor | 4451 (66.67) | 10,090 (126.58) | <0.001 |
| Acquired immunodeficiency syndrome | 260 (3.89) | 346 (4.34) | 0.19 |
| Neutropenia | 909 (13.62) | 1231 (15.44) | 0.004 |
| Solid organ transplantation (kidney, liver, heart, pancreas) | 392 (5.87) | 662 (8.31) | <0.001 |
| Hematopoietic stem cell transplantation | 29 (0.43) | 106 (1.00) | <0.001 |
| Incidence density of candidemia (per 1000 patient-days) | 218 (0.34) | 286 (0.41) | 0.04 |

[a] Any tumor is defined as any solid malignancy excluding gastrointestinal malignancy, metastatic malignancy, leukemia and lymphoma.
[b] Gastrointestinal malignancy indicates malignancies involving any part of the following organs: esophagus, stomach, small or large intestines, and rectum.