

CORRELATIONS OF PROSTATE VOLUME WITH PSA LEVELS IN BPH PATIENTS AT ULIN GENERAL HOSPITAL BANJARMASIN

¹Nur Ramadhanti Cindy Levissa, ²Eka Yudha Rahman, ³Dewi Indah Noviana Pratiwi, ²Heru Prasetya, ⁴Siti Kaidah.

¹Medical Education Study Program, Medical Faculty/Lambung Mangkurat University, Banjarmasin.

²Department of Urology, Medical Faculty/Lambung Mangkurat University, Ulin General Hospital, Banjarmasin.

³Department of Clinical Pathology, Medical Faculty/Lambung Mangkurat University, Ulin General Hospital, Banjarmasin.

⁴Department of Physiology, Medical Faculty/Lambung Mangkurat University, Banjarmasin.

Correspondence Email: cindylevissa11@gmail.com

Abstract: *This study aims to determine the association between prostate volume and PSA levels in BPH patients at Ulin Hospital Banjarmasin. This study used a cross-sectional retrospective approach and analytic method. A total of 52 samples were obtained by purposive sampling based on inclusion and exclusion criterias. The highest prostate volume of 20.00-39.99 cc was obtained from 16 patients (30.7%) and the lowest volume of 60.00-79.99 cc was obtained from 10 patients (19.2%). Examination of PSA levels were highest at 2.6-9.9 ng/mL from 24 patients (46.2%) and the lowest at >20.0 ng/mL (5.8%) from 3 patients. Data analysis using Pearson correlation coefficient showed a positive correlation between prostate volume and PSA levels in BPH patients at Ulin Hospital Banjarmasin with a p value = 0,000 and r = 0.616 (positive and strong correlation).*

Keywords: BPH, Prostate volume, PSA

INTRODUCTION

Benign prostate hyperplasia (BPH) is one of the common condition in men in which there is a benign enlargement of the prostate gland, that can be fibromuscular hyperplasia or glandular hyperplasia.¹ According to data from WHO, there are an estimated 70 million degenerative cases, one of which is BPH, with BPH world incidence reaches 2,466,000.² A population-based cross-sectional study in 1995 concluded that approximately 5.6 million white men aged 50-79 years in the United States suffer from BPH. The study also estimated that in 2010 this number will double up with increasing life expectancy.³ The incidence of BPH in Asia reaches 764,000 people, consist of 19% cases in developed countries and 5,35% in developing countries.² BPH ranks second as the most common disease in Urology clinics in Indonesia after urinary tract stones. According to the medical records of Pandanarang Boyolali Hospital, there were 90 cases of BPH patients in 2012 and 131 cases from 2012 to April 2013.² In 2013, there were 9.2 million cases of BPH, of which mostly the patients were over the age of 60 years. The histological prevalence of BPH increases in men aged 41-50 years by 20%, 50% in men aged 51-60 years, and more than 90% in men over 80 years of age.⁴

BPH is a hyperplasia nodule located in the transitional zone and the periurethral zone whose macroscopic appearance is marked by enlargement caused by progressive stromal hyperplasia of the prostate gland.⁵ Hence, resulting in volume and histological changes in the prostate structure. Prostate volume varies from age to age. Several studies using cross-sectional method, concluded that prostate volume increased by 25 cc in men 30 years ago to 35-45 cc in 70 years old men.¹

Prostate volume is affected by BPH, caused by the aging mechanism which results in a decrease of hormone levels, especially testosterone in men. The testosterone hormone is converted into dihydrotestosterone (DHT) in prostate gland, in which DHT will stimulate the enlargement of the prostate gland. Factors that can affect BPH include the patient's background such as age, family history,

increased blood cholesterol levels, high fat diet, exercise, smoking, alcohols, Diabetes Mellitus, sexual activity, and obesity are thought to increase the risk of BPH. Body mass index (BMI) is not related to symptoms, but waist to hip ratio (WHR) and abdominal girth which describe abdominal obesity increase the risk of BPH.^{6,7} Prostate volume can be used to monitor therapeutic results and indicator of surgical planning on BPH.⁸ Prostate volume for BPH is determined by ultrasound imaging (USG), either transabdominal ultrasonography (TAUS) or transrectal ultrasonography (TRUS) because of its accuracy to detect prostate enlargement, there is no harm of radiation, and relatively inexpensive costs.⁹

PSA is a serine protease produced by prostatic epithelial cells in normal prostate, BPH, and prostate cancer. The amount of PSA secretion is determined by various factors such as the presence of an inflammatory process, benign or malignant enlargement, manipulation of the prostate gland on rectal examination, prostate mass, or catheter placement.¹⁰ These antigens are not cancer-specific, but rather organ-specific, which greatly increased when trauma, inflammation and BPH occur. Although free PSA (FPSA) is more practical and widely used, total PSA (TPSA) is more effective in early diagnosis.¹¹

According to data in the Urology Clinic at Ulin General Hospital Banjarmasin, BPH patients are classified as high, but there is still no epidemiology of BPH. PSA levels and prostate volume examination in BPH patients are very important to monitor, because the management is performed in the hope that it can make better outcome or determine prognosis earlier. This study can also be used to determine the grading of BPH.

