COST ANALYSIS OF TRANSPERINEAL PROSTATE BIOPSY WITH VY DEVICE AND TRANSRECTAL PROSTATE BIOPSY AT HASAN SADIKIN ACADEMIC MEDICAL CENTER BANDUNG: A RETROSPECTIVE STUDY

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ABSTRACT

Objective: *This study aimed to determine the analysis for the cost of Transperineal Prostate Biopsy using the VY device (VY-TPPB) and Transrectal Prostate Biopsy (TRPB).* ***Material &Methods:*** *This study is a retrospective descriptive study with the sample being patients who underwent TRPB or TPPB at Hasan Sadikin Academic Medical Center, Bandung for the period of January 2019 to December 2023. The total sample was 108 patients,with 53 patients having undergone TPPB and 55 patients having undergone TRPB. The cost for each procedure are then analyzed and divided into pre-procedure, intra-procedure, and post-procedure costs.* ***Results:****The average cost per patient is Rp 8.005.356 (USD 507.4) for VY-TPPB procedures and Rp 11.748.976 (USD 744.7) for TRPB procedures. Comparison of the average costs of VY-TPPB with TRPB was higher in the TRPB group ($p < 0.05$). Comparison of the average intra-procedure and post-procedure costs was also significantly higher in the TRPB group ($p < 0.05$). There was no significant difference in pre-procedure costs.* ***Conclusion:*** *The TPPB-VY technique is more cost-effective compared to TRPB, although further research is needed to understand the advantages of each method.*

Keywords: *Prostate biopsy, VY device, cost.*

ABSTRAK

Tujuan: *Penelitian ini bertujuan untuk menentukan analisis biaya Biopsi Prostat Transperineal menggunakan perangkat VY (TPPB-VY) dan Biopsi Prostat Transrektal (TRPB).* ***Bahan & Cara:*** *Peneitian ini adalah studi deskriptif retrospektif dengan sampel pasien yang menjalani TRPB atau TPPB di Rumah Sakit Umum Pusat Hasan Sadikin Bandung untuk periode Januari 2019 hingga Desember 2023. Total sampel adalah 108 pasien, dengan 53 pasien menjalani TPPB dan 55 pasien menjalani TRPB. Biaya untuk setiap prosedur kemudian dianalisis dan dibagi menjadi biaya pra-prosedur, intra-prosedur, dan pasca-prosedur.* ***Hasil:*** *Rata-rata biaya per pasien adalah Rp 8.005.356 (USD 507.4) untuk prosedur TPPB-VY dan Rp 11.748.976 (USD 744.7) untuk prosedur TRPB. Perbandingan rata-rata biaya TPPB-VY dengan TRPB lebih tinggi pada kelompok TRPB ($p < 0.05$). Perbandingan rata-rata biaya intra-prosedur dan pasca-prosedur juga secara signifikan lebih tinggi pada kelompok TRPB ($p < 0.05$). Tidak ada perbedaan signifikan dalam biaya pra-prosedur.* ***Simpulan:*** *Teknik TPPB-VY lebih hemat biaya dibandingkan dengan TRPB, meskipun penelitian lebih lanjut diperlukan untuk mengetahui keunggulan masing-masing metode.*

Kata Kunci: *Biopsi prostat, perangkat VY, biaya.*

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INTRODUCTION

Prostate cancer is the most common tumor among men and the fifth leading cause of cancer mortality worldwide, with an estimated 1.276 million new cases and 359.000 deaths in 2018. In the United States, approximately 3.1 million new cases were reported from 2003 to 2017. By 2020, prostate cancer ranked among the top three cancers affecting men, particularly in countries like Israel, Lebanon, and Japan. In Indonesia, The Global Cancer Observatory reported 13.563 new cases in 2020, making it the fifth most common cancer among men, with 4.863 deaths. A study at Hasan Sadikin Academic Medical Center Bandung identified 113 prostate cancer cases from 2015 to 2019. Risk factors for prostate cancer are classified into non-modifiable (age, race, family history, genetics) and modifiable factors (diet, obesity, physical inactivity, smoking, alcohol consumption).[1-5]

Diagnosis typically involves digital rectal examination (DRE), prostate-specific antigen (PSA) testing, and transrectal ultrasound-guided biopsy (TRUS), which is the standard method for confirming prostate cancer.[6-7] Two primary diagnostic approaches exist: transrectal (TR) and transperineal (TP) ultrasound biopsies. While both methods have similar diagnostic accuracy, TR has a high false-negative rate of 49% and is associated with complications such as rectal bleeding and infection. Conversely, TP has a lower complication rate and is increasingly recognized for its safety and effectiveness. The VY device is a tool developed by doctors at Hasan Sadikin Academic Medical Center Bandung, which aims to obtain a better, more efficient and affordable instrument to provide precision during transperineal biopsy procedures.[8-12]

