Jurnal Anestesi: Jurnal Ilmu Kesehatan dan Kedokteran
Volume. 4 Nomor. 2 April 2026
e-ISSN: 2828-7118; p-ISSN: 2828-7207, Hal. 242-249
DOI: https://doi.org/10.59680/anestesi.v4i2.2402
Tersedia: jurnal.stikeskesdam4dip.ac.id/index.php/Anestesi

The Relationship Between Prostate Specific Antigen (PSA) Levels and Gleason Score in Prostate Cancer Patients at Dr. Pirngadi Regional Hospital Medan City

Mutiara[1*], Hasroni Fathurrahman[2], Aril Rizaldi[3]
[1]Faculty of Medicine, Universitas Muhammadiyah Sumatera Utara, Medan, Indonesia,
[2-3]Department of Surgery, Faculty of Medicine, Universitas Muhammadiyah Sumatera Utara, Medan, Indonesia,
Email: mutiararizki86@gmail.com[1], hasronifathurrahman@umsu.ac.id[2], arilrizaldi@umsu.ac.id[3]*

**Corresponding author: mutiararizki86@gmail.com*

Abstract. *PSA is a glycoprotein produced by epithelial cells in the prostate gland and ducts. In prostate cancer patients, PSA levels are generally elevated. The most commonly used tumor cell differentiation assessment system is the Gleason Score. This study used a retrospective analytical observational study design with a cross-sectional design approach using medical record data. Based on the results of the study conducted at Dr. Pirngadi Regional Hospital, Medan City, 71 samples were obtained. The highest incidence of prostate cancer was in the age range of 61-70 years, as many as 28 people (39.44%). The most common prostate specific antigen (PSA) level was >20 mg/ml (53.5%), and the most common Gleason score was poorly differentiated (57.7%). Spearman correlation results showed a significant relationship between prostate-specific antigen (PSA) levels and Gleason score in prostate cancer patients (p=0.003), with a correlation coefficient (r=0.347) indicating a sufficient correlation, where a positive correlation coefficient value indicates a directional relationship between the two variables. There is a significant relationship between prostate-specific antigen (PSA) levels and Gleason score in prostate cancer patients.*

Keyword: *Prostate Cancer; Prostate-Specific Antigen (PSA); Gleason Score; Korelasi Spearman; Diferensiasi Tumor.*

1. INTRODUCTION

Prostate cancer is a malignant disease characterized by abnormal cell growth in the prostate gland tissue, where cells grow in the prostate gland and develop uncontrollably.[1] Prostate cancer is the most common malignant disease in men, after lung cancer. The exact cause of prostate cancer remains unknown, but several factors that contribute to the risk include age, diet, lifestyle, smoking, race, and family history.[2,3]

According to GLOBOCAN, in 2018, there were approximately 1,276,106 cases of prostate cancer worldwide, with approximately 358,989 deaths. According to the American Cancer Society, in America, new cases were estimated at 164,690 cases and mortality was around 29,430 in 2018. In 2018, according to GLOBOCAN data, the incidence in Indonesia was around 11,361 cases with a mortality rate of around 5,007 people.[4] In 2020, Indonesia experienced an increase in prostate cancer cases, totaling 42,772 cases with a mortality rate of 13,563 people.[5]

Prostate cancer can be suspected based on a digital rectal exam. A complementary test used to diagnose prostate cancer is to assess prostate specific antigen (PSA) levels. PSA is a glycoprotein produced by epithelial cells in the acinus and ductus of the prostate gland. PSA testing can be used to detect and monitor prostate cancer treatment. A serum PSA level greater

Naskah Masuk: 19 Februari 2026; Revisi: 23 Maret 2026; Diterima: 22 April 2026; Terbit: 30 April 2026

than 4 mg/ml is abnormal and indicates a prostate biopsy. This test is performed for early detection. The Gleason score can determine the outcome of a prostate biopsy.[6]