This research was aimed to determine the correlation between prostate volume and PSA levels in BPH patients at Ulin General Hospital Banjarmasin.

RESEARCH METHODS

This study use dan analytic methos with a cross-sectional retrospective approach. The study subjects were medical records of patients diagnosed with BPH at Ulin General Hospital Banjarmasin in the period of 2017-2018 obtained by purposive sampling based on inclusion and exclusion criterias.

Data analysis using Pearson correlation coefficient. Inclusion criteria for the sample are the medical record data of patients who have been diagnosed BPH clinically by a urology specialist, the medical record data of BPH patients who have performed a supporting ultrasound examination, and PSA laboratory tests through blood serum.

Exclusion criteria of the study were

medical records of BPH patients with other urinary tract diseases, medical records of BPH patients with prostatitis, medical records of BPH patients with trauma, medical records of patients with clinical, laboratory, and sonographic data likely to lead to prostate cancer and medical records of BPH patients who have undergone prior BPH surgery.

RESULTS AND DISCUSSION

Study on the association of prostate volume and PSA levels in BPH patients at Ulin General Hospital Banjarmasin in the period of 2017-2018 showed that the number of BPH patients was 52 patients who met the inclusion and exclusion criteria with age grouping based on the samples obtained.

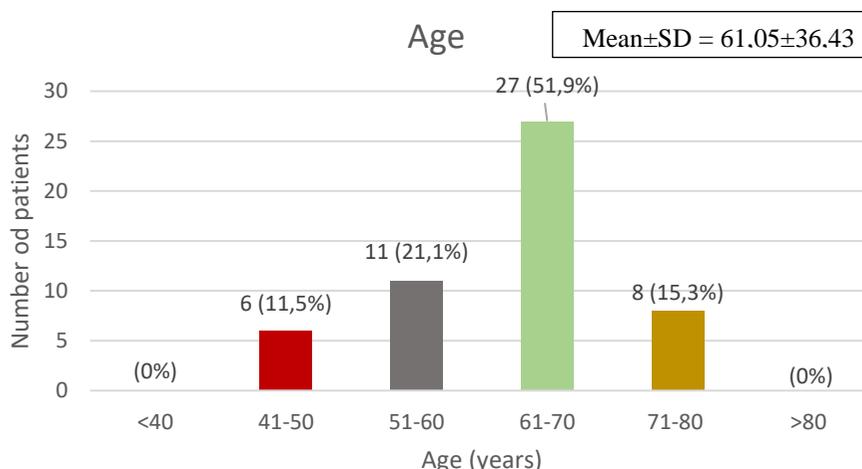


Figure 1 Distribution of BPH Patients Based on Age at Ulin General Hospital Banjarmasin 2017-2018.

According to (Figure 1) the mean age of BPH patients at Ulin General Hospital Banjarmasin is 62,79 with a standard deviation of 8,36, the age of prostate enlargement is mainly at the age of 61-70 years with a percentage of 51.9%, followed by the age of 51-60 years with a percentage of 21.1%, aged 71-80 years with a percentage of 15.3%, and at the age of 41-50 years with a percentage of 11.5%. This is comparable to the research by Adelia et al. (2014-2017) at RSUP Prof. Dr. R. D. Kandou Manado with the most BPH patients at the age

of 61-70 years with the percentage of 46.15% and the smallest percentage is the age of 41-50 years with a percentage of 5.13%.¹² This result is also similar to the research by Daniel et al. (2017) at RS Bhayangkara Mataram that the highest BPH incidence rate was at 64 years old.¹³ Prostate enlargement generally occurs due to hyperplasia. Microscopic pathological hyperplasia occurs at the age of 30-40 years, followed by macroscopic pathological hyperplasia at the age of 40-50 years, and hyperplasia with clinical symptoms at the age after 50 years.¹⁴

