



**3 Years Experimental Study on Abdominal Aortic Aneurysm Patients Who were Treated with Endovascular Aneurysm Repair in Dr. Mohammad Hoesin General Hospital Palembang During 1<sup>st</sup> of January 2018 – 31<sup>st</sup> of December 2020**

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**Abstract**

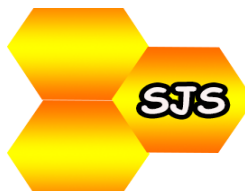
**Background:** Abdominal aortic aneurysm (AAA) is a focal dilatation of the aortic segment with an increase of 1.5 times the normal value or  $\geq 3$  cm. The risk increases in old age and requires alternative surgery such as EVAR. EVAR is more useful in AAA therapy than surgery with wide incisions.

**Methods:** This research was descriptive in RSMH Palembang for 5 years in 1st of January 2018 - 31st of December 2020 with variables of patient clinical characteristics and patient CTA results.

**Results:** The results showed that AAA was more common in men, aged 60-69 years with high school education, risk factors such as a history of CHF, hypertension, CAD, and smoking habits. Angiographic CT result showed proximal diameter  $> 2$  cm, PAU, calcification, iliac aneurysm, and lowest renal artery on the left side. All AAA patients had inferior limb thrombus and angulation  $> 600$ . The average of aneurysm is 5.8 cm in diameter and 9.23 cm in length. The mean diameter of the right iliac artery differs from the mean diameter of the left iliac artery.

**Conclusion:** The diameter of the right femoral artery also differs from the diameter of the left femoral artery. AAA patients mostly had no history of CKD, COPD, and DM. The patients were hospitalized for an average of 7 days, especially in the ICU for 2 days.

**Keyword:** Abdominal Aortic Aneurysm (AAA), CAD, CHF, CAD, LDL



## **1. Introduction**

Abdominal Aortic aneurysm (AAA) is a focal dilatation of the aortic segment with a diameter of  $\geq 3$ cm.<sup>1</sup> The percentage of asymptomatic AAA in men is 8.2% in the UK, 8.8% in Italy, 4.2 in Denmark, and 8.5% in Sweden. The AAA percentage in women is much lower (0.6-1.4%). Based on a national study conducted in the US from 2007 to 2011 totaling 166.443 subjects, the average age of AAA patients undergoing surgical intervention was 73 years.<sup>2</sup> As the population ages, the number of elderly AAA patients requiring elective or emergency surgery is expected to increase. Endovascular surgery such as EVAR is better than open surgery with a lower risk of mortality.<sup>2,3</sup> This study aimed to determine the characteristics of patients with abdominal aortic aneurysms (AAA) at Dr. Mohammad Hoesin Hospital Palembang.

## **2. Methods**

This study is a retrospective descriptive study using secondary data from the medical records of Mohammad Hoesin Hospital Palembang for January 2018 to December 2020 period. The sample is all patients with a final diagnosis of an abdominal aortic aneurysm with incomplete research variables excluded from this study. The variables used in this study included age, sex, and education level, hypertension, coronary arterial disease (CAD), congestive heart failure (CHF), chronic obstructive pulmonary disease (COPD), diabetes mellitus, kidney failure, smoking, length of time. treatment, length of stay in the ICU, complications, low-density lipoprotein (LDL) values, urea values, creatinine values, CTA results: proximal diameter of the aneurysm, lowest renal artery level, aortic thrombus, penetration of atherosclerotic ulcers (PAU), angulation, aneurysm diameter, aortic calcification, iliac calcification, femoral calcification, aneurysm length, aneurysm neck length, iliac artery diameter, femoral artery diameter, iliac aneurysm. After obtaining approval from the Research Ethics Committee, data recording was carried out in the medical record room, processed descriptively based on the amount of data obtained following the variables studied. The results of the study are presented in tabular form which is further explained in narrative form.