As prostate cancer patients progress, blood PSA levels generally increase, and in 1986, the PSA test was approved by the Food and Drug Administration (FDA) to monitor prostate cancer progression in men diagnosed with prostate cancer. The most commonly used tumor cell differentiation assessment system is the Gleason score. Based on the Gleason Score assessment according to the IAUI in 2011, the Gleason score is divided into several groups: well differentiated (generally ≤6), moderate (7), and poorly differentiated (8–10).[1]

Early detection of prostate cancer can be achieved based on risk factors. Men over 50 years of age are recommended to undergo a total PSA (Prostate Specific Antigen) test and a Digital Rectal Examination (DRE) or annual anal colic. If there is a family history of prostate cancer, screening should be performed at age 40.[7]

Based on the above, researchers are interested in examining the relationship between Prostate Specific Antigen (PSA) levels and Gleason scores in prostate cancer patients at Dr. Pirngadi Regional Hospital Medan City.

2. RESEARCH METHOD

This study employed a retrospective analytical observational study design with a cross-sectional approach, utilizing patient medical records. The study was conducted from September 2023 to April 2024 at Dr. Pirngadi Regional Hospital Medan City. The population used in this study was prostate cancer patients admitted to the urology department at Dr. Pirngadi Regional Hospital Medan City, between 2019 and 2023. The sample consisted of prostate cancer patients who met the inclusion and exclusion criteria. A total of 71 patients were recruited.

The data obtained from the study were analyzed using univariate and bivariate analyses. Univariate analysis was performed to describe characteristics using a frequency distribution table based on the independent and dependent variables studied. Data were presented as percentages. Bivariate analysis was performed using the Spearman correlation test. This study analyzed secondary data from prostate cancer patients. Sampling was conducted using a purposive sampling method.

3. RESULT AND DISCUSSION

Table 1. Frequency Distribution Based on Age.

Age	N	Percentage
51-60	12	16,90%
61-70	28	39,44%
71-80	25	35,21%
81-91	6	8,45%
Total	71	100%

Table 1 shows that the 51-60 age group had 12 samples (16.90%), the 61-70 age group had the largest sample size at 28 (39.44%), the 71-80 age group had 25 samples (35.21%), and the 81-91 age group had 6 samples (8.45%).

Table 2. Frequency Distribution Based on Prostate Specific Antigen (PSA) Levels.

PSA Levels	N	Percentage
<10 ng/ml	27	38%
10-20 ng/ml	6	8,5%
>20 ng/ml	38	53,5%
Total	71	100%

Based on Table 2, it can be seen that of the study samples, 27 (38%) had PSA levels <10 mg/ml, while 6 (8.5%) had PSA levels 10-20 mg/ml, and 38 (53.5%) had PSA levels >20 mg/ml.

Table 3. Frequency Distribution Based on Gleason Score.

Gleason Score	N	Percentage
Well Differentiated	5	7%
Moderately Differentiated	25	35,2%
Poorly Differentiated	41	57,7%
Total	71	100%

Table 3 shows that the Well Differentiated Gleason score had 5 (7%) samples, while the Moderately Differentiated Gleason score had 25 (35.2%) samples, and the Poorly Differentiated Gleason score had the largest number of samples, at 41 (57.7%).

Table 4. Frequency Distribution Based on Prostate Specific Antigen (PSA) Levels and Gleason Score.

PSA Levels	*Gleason* Score							
	Well Differentiated		***Moderately Differentiated***		***Poorly Differentiated***		**Total**	
	N	%	N	%	N	%	N	%
<10 ng/ml	3	4.2%	13	18.3%	11	15.5%	27	38.0%
10-20 ng/ml	2	2.8%	2	2.8%	2	2.8%	6	8.5%
>20 ng/ml	0	0%	10	14.1%	28	39.4%	38	53.5%
Total	5	7.0%	25	35.2%	41	57.7%	71	100%

