

RELATION OF TOTAL CHOLESTEROL TO PROSTATE VOLUME AND INTRAVESICAL PROSTATIC PROTRUSION IN BENIGN PROSTATIC HYPERPLASIA PATIENTS

¹Made Devi Desyana Arisandi, ¹Septa Surya Wahyudi, ¹Heni Fatmawati.

¹ Faculty of Medicine/Jember University, Jember.

ABSTRACT

Objective: To determine the relationship between total cholesterol, prostate volume, and intravesical prostatic protrusion in patients with benign prostatic hyperplasia. **Material & Methods:** This study used a cross-sectional method, carried out at the Paru and Bina Sehat Hospital in Jember. The sample in this study was BPH patients who met the inclusion criteria taken through medical record data from October 2019 to January 2020. **Results:** Samples on this study amounted to 33 patients. In this study, there was a difference between normal and high cholesterol with prostate volume in BPH patients ($p = 0.00$) and there was a significant relationship between cholesterol and prostate volume with strong correlation strength ($p = 0.00$ and $r = 0.751$) while the difference between high and normal cholesterol with IPP obtained insignificant results ($p = 0.211$) and the correlation between cholesterol and IPP obtained an insignificant relation with weak correlation strength ($p = 0.217$ and $r = 0.221$). **Conclusion:** There is a significant relationship between total cholesterol and prostate volume and a significant difference in prostate volume between normal and high total cholesterol in BPH patients, while there is no significant result between total cholesterol and intravesical prostatic protrusion in BPH patients.

Keywords: Prostate volume, IPP, total cholesterol, BPH.

ABSTRAK

Tujuan: Mengetahui hubungan antara kolesterol total terhadap prostate volume dan intravesical prostatic protrusion pada pasien benign prostatic hyperplasia. **Bahan & Cara:** Penelitian ini menggunakan metode cross sectional, dilakukan di Rumah Sakit Paru dan Bina Sehat Jember pada bulan Januari 2020. Sampel dalam penelitian ini yaitu pasien BPH yang memenuhi kriteria inklusi yang diambil melalui data rekam medis dengan rentang waktu Oktober 2019 sampai dengan Januari 2020. **Hasil:** Sampel pada penelitian ini berjumlah 33 pasien. Penelitian ini diuji dengan uji komparasi Mann-Whitney dan uji korelasi Spearman. Pada penelitian ini didapatkan perbedaan antara kolesterol normal dan tinggi dengan prostate volume pada pasien BPH ($p = 0.00$) dan terdapat hubungan signifikan antara kolesterol dengan prostate volume dengan kekuatan korelasi yang kuat ($p = 0.00$ dan $r = 0.751$), sedangkan hubungan kolesterol dengan IPP yang diuji dengan Mann-Whitney didapatkan hasil yang tidak signifikan ($p = 0.211$) dan hasil yang di uji dengan Spearman didapatkan hasil yang sama dengan kekuatan korelasi lemah ($p = 0.217$ dan $r = 0.221$). **Simpulan:** Terdapat hubungan yang signifikan antara kolesterol total dengan volume prostate dan didapatkan perbedaan volume prostate yang signifikan antara kolesterol total normal dan tinggi pada pasien BPH, sedangkan tidak terdapat hubungan signifikan antara kolesterol total dengan intravesical prostatic protrusion pada pasien BPH.

Kata Kunci: Prostate volume, IPP, kolesterol total, BPH.

Correspondence: Septa Surya Wahyudi, c/o: Faculty of Medicine/Jember University. Jl. Kalimantan No.37 Jember 68121. Mobile Phone: +628123479140. Email: drss_wahyudi@yahoo.com.

INTRODUCTION

Benign Prostatic Hyperplasia (BPH) is a condition of increasing numbers of prostatic epithelial cells and stromal cells. Prostate enlargement can result in obstruction of the urinary tract which can cause various clinical symptoms. BPH is one of the

diseases of the urological system that often occurs in older men and America BPH cases are the second most common cause of death in men over 55 years.¹ The incidence of BPH in Indonesia varies as much as 24-30% of urology cases treated in several hospitals, one of which is Dr. Soetomo hospital in the span of 10 years (1993-2002) recorded 1.948 cases.²

The prevalence of hypercholesterolemia at the age of 55-64 years increased by 15.5% compared to ages 25-34 years which was as much as 9.3%.³ Enlarged prostate involves the stromal gland compartment. One of the causes of BPH depends on the stimulation of androgens, especially DHT whose work is influenced by cholesterol in the blood circulation and pathogenesis of lipid levels indirectly affect the enlargement of the prostate gland.⁴

OBJECTIVE

The purpose of this study was to determine the relationship between total cholesterol and prostate volume and intravesical prostatic protrusion in patients with benign prostatic hyperplasia.