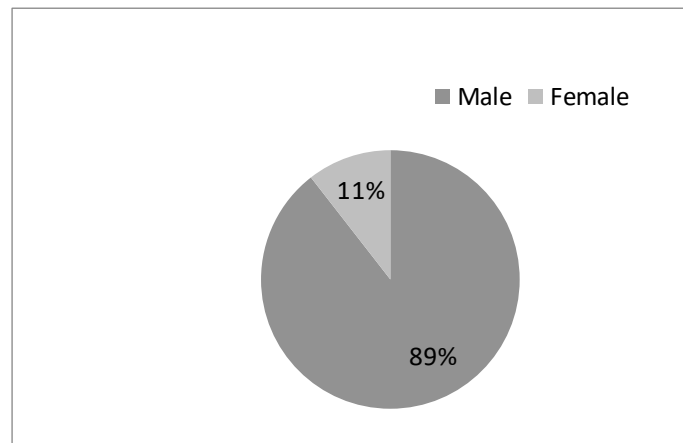
## **3. Results**

This study is a retrospective descriptive study using secondary data through patient medical records. 19 subjects met the research criteria.

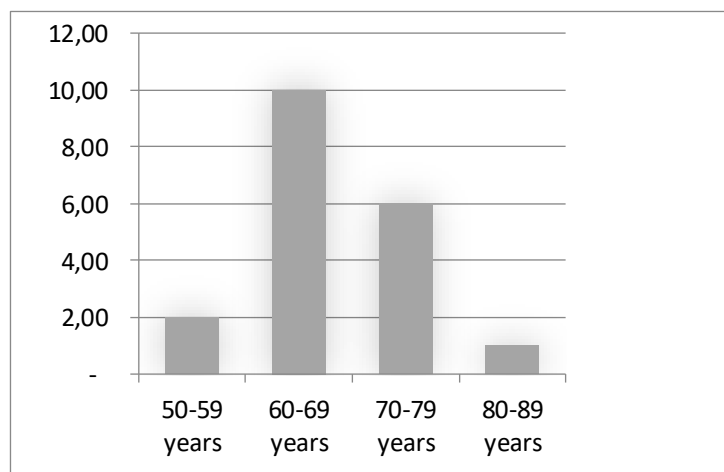
From 19 cases of abdominal aortic aneurysms, it was found that most patients with abdominal aortic aneurysms were male, namely 17 patients (89%). The results can be seen in graph 1.

The age distribution can be seen in graph 2. The youngest age of people with abdominal aortic aneurysms was 55 years old, while the oldest was 82 years old. The distribution by age is as follows: there are 2 patients (10%) in the 50-59 years age group, 10 patients (53%) in the 60-69 years age group, 6 patients (32%) in the 70-79 years age group, 1 patient (5%) in the 80-89 years age group.

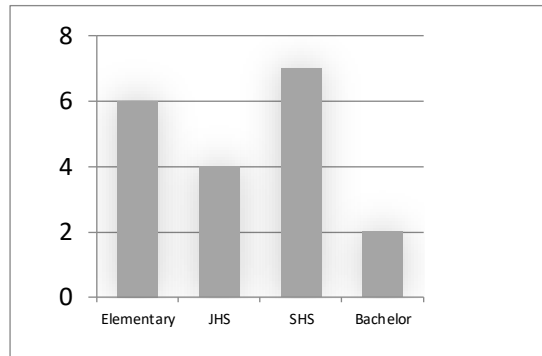
During the period January 1, 2018–31 December 2020, the latest distribution of patient's education was as follows: 6 patients (32%) in elementary school, 4 patients (21%) in junior high school, 7 patients (37%) in senior high school, 2 patients (10%) in a bachelor degree at Dr. Mohammad Hoesin Hospital Palembang. The latest education distribution can be seen in graph 3.