Based on table 4, it can be seen that in the well differentiated Gleason score, there were 3 samples (4.2%), out of 27 samples that had PSA levels <10 mg/ml, while in the well differentiated, moderately differentiated, and poorly differentiated Gleason scores, there were 2 samples (2.8%), out of 6 samples that had PSA levels of 10-20 mg/ml. In the well

differentiated Gleason score, there were 0 samples (0%) out of 38 samples with PSA levels >20 mg/ml. In the moderately differentiated Gleason score, there were 13 samples (18.3%) out of 27 samples with PSA levels <10 mg/ml, while in the poorly differentiated Gleason score, there were 11 samples (15.5%) out of 27 samples with PSA levels <10 mg/ml. The Gleason score was moderately differentiated in 10 samples (14.1%) of the 38 samples with PSA levels >20 mg/ml, while the Gleason score was poorly differentiated in 28 samples (39.4%) of the 38 samples with PSA levels >20 mg/ml.

Table 5. Correlation Test of The Relationship Between Prostate Specific Antigen (PSA) and Gleason Score.

Correlation			***Prostate Specific Antigen* (PSA) Levels**	***Gleason* Score**
Spearman's rho	*Prostate Specific Antigen* (PSA) Levels	Correlation Coefficient	1.000	.347
		Sig. (2-tailed)	.	.003
		N	71	71
	Gleason Score	Correlation Coefficient	.347	1.000
		Sig. (2-tailed)	.003	.
		N	71	71

Based on table 5, the results of the Spearman correlation test analysis obtained a p value of 0.003 (p-value < 0.05) which indicates that there is a meaningful or significant relationship between Prostate Specific Antigen (PSA) levels and Gleason scores in prostate cancer. With a correlation coefficient of 0.347, it shows sufficient correlation. The positive correlation coefficient value means that the relationship between the two variables is in the same direction, the higher the PSA level, the higher the Gleason score.

Discussion

Table 1 shows that prostate cancer is most prevalent in the 61–70 age range (39.44%). Prostate cancer often occurs in men entering old age. A study conducted by Claudia Clary N et al. showed that prostate cancer incidence is highest in those aged 61–70 because testosterone levels tend to decline with age. Increasing age changes the ability and activity of genes, leading to overexpression or underexpression. The incidence of prostate cancer increases by 20% in those aged 50–60 years and up to 70% in those aged 70–80 years.[19,20]

Table 2 shows the highest PSA levels, with PSA levels >20 mg/ml in 38 samples (53.5%). Higher PSA levels indicate a higher incidence of prostate cancer. This study is similar to that conducted by Claudia Clary N et al. at Dr. Soetomo General Hospital. Soetomo Surabaya stated that the higher the PSA level, the greater the risk of prostate cancer.[19] According to IAUI (2011), prostate cancer sufferers with PSA levels ≥ 20 have a very high risk

level related to prognosis and subsequent management steps, while PSA levels < 20 have a low to moderate risk level.[21] PSA is a serine protein produced by prostate epithelial tissue. Prostate tissue cells also have the ability to produce PSA like normal prostate cells, but at a lower rate. However, PSA secretion from cancer cells can easily penetrate the circulation due to damage to the prostate gland membrane and its ability to avoid proteolysis in the circulation. Therefore, higher serum PSA levels can increase the risk of prostate cancer.[19]

Table 3 Based on the results of this study, it was found that most prostate cancer patients showed poorly differentiated prostate cancer with a Gleason score of 8-10, as many as 41 samples (57.7%). This is similar to the study conducted by Pai et al., where the highest frequency occurred in prostate carcinoma that was poorly differentiated prostate cancer with a Gleason score of more than 7, which was found in 56 patients (77.77%) of a total of 123 patients diagnosed with prostate carcinoma. Siolang et al. also found that the highest frequency of prostate carcinoma patients was a Gleason score of 8-10. This is related to tumor growth and progression involving multiple factors, including the interaction between tumor cells and the stromal cells surrounding the tumor. The importance of the influence of the stromal and infiltration of immune cells surrounding the tumor in tumor onset and progression has been investigated. Stromal cells such as fibroblasts and endothelial cells, as well as infiltrating stratified cells, secrete various cytokines, growth factors, chemokines, and matrix metalloproteinases (MMPs), which are factors involved in proliferation, angiogenesis, and metastasis.[22]