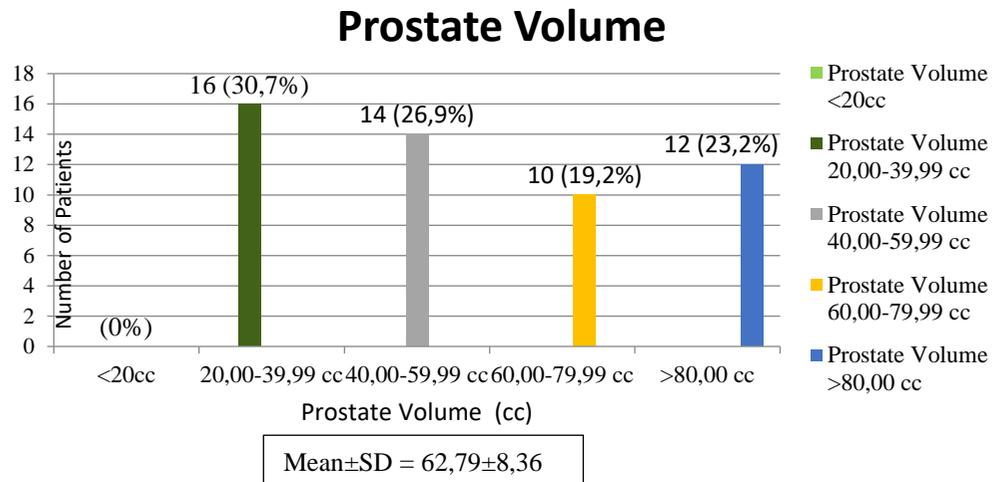


Figure 2 Distribution of BPH Patients Based on Prostate Volume at Ulin General Hospital Banjarmasin 2017-2018

The results of prostate volume in BPH patients at Ulin General Hospital Banjarmasin showed an average level of 61.05 cc and a standard deviation of 36.43 with a total of 52 subjects. Based on (Figure 2) showing the distribution of prostate volume data of 52 patients, consisted of 16 patients with a volume of 20.00-39.99 cc (30.7%), 14 patients with a volume of 40.00-59.99 (26.9%), 12 patients with a volume of >80.00 cc (23.2%), and 10 patients with a volume of 60.00-79.99 cc (19.2%). This is comparable to the research by Daniel et al. (2017) at Bhayangkara Hospital Mataram, stating the prostate enlargement will

be proportional to the increase in prostate volume.¹³ This results also are similar to the studies conducted by Dong et al. (2013) and Jozo et al. (2015) where there is a correlation between prosate volumen and PSA levels. Measurement of prostate volume is determined by conducting transabdominal and transrectal ultrasound as a diagnosis for BPH.⁹ Full bladder Transabdominal Ultrasound will usually show and measure prostate volume, whereas for prostate volume measurement to be more accurate can be done with transrectal ultrasound. Prostate volume can be affected by age, race, and ethnicity.¹⁵

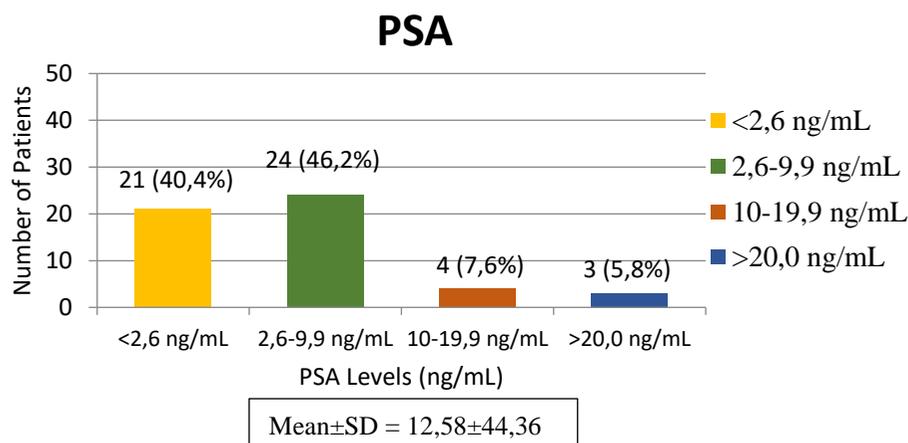


Figure 3 Distribution of BPH Patients Based on PSA Levels at Ulin General Hospital Banjarmasin 2017-2018.

PSA levels results of BPH patients at Ulin Banjarmasin Hospital Banjarmasin showing an average level of 12.58 ng/mL and a standard deviation of 44.36 with a total of 52 subjects. The distribution of PSA levels of BPH patients at Ulin General Hospital Banjarmasin based on (Figure 5.3) presented 24 patients with PSA levels of 2.6-9.9 ng/mL (46.2%), followed by PSA levels <2.6 ng/mL of 21 patients (40.4%), 4 patients with PSA levels of 10-19.9 ng/mL (7.6%), and 3 patients with PSA levels of > 20.0 ng/mL (5.8%).

