Histopathological Overview of Common Prostatic Lesions

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Abstract

Objective: To determine the frequency of different prostate lesions in our population regarding age and to grade carcinoma prostate according to the Modified Gleason Grading System.

Material and Methods: A 3-year retrospective study of prostate biopsies received at the Pathology Department, Central Park Teaching Hospital /Central Park Medical College, Lahore from 1st January 2021 to 31st December 2023. Previous records were reviewed regarding age, type of surgical specimens, diagnosis and Gleason grading in prostate cancer cases. Statistical analysis using SPSS version 21 was utilized for calculations.

Results: Out of 260 prostate biopsies, 251(96.53%) specimens were transurethral resection of prostate (TURP), 6(2.30%) cases were core needle biopsies (CNB) and 3 (1.15%) cases were radical prostatectomy (RP) specimens. Benign cases constituted of 230 (88.46%) cases which included 200 (86.95%) cases of benign prostate hyperplasia (BPH) and 30 (13.04%) cases of BPH with associated prostatitis. Malignancy was reported in 30 (11.03%) cases. Patient's age ranged between 40-95 years with cases in the age group of 61-70 years constituting of 100 (38.46%) cases. These included 89 (38.69%) cases of BPH and 11 (36.60%) malignant cases. Maximum number of malignant cases were seen in age >70 years constituting of 13(43.33%) cases. Ten (33.33%) cases of carcinoma prostate had Gleason grade 5 and 8 (26.66%) cases had Gleason grade 4. Perineural invasion was noted in 24 (80%) cases.

Conclusion: All prostatic lesions predominate in the older age group. Benign lesions outnumber malignant lesions by a ratio of almost 8:1 with the commonest biopsy being TURP. Majority of prostate cancers had high Gleason grade groups of 4 & 5.

Keywords: Benign prostatic hyperplasia, prostatitis, carcinoma prostate, Gleason grading system.

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Introduction

The prostate gland is a male genital organ located at the base of the urinary bladder. It is involved in three main pathological processes, mainly benign prostatic hyperplasia (BPH), carcinoma prostate and prostatitis.[1] The main culprit of these lesions appears to be high levels of the male hormone testosterone, some cytokines and local growth factors.[2] BPH is the commonest pathological entity characterized by benign enlargement of the prostate which histologically manifests as hyperplasia of both the stromal and epithelial components of its transitional zone.[3] Prostatitis is an inflammatory lesion which may be acute, chronic and granulomatous. It is usually associated with BPH in approximately 10 to 15 percent of cases.[4]

Carcinoma prostate is a significant public health issue ranking as the 2nd most common malignancy in elderly men after carcinoma lung and is the 5th most common cause of cancer related deaths in men in the United States[5]. Worldwide in 2020, over 1.4 million new cases

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and 381,000 deaths were attributed to carcinoma prostate, making it the most common cancer among men and it is estimated that by 2030, the number of new cases and deaths due to this malignancy will increase substantially.[6,7] There is a marked epidemiological variation in the incidence rates of carcinoma prostate related to advanced age, genetic and familial predisposition associated with dietary and environmental influences. African-American men have the highest incidence rates and the most aggressive types of carcinoma prostate.[8] In Pakis-tan, carcinoma prostate ranks amongst the top 10 common cancers and the 3rd most common genitourinary tract cancer in males.[9] The Gleason grading system is the single most reliable and significant prognostic indicator of carcinoma pros-tate based exclusively on the histological architectural pattern of the tumor as seen under the 4X objective of the light microscope.[10,11] It was devised by Dr Donald Gleason in 1966 and based on the architectural pattern of the glands by adding the most common and the second most common pattern.[12] A new Gleason grade group ranging from 1 to 5 was later introduced by Epstein and his team in 2014. This new system has the added beneficial impact on the patient's psychological awareness regarding his disease and the available choices of different treatment modalities.[11]Patients with prostate lesions frequently present with non-specific symptoms of increased urinary frequency, urinary retention, nocturia and rarely hematuria[13]. Diag-nosis of prostate lesions requires estimation of elevated serum PSA levels, digital rectal examination (DRE) and ultrasound. However, the ultimate gold standard for diagnosis is a tissue biopsy. Due to its anatomic proximity to the rectum, biopsy can be easily obtained via the transrectal route or the perineal route.[8]

The purpose of this study is to determine the nature of prostatic lesions in our population regarding frequency, age and Gleason grade group in histologically confirmed cases of carcinoma prostate.