**Graph 1.** Distribution of AAA patients based on gender

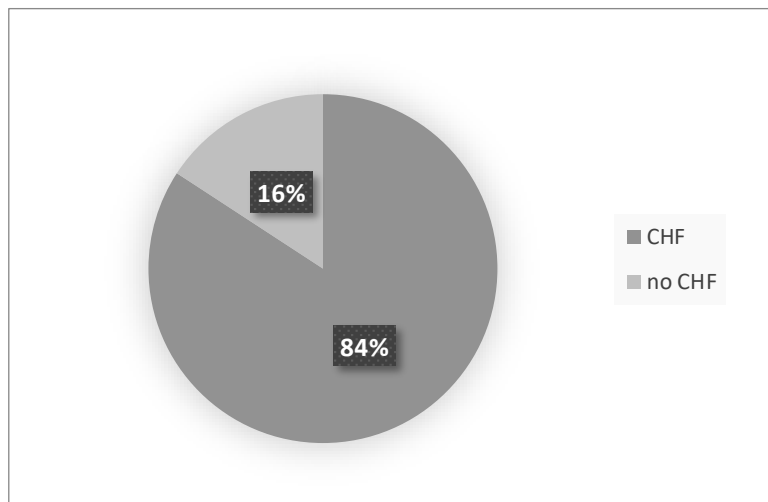


**Graph 2.** Distribution of AAA patients based on age group

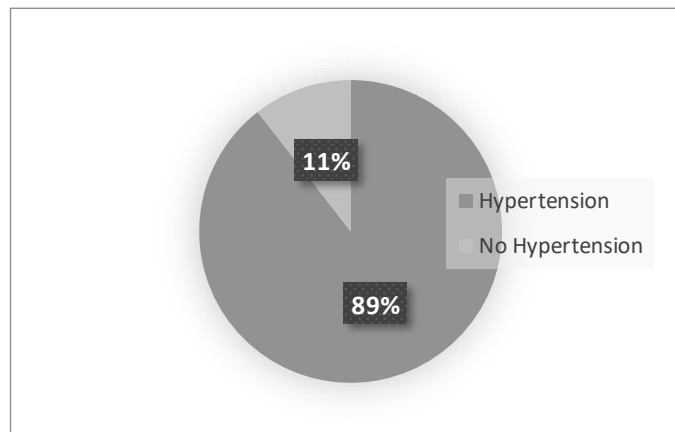


**Graph 3.** Distribution of AAA patients based on latest education

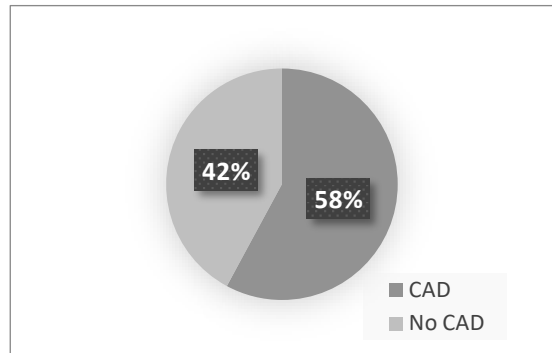
During that period, 16 patients (84%) had CHF and 3 patients (16%) did not suffer from CHF, 17 patients (89%) had a history of hypertension and 2 patients (11%) without history of hypertension. The distribution of CHF and hypertension history can be seen in graphs 4 and 5.



**Graph 4.** Distribution of AAA patients based on CHF history

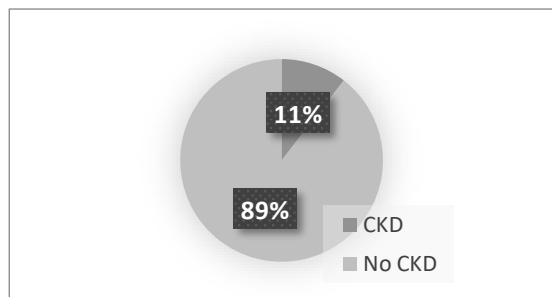


**Graph 5.** Distribution of AAA patients based on hypertension history

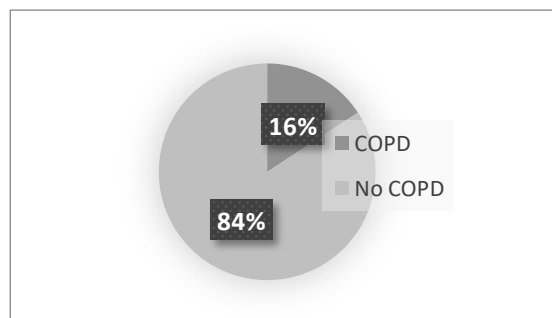


**Graph 6.** Distribution of AAA patients based on CAD history

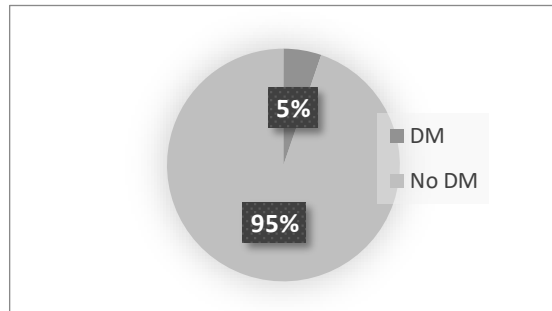
During January 2018 to December 2020 period, there were 11 patients (58%) with CAD history, 8 patients (42%) without CAD history, 2 patients (11%) suffering from CKD, 17 patients (89%) did not suffer from CKD, 3 patients (16%) had COPD history, 16 patients (84%) did not have COPD history, 1 patient (5%) had DM history, 18 patients (95%) did not suffer from DM, 16 patients (84%) have smoking history and 3 people (16%) are not have smoking history. The distribution of history of CAD, CKD, COPD, DM, and smoking can be seen in Graph 6-10.