This result is comparable to research by Mario et al. (2003) at the Education Hospital in Turin University which stated that out of 569 BPH patients, 179 patients (31.6%) had a PSA levels of >4 ng/mL, while there were 390 patients (68,4%) with a PSA levels of <4 ng/mL.¹⁶ Increased PSA levels may be caused by several conditions, including aging, race, urinary tract infections, sexual activities such as ejaculation, BPH, prostatitis, prostate gland cancer, DRE (Digital Rectal Examination), biopsy and medications.^{10,17} This is comparable to the study by Byung et al. (2006) in patients from 11 medical centers who first visited hospitals accompanied by LUTS complaints that PSA levels and age showed large variations among individuals and the study of Lee et al. (2007) in Korean men who showed an increase in PSA per increase in prostate volume decreased in the elderly group.^{15,18} PSA has a normal value of ≤ 4 ng/mL. PSA levels in seminal plasma are around 0.2–5 ng/mL. Normal blood serum levels are 0.2–4 ng/mL. Improvements were made in the interpretation of PSA values, namely PSA velocity or changes in the rate of PSA values, PSA density and mean PSA values, whose value depends on

the age of the patient.¹⁹

Kolmogorov-Smirnov test is used as a normality test to determine the distribution of data, it is said to be normal if the value of $p > 0.05$. After the normality test is done, the data generated is not normally distributed, thus the data transformation is performed using Log10 and resulting the data was normally distributed. Data analysis was then performed with the Pearson correlation test to determine the correlation value between the two variables. The results of the Pearson correlation test obtained $p = 0,000$, which means that the correlation between prostate volume and PSA levels is significant ($p < 0.05$), and $r = 0.616$, presenting the direction of a positive correlation with the strength of a strong correlation (0.60-0.799).

The results are consistent with the original hypothesis which states that there is a positive correlation between prostate volume and PSA levels. This is also comparable with the research by Daniel et al. (2015) in 28 patients at Bhayangkara Hospital Mataram, which concluded that prostate volume correlates with PSA levels in BPH patients.¹³ This is also similar to the study performed by Byung et al. (2006) in patients from 11 medical centers who first visited the hospital accompanied by LUTS complaints, which stated there was an association between prostate volume and PSA levels with results that varied with the age of the individual.¹⁸ This was also consistent with research conducted by Mario et al. (2003) in Urological patients in Turin who stated that prostate volume correlated significantly with PSA levels.¹⁶