Cost analysis in healthcare is essential for understanding the financial implications of medical procedures. It encompasses direct costs (medical equipment, medications, labor) and indirect costs (administrative expenses, social impacts). A comprehensive cost analysis ensures that medical decisions are both effective and efficient in resource utilization.[13] Recent studies indicate that transperineal biopsy is more cost-effective than transrectal biopsy, primarily due to lower procedural costs and reduced post-procedural infection treatment expenses. Research from various countries highlights the need for cost-effectiveness analysis in healthcare services, particularly in Indonesia, where such studies are limited.[11,14-17]

OBJECTIVE

Given the high incidence of prostate cancer in Indonesia, especially in Bandung, and the limited application of transperineal biopsy techniques, this study aims to analyze the costs associated with transperineal prostate biopsy (TPPB) and transrectal prostate biopsy (TRPB) at Hasan Sadikin Academic Medical Center Bandung. The findings will provide valuable insights in implementing effective diagnostic methods.

MATERIAL & METHODS

This study is a retrospective descriptive analysis comparing the costs of transperineal biopsy using the VY device with transrectal biopsy in detecting prostate cancer at Hasan Sadikin Academic Medical Center, Bandung. The subjects of this study include all patients diagnosed with prostate cancer at Hasan Sadikin Academic Medical Center, Bandung from January 2019 to December 2023. The data source is secondary data obtained from the Pusat Pengendalian Pelayanan Jaminan Kesehatan Nasional (P3JKN). The sample size is determined using the total sampling method, resulting in a total sample of 108 patient data, with 54 patients undergoing the TPPB-VY procedure and 55 patients undergoing the TPRB procedure.

Data was collected by reviewing the price list for TPPB-VY and TRPB used to detect prostate cancer at Hasan Sadikin Academic Medical Center, Bandung. The price list will include details of each item and service used in the pre-procedures, intra-procedure, post-procedure, and others.

The collected data will be compiled and analyzed using descriptive statistical methods. The data will be processed using IBM® SPSS® Statistics version 25.

RESULTS

There are 108 patients, with 54 patients undergoing the TPPB-VY procedure and 55 patients undergoing the TPRB procedure from January 2019 to December 2023. The results of the data processing regarding laboratory costs, radiology, specialist doctors, anesthesia procedures, TPPB or TPRB procedures, and medications and medical equipment obtained from the median values of all patients are presented in Table 1.

Table 1. Subject characteristics.

Variable	TPPB-VY	TPRB
Number of patient	54	55
Cost		
Laboratories	Rp 1.522.750	Rp 600.000
Radiology	Rp 375.000	Rp 697.500
Specialist doctors	Rp 70.000	Rp 100.000
Anesthetic procedure	Rp 860.000	Rp 860.000
TPPB-VY or TPRB procedure	Rp 3.100.000	Rp 3.100.000
Drugs and medical supply	Rp 1.112.800	Rp 818.800

The results of the average cost calculations pre-procedure, during the procedure, post-procedure, other costs, and total costs for patients undergoing the TPPB-VY procedure are presented in Table 2. The average total costfortheTPPB-VY procedureis Rp 8.005.356,82, with the highest source is from intra-procedure, Rp 6.498.766,04.

Table 2. Average cost of the TPPB-VY procedure.

	VY-TPPB (Mean)
Pre-procedure	Rp 1.227.091,51
Intra-procedure	Rp 6.498.766,04
Post-procedure	Rp 809.016,98
Others	Rp 1.770.006,60
Total cost	Rp 8.005.356,82

Table 3 presents a breakdown of costs, including the average costs pre-procedure, during the procedure, post-procedure, other costs, and total costs for patients undergoing the TPRB procedure.The average total cost for the TRPB procedure is Rp 11.748.976,39, with the highest source is from intra-procedure, Rp 7.051.633,33.

Table 3. Average cost of the TRPB procedure.

	TRPB (Mean)
Pre-procedure	Rp 1.722.431,94
Intra-procedure	Rp 7.051.633,33
Post-procedure	Rp 579.772,22
Others	Rp 2.395.138,89
Total cost	Rp 11.748.976,39

The total cost for TPPB-VY is Rp 8,005,356.82, while the cost for TRPB is Rp 11,748,976.39. Overall, the total cost for TRPB is significantly higher than that for TPPB-VY (p = 0.001783) as shown in Table 4.

