The body mass index profiles in chronic pulmonary aspergillosis: trend and variability in post tuberculosis patients

Findra Setianingrum1,2*, Anna Rozaliyani1,2,3

1) Department of Parasitology, Faculty of Medicine, Universitas Indonesia
2) The Indonesia Pulmonary Mycoses Centre
3) The Indonesian Society of Respirology

ABSTRACT

Tuberculosis (TB) is the leading risk factor for chronic pulmonary aspergillosis, especially in patients with residual cavitary lesions after completion of TB therapy. The body mass index (BMI) is one of the established markers in predicting the mortality of CPA. However, the data regarding BMI profiles of CPA patients in Indonesia is still limited. We evaluated the BMI profiles of CPA patients among post-TB patients. Patients were diagnosed as CPA based on clinical, radiology, and the Aspergillus IgG test. Fifty patients with a mean age of 35 years were included; 13 patients met the criteria of CPA. The overall median BMI in these patients was 21. The median BMI in the CPA group was 19.3. The lowest (19.8) median BMI value was observed in the positive Aspergillus IgG group (11.5 – 30 mg/L), with a minimum BMI of 14.7 and a maximum BMI of 29.2. The differences in median BMI across CPA and non-CPA groups and Aspergillus IgG levels were not statistically significant. However, there is a trend that lower BMI was distributed among patients with positive Aspergillus IgG. More than one-third of CPA patients in this study were classified as underweight. Future study is necessary to depict better the BMI profiles on a larger scale of populations of CPA in Indonesia to achieve better diagnosis and management of CPA.
INTRODUCTION

Chronic pulmonary aspergillosis (CPA) is a chronic respiratory disease characterized by progressive lung parenchyma destruction and persistent respiratory symptoms. Pulmonary tuberculosis (TB) is the major risk factor for CPA (Denning, Pleuvry, & Cole, 2011; Page et al., 2019; Rozaliyani et al., 2020) According to previous study, 8% of TB patients at the end of TB therapy posed a risk of developing CPA (Setianingrum et al., 2022) The TB incidence rate in Indonesia is 354 per 100,000 population, this rate placed Indonesia as the second-ranked country with the largest burden of TB (Ministry of Health Republic of Indonesia, 2023).

The prevalence of TB in certain areas is affected by several factors, one of them is nutritional status (Bhargava, 2016; Cegielski, Arab, & Cornoni-Huntley, 2012; Liu, Tang, Xiang, & He, 2022; Lönnroth, Williams, Cegielski, & Dye, 2010) A single unit decrease in BMI reduces TB incidence by 13.8% (Lönnroth et al., 2010). Previous study from Indonesia revealed that malnutrition exists in 87% of TB patients (Pakasi, Karyadi, Dolmans, Van Der Meer, & Van Der Velden, 2009).

The link between body mass index (BMI) and the prognosis of CPA is well established (Kimura et al., 2021; Lowes et al., 2017; Zhong et al., 2022) The decrease in mortality of CPA by 11% is attributed to the single increase of BMI (Lowes et al., 2017) The simple formula of BMI bring advantages for use in all levels of healthcare facilities to help clinicians assess the progression of CPA. Our main objective was to investigate the BMI profiles of CPA patients among post-TB patients and to observe if there are correlations between BMI profiles and the Aspergillus IgG level.

METHODS

This study was performed using serum samples archived in the Parasitology Laboratory, Faculty of Medicine, Universitas Indonesia. Sera were collected from 50 post-TB patients after completion of TB therapy. Proven CPA was diagnosed based on the three parameters: 1) at least one of these symptoms, including cough, chest pain, dyspnea, and/or fatigue ≥ 3 months, AND 2) positive Aspergillus IgG with automated ELISA test (Immulse 2000 testing system, Siemens, Germany) according to the manufacturer instructions AND 3) radiological features indicative of CPA (at least one of cavitation and/or fungal ball). The information regarding BMI and the sera collection for the Aspergillus IgG were gathered during patients’ visits to the hospital after completing PTB therapy. The study was conducted at the Parasitology Laboratory, Faculty of Medicine, Universitas Indonesia. Ethical approval was obtained from the Health Research Ethics Committee of the Faculty of Medicine, Universitas Indonesia (no. 95/UN2.F1/ETIK/2019).