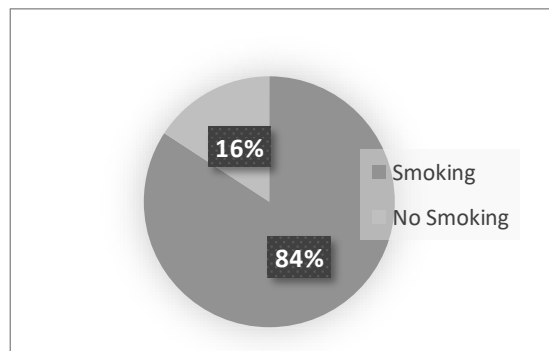
**Graph 7.** Distribution of AAA patients based on CKD history



**Graph 8.** Distribution of AAA patients based on COPD history

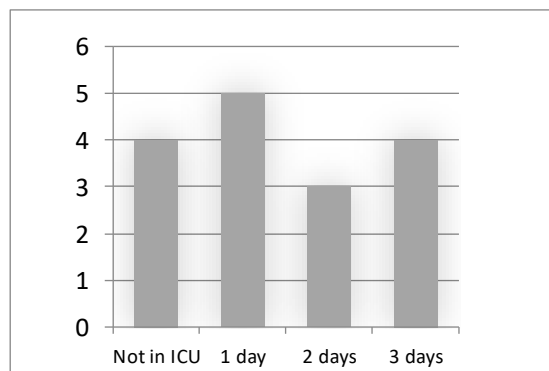


**Graph 9.** Distribution of AAA patients based on DM history



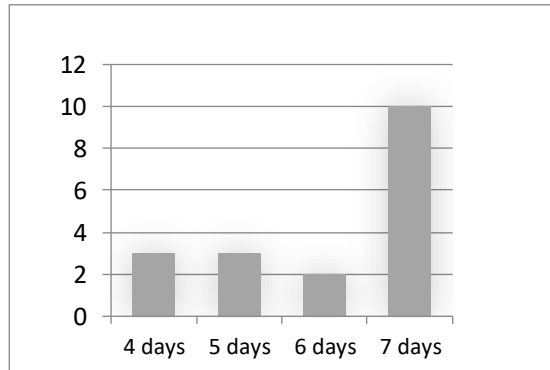
**Graph 10.** Distribution of AAA patients based on smoking history

In that period, 4 patients (21%) were not admitted to the ICU, 5 patients were treated for 1 day, 3 patients were treated for 2 days, 7 patients were treated for  $\geq 3$  days. The average length of stay in the ICU is 2 days according to graph 11.



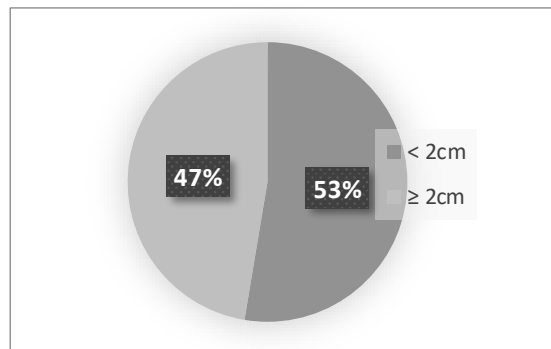
**Graph 11.** Distribution of AAA patients based on length of stay in ICU

Based on the length of stay, during that period, 3 patients were treated for 4 days, 3 patients were treated for 5 days, 2 patients were treated for 6 days, 10 patients were treated for 7 days, with an average length of stay in the hospital which was 7 days according to graph 12.