MATERIAL & METHODS

This research uses an observational analytic design and cross-sectional method with a consecutive sampling technique. The sample in this study was selected according to inclusion criteria with a sample size of 33 respondents. The inclusion criteria in this study were BPH patients with more than 50 years of age, total cholesterol levels had been measured in the laboratory and an examination with Transabdominal Ultrasound. The exclusion criteria of this study were BPH patients with a history of carcinoma of the prostate and obesity. The data in the study were analyzed with SPSS 23 with the Mann-Whitney comparison test and the Spearman correlation test.

RESULTS

Samples were taken at Paru and Bina Sehat hospital, samples of this hospital have an average age of BPH patients that is 65 ± 7.49 years. The youngest and oldest ages are 53 years and 81 years. The average total cholesterol level of BPH patients in the sample was 193.21 ± 43.94 mg/dL. The lowest and highest total cholesterol levels are 125 mg/dL and 346 mg/dL. The average prostate volume in 33 BPH samples was 47.67 ± 17.15 mL. The lowest and highest prostate volume values in the sample are 25.75 mL and 346 mL. The average Intravesical Prostatic Protrusion (IPP) is 17 ± 8 mm. The lowest and highest IPP values are 4 mm and 50 mm (Table 1).

The results in table 2 with Mann-Whitney test results of Prostate Volume and total cholesterol obtained $p = 0.000$ ($p < 0.001$). These results indicate there are significant differences between normal and high total cholesterol levels with prostate volume. The highest total cholesterol level results were found in prostate volume ≥ 51 cc, as many as 10 samples (30.3%) of 33 BPH patient samples, while normal total cholesterol levels were found most in prostate volume with a volume range of 31-50 cc (48.5%) with a total of 16 of 33 samples. The comparison of the ranks of the high cholesterol group is higher than normal cholesterol. A higher rating indicates a larger prostate volume so that the prostate volume is directly proportional to total cholesterol. The results in table 3. showed a significant correlation between total cholesterol and prostate volume ($p = 0.000$).

Table 1. General Characteristics Samples.

No	Characteristics	Mean \pm SD	Min	Max
1	Age (Years)	65 ± 7.49	53	81
2	Total Cholesterol (mg/dL)	193.21 ± 43.94	125	346
3	Prostate Volume (mL)	47.67 ± 17.15	25.75	109
4	IPP (mm)	17 ± 8	4	50

Table 2. Results of Prostate Volume Analysis with the Mann-Whitney Comparative Test.

Variable	Notes	Prostate Volume						Mean Rank Prostate Volume	P-value
		21-30 cc		31-50 cc		≥ 51 cc			
		n	%	n	%	n	%		
Normal Cholesterol	< 200 mg/dL	3	9.1%	16	48.5%	0	0.0%	11.68	0.000
High Cholesterol	≥ 200 mg/dL	0	0.0%	4	12.1%	10	30.3%	24.21	

Table 3. Results of Prostate Volume Analysis with the Spearman Correlation Test.

Variable	Notes	Prostate Volume						Coefficient correlation (r)	P-value
		21-30 cc		31-50 cc		≥ 51 cc			
		n	%	n	%	n	%		
Normal Cholestrol	< 200 mg/dL	3	9.1%	16	48.5%	0	0.0%	0.751	0.00
High Cholesterol	≥ 200 mg/dL	0	0.0%	4	12.1%	10	30.3%		

Table 4. Results of Intravesical Prostatic Protrusion Analysis with the Mann-Whitney Comparative Test.

Variable	Notes	IPP						Mean Rank IPP	P-value
		< 5 mm		5 - 10 mm		> 10 mm			
		n	%	n	%	n	%		
Normal Cholesterol	< 200 mg/dL	0	0.0%	5	15.2%	14	42.4%	15.79	0.211
High Cholesterol	≥ 200 mg/dL	1	3.0%	0	0.0%	13	39.3%	18.64	

Table 5. Results of Intravesical Prostatic Protrusion Analysis with the Spearman Correlation Test.

Variable	Notes	IPP						Coefficient correlation (r)	P-value
		< 5 mm		5-10 mm		> 10 mm			
		n	%	n	%	n	%		
Normal Cholesterol	< 200 mg/dL	0	0.0%	5	15.2%	14	42.4%	0.221	0.217
High Cholesterol	≥ 200 mg/dL	1	3.0%	0	0.0%	13	39.3%		

Spearman's correlation coefficient (r) in this study amounted to 0.751 which indicates there is a strong correlation between cholesterol and prostate volume. These results with the Mann-Whitney comparison test for Intravesical Prostatic Protrusion on table 4. indicate no difference between total cholesterol and IPP with a value of $p = 0.211$ ($p > 0.05$). The highest number of samples of BPH patients with normal cholesterol and high cholesterol were included in the IPP group > 10 mm, as many as 14 people (42.4%) and 13 people (39.4%), and the result with a spearman comparison test in Table 5. have the same result with weak correlation.