The SPSS version 20.0 software (IBM, Armonk, NY, USA) was used to perform the statistical analyses. Categorical data were presented as numbers of cases and percentages. Fisher’s exact tests or X² tests were used for categorical variables for CPA and non-CPA groups. The Mann-Whitney U test was used to detect the difference between non-parametric continuous variables. Comparison of median results across different Aspergillus IgG groups was assessed using Kruskal-Wallis tests. A p-value of p<0.05 was considered statistically significant.
RESULTS

A total of 50 patients with post-TB therapy were included in this study. Table 1 shows the patient demographic characteristics of patients. The mean age was 35 years (range: 17-72 years; 20 patients (40%) were male. In the disease category, 13 patients (26%) were classified as the CPA group and 37 patients were classified as the non-CPA group. The most common symptom in the CPA group was fatigue 85% (n=11). There was a significant difference in the proportion of cough (31% in the CPA group vs 0% in the non-CPA group), dyspnea (46% in the CPA group vs 8% in the non-CPA group), and fatigue (85% in the CPA group vs 11% in the non-CPA group). The overall median of BMI in these patients was 21, whereas the median BMI in the CPA group was 19.3.

The median value of BMI test was varied across various Aspergillus IgG groups (Figure 1). The variability of BMI across three different groups of Aspergillus IgG level showed a p-value of 0.401. The lowest (19.8) median BMI value was observed in the positive Aspergillus IgG group (11.5 – 30 mg/L) with a level range of 14.7 – 29.2. The patients with the lowest (14.7) BMI in the positive Aspergillus IgG group met the criteria of CPA with Aspergillus IgG level 12.6 mg/L with respiratory chronic symptoms (dyspnea, chest pain, and fatigue).

<table>
<thead>
<tr>
<th>Symptoms</th>
<th>ALL (n=50)</th>
<th>CPA (n=13)</th>
<th>Non-CPA (n=37)</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>20 (40%)</td>
<td>6 (46%)</td>
<td>14 (38%)</td>
<td>0.744</td>
</tr>
<tr>
<td>Female</td>
<td>30 (60%)</td>
<td>7 (54%)</td>
<td>23 (62%)</td>
<td>0.744</td>
</tr>
<tr>
<td>Age group</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt; 60 years</td>
<td>6 (11%)</td>
<td>2 (15%)</td>
<td>4 (11%)</td>
<td>1</td>
</tr>
<tr>
<td>≤ 60 years</td>
<td>44 (88%)</td>
<td>11 (85%)</td>
<td>33 (89%)</td>
<td>1</td>
</tr>
<tr>
<td>Sign &amp; symptoms (≥3 months)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cough</td>
<td>4 (8%)</td>
<td>4 (31%)</td>
<td>0 (0%)</td>
<td>0.003</td>
</tr>
<tr>
<td>Dyspnea</td>
<td>9 (18%)</td>
<td>6 (46%)</td>
<td>3 (8%)</td>
<td>0.006</td>
</tr>
<tr>
<td>Chest pain</td>
<td>2 (4%)</td>
<td>1 (8%)</td>
<td>1 (3%)</td>
<td>0.456</td>
</tr>
<tr>
<td>Fatigue</td>
<td>15 (30%)</td>
<td>11 (85%)</td>
<td>4 (11%)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Aspergillus antibody IgG</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Positive</td>
<td>20 (40%)</td>
<td>13 (100%)</td>
<td>7 (19%)</td>
<td></td>
</tr>
<tr>
<td>Negative</td>
<td>30 (60%)</td>
<td>-</td>
<td>30 (81%)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Body mass index</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Median</td>
<td>21 (14.4 – 36.4)</td>
<td>19.30 (14.7 – 24.1)</td>
<td>21.5 (14.4 – 36.4)</td>
<td>0.224</td>
</tr>
</tbody>
</table>
Diabetes insipidus in patients with traumatic severe brain injury

Case Report

Kesetyaningsih1,2

JURNAL KEDOKTERAN FKUM SURABAYA

ABSTRACT

Hypernatremia, although the immediate administration of desmopressin, adequate hypovolemic, polyuric and surgery, the signs of diabetes insipidus was presented by the patient. It is showed that the treatment of diabetes insipidus. Diabetes insipidus in cases experience severe brain injury in the United States. There are more than 50,000 deaths and 500,000 incidents of brain injury requires complicated treatment. Therefore, the implementation of health protocols (OR 4.750; p = 0.006) have a risk of experiencing a higher complication in the case of being handled improperly, it can bring death.

Median IgG – 30 mg/L) with a level range of 7.2–29.2. The patients with the lowest (14.7) BMI in the positive CPA group was 14.70 with severe bilateral cavitary lesions of TB indicated bronchiectasis patients with TB with a median BMI of 21.2 (Painter & Tabler, 2022).

The purpose of this study was to investigate the BMI, demographic, and clinical features of patients with TB. This literature aims to know the degree of serious illness needed more treatment attention as they may experience hyperglycemia to the patient. It is showed that the percentage of patients with diabetes mellitus, risk factors, hyperglycemia, and tuberculosis infection and its consequences are shown in Table 1.