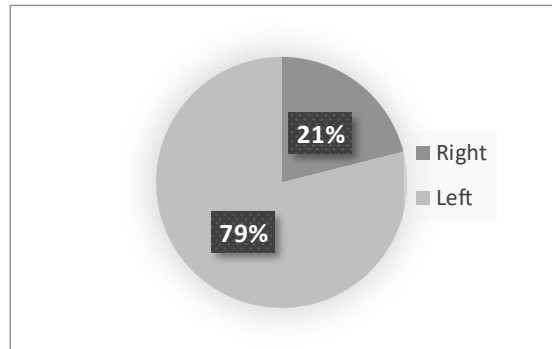
**Graph 12.** Distribution of AAA patients based on length of stay

Based on the proximal diameter, 10 patients (53%) were recorded with a proximal diameter <2cm and 9 patients (53%) with a proximal diameter  $\geq$  of 2cm according to graph 13.



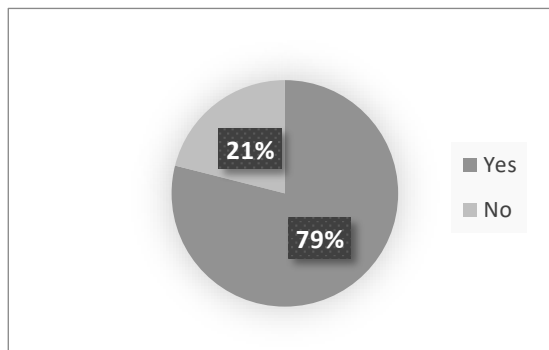
**Graph 13.** Distribution of AAA patients based on proximal diameter

Based on the lowest renal artery level, there were 4 people (21%) with the lowest renal artery on the right side and 15 people (79%) with the lowest renal artery on the left side according to graph 14.



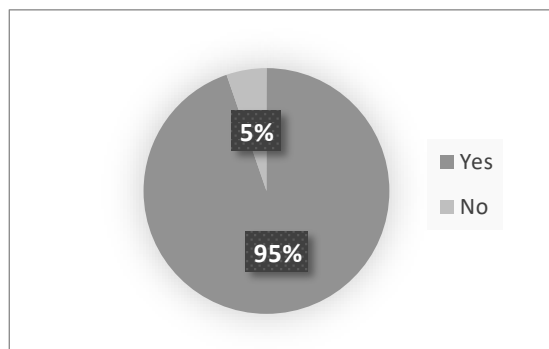
**Graph 14.** Distribution of AAA patients based on lowest renal artery level

Based on the abdominal artery thrombus, 19 people (100%) had a thrombus and no one was without a thrombus in the inferior extremities. In addition, it was recorded that 15 people (79%) had PAU and 4 people (21%) were without PAU according to graph 15.



**Graph 15.** Distribution of AAA patients based on PAU

Based on the abdominal aortic calcification, it was recorded that 18 people (95%) had calcifications and 1 person (5%) did not have calcifications according to graph 16.



**Graph 16.** Distribution of AAA patients based on abdominal aortic calcification

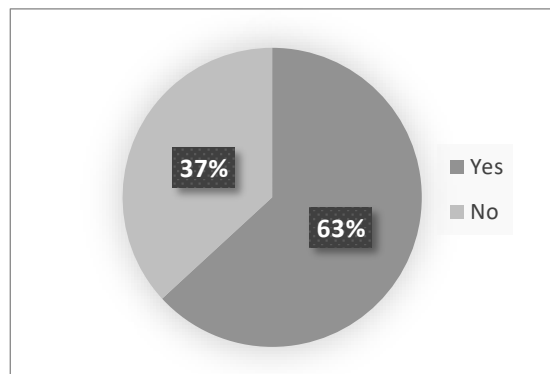
In abdominal aortic angulation, there were no people with angulation <450 and 450-600 and there were 19 people (100%) with angulation > 600 with an average diameter of the aneurysm which was 5.8



cm, the longest diameter was 9.4 cm and the shortest diameter was 3cm. and the mean length of the aneurysm was 9.23 cm, the longest aneurysm was 14 cm and the shortest aneurysm was 3.5 cm.

During the period January 2018 to December 2020, an average diameter of the right iliac artery of 1.748cm. The longest diameter of the right iliac artery was 3.3 cm and the diameter of the shortest right iliac artery was 0.93 cm. It was noted that the mean diameter of the left iliac artery was 2.1 cm, the longest diameter of the left iliac artery was 8.8 cm and the longest diameter of the left iliac artery was 0.97 cm.