Table 4 shows the frequency distribution based on PSA levels and Gleason score. Patients with PSA levels >20 ng/ml had a significantly higher proportion of patients with Gleason scores of 8-10 compared to those with PSA levels ≤20 ng/ml. Junaidi found that the highest serum PSA level was 6-15 ng/ml, but a significant correlation was found between serum PSA levels and histopathological grade according to the Gleason system. Similarly, Jacikson et al., found that serum PSA levels increased along with the Gleason score, with PSA levels >20 ng/ml found to be the most common in Gleason scores of 9. Research by Oikolo et al., (2008) also found a tendency for increased serum PSA levels before surgery with increased histopathological grade, statistically showing a positive correlation.[23]

Table 5 results of the Spearman correlation test for PSA rates and Gleason scores showed that the result was p = 0.003, which means the relationship between prostate specific antigen (PSA) levels and Gleason scores in prosthetic cancer patients at RSUD Dr. Pirngadi Medan City. The probability limit is if the p-value is < 0.05, therefore HA is accepted and H0

is rejected. This is in line with previous research conducted by Junaidi F (2012) which examined the relationship between histopathology grade (Gleason Score) and PSA levels, showing a significant relationship with a correlation strength of 0.024 ($p < 0.05$). 21 Another study conducted by Zivkovic S (2014), regarding the relationship between PSA and histopathology differences in prostate cancer assessed by Gleason Score, showed that both had a strong positive correlation ($p = 0.003$). In this study, it was also stated that an increase in PSA serum levels of 2.3 mg/ml was comparable to an increase of 1 gram of hyperplastic prostatic tissue.[21] In this study, there was a research limitation, namely the large number of incomplete medical records.

4. CONCLUSION

After testing the relationship between Prostate Specific Antigen (PSA) levels and Glenoplasty in prostate cancer patients, we concluded that the highest PSA levels were found at PSA levels >20 ng/ml, representing 38 samples (53.5%). It was found that most prostate cancer patients showed poorly differentiated in the Gleason score group 8-10 as many as 41 samples (57.7%). From the Spearman correlation test analysis, a p value of 0.003 (p-value < 0.05) was obtained, which indicated that there was a meaningful or significant relationship between Prostate Specific Antigen (PSA) and Gleason score in prostate cancer. With a correlation coefficient of 0.347, it indicated sufficient correlation. The positive correlation coefficient value means that the relationship between the two variables is in the same direction, the higher the PSA level, the higher the Gleason score.

Acknowledgments

The authors would like to acknowledge the Faculty of Medicine University of Muhammadiyah North Sumatra for academic guidance and institutional support, and Dr. Pirngadi Regional Hospital Medan City for Providing access to medical records and facilitating data collection. The authors also express their appreciation to the supervising lecturers for their valuable advice throughout the research process.

REFERENCES

Babjuk, M., Böhle, A., Burger, M., et al. (2018). EAU guidelines on non-muscle-invasive bladder cancer. EAU Guidelines on Non-muscle-invasive Bladder Cancer

Bayu, P., Hadibrata, E., Triyandi, R., & Hanriko, R. (2021). Hubungan kadar prostate specific antigen (PSA) dengan derajat histopatologi kanker prostat di RSUD Dr. H. Abdoel Moeloek Provinsi Lampung periode 2019–2020. *Jurnal Agromedicine Unila, 8*(1), 1–9.

Descotes, J. L. (2019). Diagnosis of prostate cancer. *Asian Journal of Urology, 6*(2), 129–136. https://doi.org/10.1016/j.ajur.2018.11.007

Eroschenko, V. P. (2015). *Atlas histologi diFiore: Dengan korelasi fungsional* (12th ed.). EGC.