Figure 1. The variety level of body mass index (BMI) according to the Aspergillus IgG classifications.

Figure 2. The body mass index profiles of CPA and non-CPA patients.

Groups of patients

- CPA
- non-CPA

<table>
<thead>
<tr>
<th>The percentage of patients</th>
<th>Underweight</th>
<th>Healthy weight</th>
<th>Overweight</th>
<th>Obesity</th>
</tr>
</thead>
<tbody>
<tr>
<td>CPA</td>
<td>39%</td>
<td>62%</td>
<td>57%</td>
<td>0%</td>
</tr>
<tr>
<td>non-CPA</td>
<td>27%</td>
<td>0%</td>
<td>14%</td>
<td>3%</td>
</tr>
</tbody>
</table>
The distributions of the BMI is depicted in Figure 2. There were 39% (n=5) patients from the CPA group who were classified as underweight and 27% (n=10) patients in the non-CPA group (p=0.493). Overweight patients were only present in the non-CPA group (14%, n=5), resulting in p=0.309 compared to the CPA group. No significant differences were detected for the BMI groups between CPA and non-CPA groups. The comparison of BMI between healthy weight (62% in CPA vs 57% in the non-CPA group) and obesity (0% in CPA vs 3% in the non-CPA group) showed a p-value = 1.

DISCUSSION

The purpose of this study was to investigate the BMI, demographic, and clinical characteristics of post-TB patients. This is the first study revealing the BMI profiles of CPA patients in Indonesia. This study is important because the variability of BMI is affected by ethnic groups worldwide (Kenangalem et al., 2013; Painter & Tabler, 2022). Asian ethnicities tend to have a lower BMI compared to the Black and Latino populations (Painter & Tabler, 2022) The overall median BMI of post-TB patients in our study (21) is the same as recent research from Singapore that investigated the BMI profiles of bronchiectasis patients with TB with a median BMI of 21.2 (Fong, Low, & Yii, 2022)

The median rate of BMI in CPA patients in our study was 19.3. This rate is slightly higher than other previous studies of CPA conducted in other countries with a BMI range from 17.1 to 18.98 (Nguyen et al., 2021; Ohara et al., 2016; Ohba et al., 2012). Malnutrition indicated with an underweight BMI is commonly found in CPA patients and becomes an independent predictor for mortality (Kimura et al., 2021; Lowes et al., 2017; Ohba et al., 2012).

The lowest BMI observed from this study is 14.40 from a non-CPA group patient with an Aspergillus IgG level of 7.04 mg/L and persistent respiratory or systemic symptoms. The lowest BMI from the CPA group was 14.70 with severe bilateral cavitary lesions of TB in the early stages of TB therapy. There is the possibility that the BMI was lower than 14.70 at the time of TB diagnosis. A Van Lettow et al. study showed that the severity of radiological findings correlates with weight loss.

Previous studies revealed underweight is the major risk factor for TB(Choi et al., 2021) The poor clinical status reflected by BMI accompanied by severe lung cavitation is the perfect combination for the development of CPA in post-TB patients. TB and CPA as dual infections were reported in our previous study (Setianingrum et al., 2022) The effect of co-existence between CPA and TB on the BMI profiles of TB patients is required to be explored.

The proportion of underweight patients is higher in the CPA group than the non-CPA group, although this was not statistically significant (p=0.493). Also, the median BMI across different Aspergillus IgG groups was not statistically significant (p=0.401). There is a decrease trend of BMI in the positive Aspergillus IgG group (median BMI 21.6) compare to the negative Aspergillus IgG group. One of the limitations of this study is the small number of CPA cases. The high positive Aspergillus IgG group is defined by the Aspergillus IgG range >30 mg/L. There was only five patients classified into this group. In contrast, the number of patients in other Aspergillus IgG groups are 32 and 13. Therefore, future studies with a sufficient number of CPA cases might confirm our findings and elucidate the role of the BMI index in the progression of CPA in post-TB patients in Indonesia.
CONCLUSIONS

The BMI is profile is a potential and simple tool to assess the prognosis of CPA. There is a need for future studies to understand better the interactions between the decrease in BMI and the increase in Aspergillus IgG levels in CPA patients. Furthermore, the co-existence between CPA with other conditions such as TB, bronchiectasis, and other pulmonary diseases might affect the fluctuation of BMI of patients.

ACKNOWLEDGEMENT

The authors gratefully acknowledge the staff of Department of Parasitology FMUI for the laboratory works, David Denning for international research collaboration, Winda Sofvina and Mutia Syarifah for their help in the data collection from Parasitology Laboratory, Department of Parasitology, Faculty of Medicine Universitas Indonesia.

REFERENCES:


Nguyen, N. T. B., Le Ngoc, H., Nguyen, N. V.,