DISCUSSION

The average age of BPH patients in this study was 65 years. The youngest and oldest ages in

this study were 53 years and 81 years. This is consistent with previous research which states that increasing age is directly proportional to the incidence of BPH, as many as 50% of men aged 60 years were diagnosed with BPH and the number increased to reach 90% at the age of 80 years.⁵ These results are supported by other studies which state that age is a risk factor and is closely related to BPH. Old age causes an increase in prostate size so that this can cause the occurrence of Lower Urinary Tract Symptom (LUTS).⁶⁻⁷

The results of this study were tested statistically with the Mann-Whitney comparison test showing there was a significant difference between total cholesterol and prostate volume as evidenced by the results of $p = 0.000$. BPH patients with high total cholesterol levels have a larger prostate volume compared to the size of prostate volume in BPH

patients who have normal total cholesterol levels. Both of these variables correlate with the strength of a strong correlation ($r = 0.751$) statistically tested by the Spearman correlation test.

The results of this study are in accordance with previous research which states that there is a correlation between serum lipids i.e. total cholesterol, LDL cholesterol, HDL cholesterol, and Tg on prostate volume with weak correlation strength.⁸ A similar study, a case-control study with 50 BPH case samples and 38 control samples, showed a significant relationship between total cholesterol, LDL cholesterol, and HDL cholesterol with an increase in prostate volume.⁹ Another study with a cohort study design in the Chinese population obtained significant results between HDL cholesterol and triglycerides on prostate volume and insignificant results on total cholesterol and LDL cholesterol. The difference in results in this study can be due to the inadequate number of samples and different research methods.¹⁰ The relation between cholesterol and BPH is associated with cholesterol as a metabolic precursor in the synthesis of steroid hormones namely androgens.¹¹ Some hormone derivatives made by cholesterol are progesterone, 17β -estradiol, and testosterone.¹²

Total cholesterol is the amount between HDL, LDL, and Tg cholesterol.¹³ Dyslipidemia has a negative effect on prostate cells which increases the occurrence of inflammation of the prostate so that it becomes one of the important factors that play a role in the development of BPH. This is evidenced by the significant results on the increase of Tg in BPH patients with Prostate Inflammatory Score (IS) and LDL cholesterol which have a role in increasing the occurrence of inflammation and remodeling of prostate tissue in BPH.¹⁴

The results of the study of the relationship of total cholesterol and intravesical prostatic protrusion tested comparatively with Mann-Whitney showed insignificant results with the results of $p = 0.211$ ($p > 0.05$), statistically, the Spearman correlation test results between the two variables do not have a significant relationship and have Weak correlation with the value of $p = 0.217$ ($p > 0.05$) and $r = 0.221$. The intravesical prostatic protrusion is a prostate protrusion of the bladder which if there is a large protrusion, can obstruct the urinary tract, causing symptoms of LUTS.

The results of this study are supported by a previously stated relationship between HDL cholesterol and IPP ($p = 0.01$).¹⁵ HDL cholesterol is

one part of total cholesterol in addition to Tg and LDL cholesterol. Research in India with a cross-sectional study design and a sample of 114 BPH patients showed different results from this study. Third-degree IPP has a relationship with Tg and HDL cholesterol. The study showed that Tg and HDL cholesterol affected prostate protrusion against the bladder at a large IPP size with an IPP value > 10 mm which in this case could cause symptoms of LUTS.¹⁶⁻¹⁷

Cholesterol components that show a positive correlation with prostate enlargement are HDL and Tg. No studies are linking total cholesterol and LDL cholesterol with an increase in the degree of IPP so that cholesterol cannot significantly ascertain the degree of IPP. The mechanism of prostate enlargement, the onset of prostate protrusion and the effect of cholesterol on a prostate protrusion in BPH is unclear but in the study, it was explained that increased serum lipids can increase prostatic muscle tone activity and sympathetic nervous system activity so that triggering LUTS. Limitations in this study are the time and IPP data that is difficult to obtain at the hospital where the study is so that the number of samples obtained is limited.¹⁵⁻¹⁶

CONCLUSION

Total cholesterol is a risk factor in increasing prostate volume and both of them correlate. There is a significant difference in prostate volume between normal and high total cholesterol in BPH patients and total cholesterol is not related to the intravesical prostatic protrusion in BPH patients in the Paru Hospital and Bina Sehat Hospital in Jember.

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