DISCUSSION

Prostate cancer is the most common tumor among men and the fifth leading cause of cancer mortality worldwide. Currently, there are two primary diagnostic approaches exist transrectal (TR) and transperineal (TP) ultrasound biopsies. While both methods have similar diagnostic accuracy, TR has a high false-negative rate of 49% and is associated with complications such as rectal bleeding and infection. Conversely, TP has a lower complication rate and is increasingly recognized for its safety and effectiveness. The VY device is a tool developed by doctors at Hasan Sadikin Academic Medical Center Bandung, which aims to obtain a better, more efficient, and affordable instrument to provide precision during transperineal biopsy procedures.[8-12] From this study, we analyze the costs associated with transperineal prostate biopsy (TPPB) using VY device and transrectal prostate biopsy (TRPB) at Hasan Sadikin Academic Medical Center, Bandung.

The average pre-procedure cost for TRPB is higher compared to TPPB-VY; however, this difference is not statistically significant (p=0.812804). This indicates that the initial preparation costs for both procedures are not significantly different, which may reflect similarities in the pre-operative preparation stages for both biopsy methods. These results similar with the study by Wagner et al. (2018), which found that preparation costs for prostate biopsy are relatively consistent across methods.[18]

Intra-procedure, the costs for TRPB were recorded as higher than for TPPB-VY, with a statistically significant difference (p=0.027818). This may be due to a longer procedure duration, the use of more expensive equipment, or a greater need for medications and supplies in TRPB. Research conducted by Smith et al. (2020) also found that transrectal biopsy tends to require more time and intensive resource use compared to the transperineal

Table 4. Cost comparison between TPPB-VY and TRPB procedure.

	TPPB-VY	TRPB	*p*
Pre-procedure	Rp 1.227.091,51	Rp 1.722.431,94	0.812804
Intra-procedure	Rp 6.498.766,04	Rp 7.051.633,33	0.027818
Post-procedure	Rp 809.016,98	Rp 579.772,22	2,75E-03
Others	Rp 1.770.006,60	Rp 2.395.138,89	0.000475
Total cost	Rp 8.005.356,82	Rp 11.748.976,39	0.001783

method. Additionally, the study by Greenberg et al. (2021) found that TRPB procedures often require longer operating times and more complex anesthesia, contributing to additional costs.[19]

In the post-procedure category, the costs for TPPB-VY are higher than for TRPB, with a very significant difference (p=2.75E-03). This may reflect differences in post-operative management, such as wound care, antibiotic use, and side effects. This is consistent with the findings of Jones et al. (2019), which indicate that transrectal biopsy requires fewer post-procedure interventions compared to the transperineal method. In a study by Patel et al. (2017), it was found that patients undergoing transperineal biopsy may experience longer pain and require more analgesics, which could contribute to increased post-procedure costs.[20-21]

The 'others' costs related to the procedure including administrative fees, transportation, and accommodation. Data show that these costs are significantly higher for TRPB (p=0.000475). This may indicate a greater need for additional care or more intensive follow-up for TRPB patients, as observed in the study by Lee et al. (2018), which emphasized that transrectal biopsy have a higher risk of infection that require additional management.[22]

Overall, the total costs for TRPB are significantly higher than for VY-TPPB (p=0.001783). This suggests that, although TRPB may be more commonly used as a standard method, the use of VY-TPPB can result in significant cost savings, which could have important implications for hospital policy and health resource allocation. The study by Davis et al. (2021) supports this finding by stating that the adoption of more cost-efficient biopsy techniques can reduce the financial burden on patients, as well as the healthcare system. Research by Thompson et al. (2022) also supports this finding, stating that innovations in prostate biopsy techniques, including the use of devices like VY, can lower overall costs without compromising clinical outcomes.[19,23]

This study can serve as a basis for reviewing and possibly revising procedural recommendations, considering the cost-effectiveness of using the VY device in TPPB. Training and skill development in the application of the VY device can enhance the adoption of this method. Further studies are needed that combine cost analysis with evaluations of clinical outcomes, patient comfort, and quality of life after the procedure to provide more comprehensive information of both methods.

This study has several limitations. First, the source of secondary data is from a single hospital, which may not fully represent the broader population or healthcare settings in Indonesia. Additionally, the retrospective design may introduce biases related to data collection and patient selection. To address these limitations, future research should consider multi-center studies to enhance the generalizability of the findings and incorporate prospective data collection methods. Furthermore, integrating clinical outcomes and patient quality of life assessments with cost analyses will provide a more comprehensive understanding of the effectiveness and efficiency of these biopsy techniques, ultimately guiding better clinical practices and healthcare policies.

CONCLUSION

The VY-TPPB technique is more economically favorable compared to TRPB, although further research is needed to understand the advantages of each method. This study can serve as a basis for reviewing and possibly revising procedural recommendations, considering the cost-effectiveness of using the VY device in TPPB.

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