Based on the presence or absence of iliac aneurysms, 12 patients with iliac aneurysms (63%) and 7 patients without iliac aneurysms (37%) were recorded as per Graph 17.



**Graph 17.** Distribution of AAA patients based on iliac aneurysms

In this study, the longest diameter of the femoral artery was 1.4 cm and the diameter of the shortest right femoral artery was 0.7 cm. The mean diameter of the left femoral artery was 1.01 cm. The longest left femoral artery diameter was 1.3 cm and the shortest left femoral artery diameter was 0.7 cm.

#### 4. Discussion

This study found that the male gender is more dominant (89%). This is following research by Mitsunori Nakano and Perwira Widiyanto which showed that most patients were male, even Kulbir Singh et al in Norway showed that the male population was > 4x more likely to suffer from AAA.<sup>4-6</sup>

In this study, the 60-69 years age group dominated the study subjects (32%). This is consistent with the study of Mitsunori Nakano with the mean age of AAA patients was 72 years and in the study of Perwira Widiyanto, the mean age of AAA patients was 64 years. A study in Norway from 1994-1995 of 6.386 AAA patients also showed that AAA patients were over 48 years of age<sup>4-6</sup>

The incidence of AAA at the latest in bachelor degree in this study was relatively low (10%). This is associated with a better patient understanding of risk factors and AAA prevention.<sup>7</sup> Lyttkens et al have a systematic review reporting that patients lack understanding of knowledge, progressivity, physical exercise, lifestyle changes, and follow-up plans for AAA management, resulting in anxiety.<sup>8</sup> Christakis and Fowler in 2008 showed that cigarette dependence can be reduced by 36% by the influence of a group of friends with higher education.<sup>9</sup>

The incidence of CHF in this study was relatively high (84%). This is inconsistent with Mitsunori Nakano's study where patients without CHF were dominant.<sup>4</sup> Barisione et al. In 2018 reported that 25% of heart damage occurred in AAA patients, and 38.8% of cases also accompanied cardiorenal syndrome.<sup>10</sup> Duncan in Skorlandia reported increased mortality in male AAA patients aged 65-74 years is directly proportional to the size of the aortic diameter and the risk of the need for cardiovascular hospitalization.<sup>11</sup>

The history of hypertension in AAA cases in this study was relatively high (89%). This is following the research of Mitsunori Nakano and Perwira Widiyanto where AAA patients were predominantly hypertensive.<sup>4,5</sup> Vardulaki found that hypertension increased 30-40% risk of AAAs.<sup>12</sup> However, Cornuz et al in a systematic review and meta-analysis showed that hypertension had a weak correlation with the incidence of AAA (OR = 1.33).<sup>13</sup>

The history of CAD in AAA cases in this study was relatively higher than without CAD (58%). This is consistent with the meta-analysis of Elkalioubie et al AAA patients with CAD were significantly higher than patients without CAD.<sup>14</sup> Durieux et al (2014) also showed that the risk of AAA was increased in patients with CAD that occurred in three coronary arteries.<sup>15</sup> However, Chun in study of 6,142 patients war veterans pointed out that CAD to be a risk factor for AAA.<sup>16</sup>

The history of patients without CKD in AAA cases in this study was relatively higher than patient with CKD history (89%). Reeps et al in their study showed that the abdominal aortic wall of patients with CKD was thinner than the abdominal aortic wall of patients with DM.<sup>17</sup> However, the Matsushita et al. (2018) study showed a decrease in eGFR and an increase in albuminuria associated with the incidence of AAA and a larger abdominal aortic diameter.<sup>18</sup> The research of Takeuchi et al (2018) shows that CKD is positively associated with AAA, while DM is not.<sup>19</sup>

The history of patients without COPD in AAA cases in this study was relatively higher than that of COPD (84%). This is consistent with the Spencer et al and Takagi et al cohort study that COPD was

not associated with the onset of AAA.<sup>20,21</sup> However, this is different from the study by Meijer et al that COPD increases the risk of 2 times AAA.<sup>22</sup>

Patient history without DM (95%) was dominant in AAA cases in this study compared to DM or. This is following the study of Mitsunori Nakano and Perwira Widiyanto where AAA patients without a history of DM were more dominant.<sup>4,5</sup>