Ha Chung, B., Horie, S., & Chiong, E. (2019). The incidence, mortality, and risk factors of prostate cancer in Asian men. *Prostate International, 7*(1), 1–8. https://doi.org/10.1016/j.prnil.2018.11.001

Hafsah, H., Alang, H., & Yusal, M. S. (2022). Peningkatan pengetahuan "penyakit kanker prostat" pada masyarakat Dusun Mapung Buttu Kecamatan Campalagian, Kabupaten Polewali Mandar. *Kreatif: Jurnal Pengabdian Masyarakat Nusantara, 2*(2), 1–6. https://doi.org/10.55606/kreatif.v2i2.392

Hardini, N., & Citrawati, M. (2021). Korelasi skor Gleason dengan kadar prostat spesifik antigen (PSA) pada pasien karsinoma prostat. *Majalah Kedokteran Andalas, 44*(2), 71–79. https://doi.org/10.25077/mka.v44.i2.p71-79.2021

Larissa, U., Hanriko, R., & Perdani, R. W. (2019). Hubungan usia dan indeks massa tubuh terhadap derajat histopatologi kanker prostat di RSUD Dr. H. Abdul Moeloek Bandar Lampung periode 2017. *Medula, 9*(1), 15–19.

Lawrenti, H. (2019). Perkembangan terapi kanker prostat. *Cermin Dunia Kedokteran, 46*(8), 521–528. Cermin Dunia Kedokteran

Leslie, S. W., Soon-Sutton, T. L., Sajjad, H., et al. (2023). Prostate cancer. In *StatPearls*. StatPearls Publishing.

Navisa, C. C., Sandhika, W., & Arwiati, H. (2019). Hubungan antara kadar prostate specific antigen serum dan skor Gleason pada adenokarsinoma prostat. *Jurnal Kedokteran Brawijaya, 30*(3), 181–184. https://doi.org/10.21776/ub.jkb.2019.030.03.3

Perdana, N. R., Mochtar, C. A., Umbas, R., & Hamid, A. R. A. (2016). The risk factor of prostate cancer and its prevention. *Acta Medica Indonesiana, 48*(3), 228–238.

Purnomo, B. B. (2012). *Dasar-dasar urologi* (3rd ed.). CV Sagung Seto.

Putriyuni, A., & Hilbertina, N. (2014). Adenokarsinoma prostat: Penilaian prognostik dan derajat histopatologi. *Majalah Kedokteran Andalas, 37*(2), 93–100. https://doi.org/10.22338/mka.v37.i2.p93-100.2014

Rawla, P. (2019). Epidemiology of prostate cancer. *World Journal of Oncology, 10*(2), 63–89. https://doi.org/10.14740/wjon1191

Safriaidi, F., Rainy, U., Danarito, et al. (2022). *Panduan penanganan kanker prostat*. Ikatan Ahli Urologi Indonesia.

Sharma, M., Lawson, J., Karunananayake, C., Dosman, J. A., & Pahwa, P. (2016). Prostate cancer, farming and other risk factors: A mini review. *Journal of Prostate Cancer*.

Sherwood, L. (2018). *Fisiologi manusia: Dari sel ke sistem* (9th ed.). EGC.

Sung, H., Ferlay, J., Siegel, R. L., et al. (2021). Global cancer statistics 2020: GLOBOCAN estimates of incidence and mortality worldwide for 36 cancers in 185 countries. *CA: A Cancer Journal for Clinicians, 71*(3), 209–249. https://doi.org/10.3322/caac.21660

Thristy, I. (2016). Prostat spesifik antigen. *Buletin Farmatera, 3*(September), 14–16.

Wulansari, N. S., & Marindawati, M. (2020). Profil prostate specific antigen (PSA) pada penyakit prostat di Rumah Sakit Umum Daerah Cengkareng Jakarta Barat. *Muhammadiyah Journal of Geriatric, 1*(1), 18–22. https://doi.org/10.24853/mujg.1.1.18-22