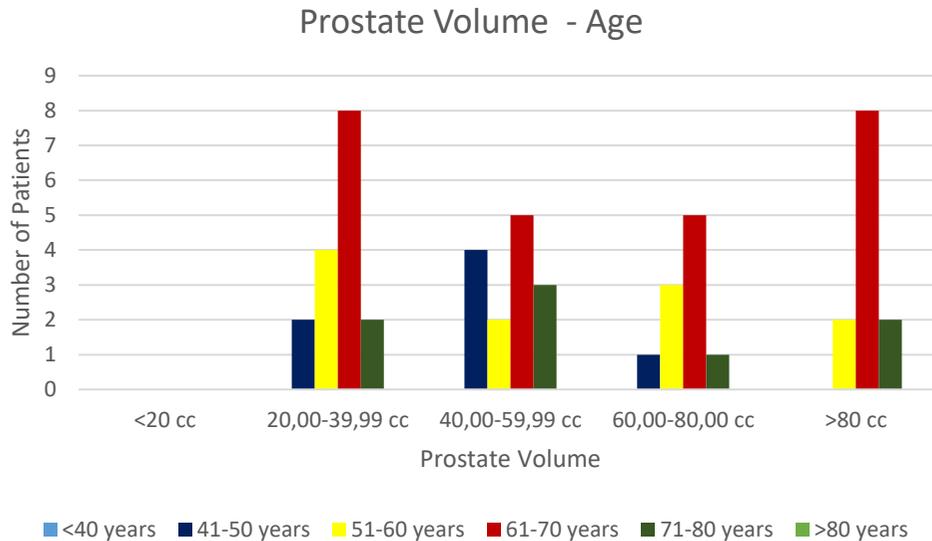


Figure 4 Distribution of Prostate Volume Based on Age

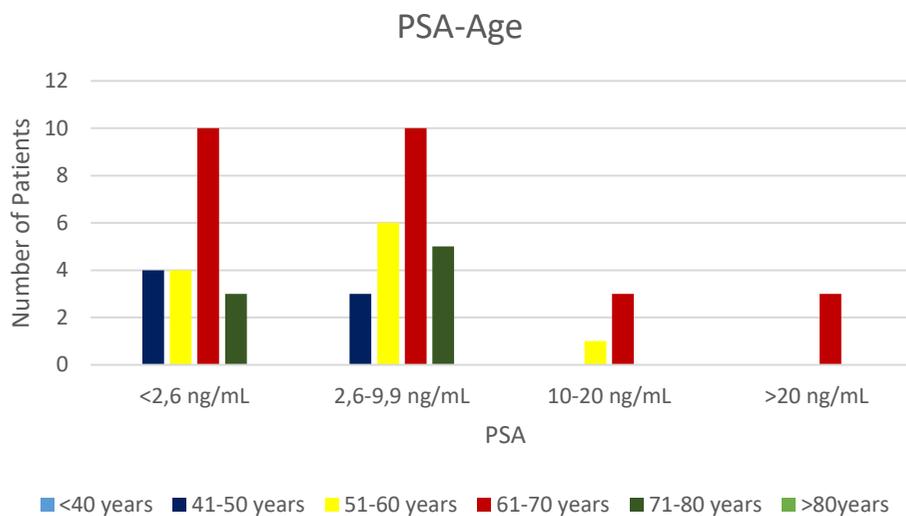


Figure 5 Distribution of PSA Levels Based on Age

Proportion of prostate volume distribution by age (Figure 4) shows that the most age obtained in prostate volume is 20.00-> 80 cc at the age of 61-70 years, as well as the distribution of PSA levels by age (Figure 5) shows that the most age obtained at PSA levels <2.6-> 20 ng / mL is at the age of 61-70 years.

The charts of prostate volume based on age distribution (Figure 5.4) and PSA based on age distribution (Figure 5.5) proves the theory of aging which is one of the etiologies of BPH, this theory may be involved in the imbalance of testosterone and estrogen hormones thus

increase the hyperplasia of stromal tissue of prostate gland, and suppress cell death that leads to an increase in prostate volume.²⁰ This chart also shows an increase in prostate volume and PSA levels for the same age in BPH patients at Ulin General Hospital Banjarmasin which implies an increase in prostate volume followed by an increase in PSA levels in patients BPH at Ulin General Hospital Banjarmasin.

This study shows the value of $p = 0,000$ ($p < 0.05$) and the value of $r = 0.616$, implying that t prostate volume and PSA levels has a

significant and strong correlation. The strong correlation in this study can be influenced by the prior therapy given before the PSA levels examined. Prostate enlargement can be caused by the reduction of the hormone testosterone in old age which is compensated by the body by forming plenty 5 α -reductase enzymes which work to reduce testosterone to dihydrotestosterone (DHT), the therapy given for BPH patients, namely harnal therapy (tamsulosin) where this drug is one of the drugs one drug to treat BPH. Tamsulosin is classified in α -blocker class of drugs. This drug has a function to relax the muscles of the trigones, sphincter in the neck of the bladder, and smooth muscles of the enlarged prostate gland to help the flow of urine goes smoothly without any obstacles and other signs that accompany obstruction in the prostate. Drugs that are often used are 5-alpha reductase inhibitors such as dutasteride, because they can reduce the prostate by reducing male hormone levels, dihydrotestosterone (DHT) or inhibiting the conversion of testosterone to dihydrotestosterone (DHT) which plays a significant role in prostate growth, leads to a decrease in DHT level, and reduces prostate volume and PSA levels.^{21,22}

In addition, the treatment received by the patients can affect the results. Ideally, the proper time for PSA examination is when the patient comes directly to get tested at the Clinical Pathology Laboratory after history-taking and received informed consent about the management approval, because some medical treatment can affect the PSA level, such as in rectal examination as in the study by Connolly et al. (2009) that patients who receive treatment, therapy, or abnormal PSA levels must be re-examined thus the results of the study is unbiased.¹⁷ Other measures are catheter placement, in which the prostate gland can be traumatized, so it is recommended to wait for 2-3 weeks after being placed to do the PSA test. PSA levels in the blood can also increase after sexual intercourse, in normal conditions generally 2-3 days after having sex the PSA levels will return to normal thus usually if someone plans to perform a PSA examination,

it is not allowed to have sexual intercourse for 48 hours before the examination.^{23,17}

CONCLUSION

There is a significant association between prostate volume and PSA levels in BPH patients at Ulin General Hospital Banjarmasin 2017-2018 with $p = 0,000$ and $r = 0.616$ showing a strong and positive correlation.

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