Smoking history was dominant in AAA cases in this study (84%). This is consistent with the study of Mitsunori Nakano and Perwira Widiyanto where AAA patients with a history of smoking were more dominant.<sup>4,5</sup> The Egorova et al cohort study also showed that smoking is a risk factor for AAA.<sup>23</sup> The average length of stay in the ICU in this study was 2 days. This is consistent with the retrospective study of Cruz et al.<sup>24</sup> Epidural analgesia can also shorten the length of stay in the ICU when compared to opioid analgesics given after abdominal aortic surgery.<sup>25</sup>

The average length of stay for AAA patients in this study was 7 days. This is consistent with Cruz et al. That the average length of stay in the hospital is 6-7 days.<sup>24</sup> Early extubation of ETT tends to reduce hospital stay and respiratory system complications after AAA repair.<sup>26</sup>

The proximal diameter of the abdominal aorta, in this case, was <2 cm (53%). Proximal diameter > 26 mm tends to have a worse prognosis after EVAR.<sup>27</sup>

The incidence of the renal artery was lowest in cases of dominant AAA on the left side (79%). Under normal conditions, the diameter of the left renal artery is greater than the diameter of the right renal artery.<sup>28</sup>

The incidence of thrombus in AAA is very high (100%). Men with CAD with a history of smoking are at increased risk of thrombus.<sup>1,29</sup> The incidence of PAU was also high (79%) in AAA cases. Focal perforations of the intima and medial wall hematomas may occur in iliac artery aneurysms accompanied by pseudoaneurysms of the abdominal aorta due to PAU before the aneurysm ruptures.<sup>30</sup>

The incidence of abdominal aortic calcification is very high in AAA cases (95%). The more dominant calcifications were according to CAD and smoking history was more dominant in this study.<sup>31</sup> In this study all patients had angulation >60° which is following the study of Perdikides et al.<sup>32</sup> Angulation >60° between the neck of the infrarenal aorta and the longitudinal axis of the aneurysm was associated with proximal Type I rupture that can be treated with AAA repair techniques with vascular transplantation.<sup>33</sup>

The average diameter of the aneurysm in this study was 5.8 cm and the length was 9.23 cm. Brady et al on 1743 of AAA patients showed that the mean aneurysm diameter was initially 43 mm (28-85 mm) and increased by 2.6 mm / year.<sup>34</sup> The maximal diameter of the aneurysm was no more accurate and sensitive than the identification of AAA biomechanical factors, such as maximal arterial wall pressure as measured by computational techniques.<sup>1</sup>

The mean right iliac artery diameter was 1,748 cm. Schanzer et al in their study of 10,288 patients who underwent EVAR showed that a common iliac artery diameter > 2 cm was indicative of a AAA prognosis.<sup>35</sup> Iliac artery diameter affects hemodynamics after stent grafting of AAA.<sup>1</sup>

The incidence of iliac arteries at AAA is quite high (63%). Unilateral iliac aneurysms tend to be more common than bilateral iliac aneurysms.<sup>36</sup> The presence of an iliac aneurysm will determine the type of AAA repair procedure.<sup>1</sup>

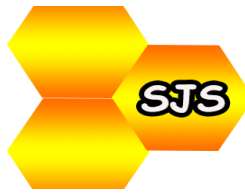
The mean diameter of the right femoral artery in this study was 1.46 cm. Age of growth and sex of males tend to have a larger diameter of the common femoral artery that may be considered for AAA screening.<sup>1</sup>

## **5. Conclusion**

Subjects with AAA were mostly men, aged 60-69 years, last high school education, had a history of CHF, hypertension, CAD, smoking habits, proximal diameter > 2 cm, PAU, calcification, iliac aneurysms, and the lowest renal artery on the side. left. All AAA patients had inferior limb thrombus and angulation > 60°. Aneurysms have an average diameter of 5.8 cm and a length of 9.23 cm. The mean diameter of the right iliac artery was 1.748 cm and the mean diameter of the left iliac artery was 2.1 cm. The mean diameter of the right femoral artery was 1.46 cm and the mean diameter of the left femoral artery was 1.01 cm. AAA patients mostly had no history of CKD, COPD, and DM. The average length of stay in the ICU is 2 days. The average length of stay in the hospital was 7 days.

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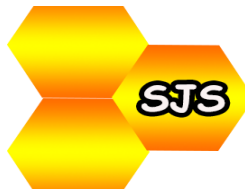
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