Material and Methods

This was a 3-year retrospective study commencing from January 2021 to December 2023, conducted at the Histopathology section of Department of Pathology at Central Park Teaching Hospital/Central Park Medical College, Lahore, Pakistan. It was approved by the Ethical Review Committee of CPMC (Letter No: CPMC / IRB- No / 1454, Dated: 27/02/2024).

Previous records of these cases were retrieved from computer data and biopsy record registers maintained at the Histopathology section. During this 3-year period, 260 prostate biopsies comprising mainly of trans urethral resection of prostate (TURP), few core needle biopsies (CNB) and radical prostatectomy (RP) specimens were included in this study. The retrieved histopathology slides were reviewed by 2 consultants to confirm the diagnosis. Autolyzed and inadequate biopsy specimens were excluded from the present study. Available clinical data regarding patient's age, clinical history, clinical suspicion, type of surgical procedure and final diagnosis was incorporated in a proforma. Prognostic pathological parameters regarding prostatic carcinoma including Gleason score with grade groups, perineural invasion (PNI), extra prostatic extension (EPE) and tumor load were noted. Grading of prostate carcinoma was done according to the modified Gleason grading system as shown in **(Table-I)**.[14] The obtained data was analyzed using Statistical Package for Social Sciences (SPSS) version 21. Frequency and percentages were calculated for the number of cases, age, benign and malignant categories, Gleason's grading and perineural invasion.

Results

Out of a total of 260 prostate biopsies received during a 3 year period commencing from 1st January 2021 to 31st December 2023, 251 (96.53%) cases were TURP specimens, 06 (02.30%) cases were CNB specimens and 3 (01.15%) cases were RP specimens. Out of 260 prostate specimens, 230 (88.46%) cases were classified as benign lesions which included 200 (86.95%) cases of BPH and 30 (13.04%) cases of BPH associated with prostatitis (Figure 1 & 2). Cases of prostatitis were segregated as 15 cases of chronic prostatitis, 4 cases each of follicular prostatitis and acute prostatitis, 3 cases of granulomatous prostatitis, 2 cases of abscess formation and 1 case of infarction. Malignancy was reported in 30(11.3%) prostate biopsies of which 28 (93.33%) cases were adenocarcinomas, 01 (3.33%) case was poorly differentiated carcinoma based on immunohistochemical stains (IHC) and 01 (3.33%) case was a metastatic urothelial carcinoma invading the prostate. In the present study, patients age ranged between 40-95 years. Age distribution ranges are depicted in Table-2. Maximum number of cases were seen in age group of 61-70 years constituting of 100 (38.46%) cases. These included 89 (38.69%) benign

cases and 11 (36.60%) malignant cases. However maximum number of malig-nant cases were seen in age >70 years constituting of 13 (43.33%) cases. Mean age was 68.9 and median age was 70 years. The updated Gleason grading system was applied for grade determination of prostate cancer cases as shown in Table-3. Maximum number of cases were seen in grade group 5 comprising of 10 (33.33%) cases followed by grade group 4 having 8 (26.66%) cases. A grade of 2 and 3 was assigned to 3 (10%) and 5 (16.66%) cases respectively, while 2 (6.6%) cases had grade group 1 on morphology **(Figure 3, 4 & 5)**. Perineural invasion was observed in 24 (80%) cases and extraprostatic extension was seen in 3 (10%) cases with high Gleason scores of grades of 4 and 5 (Figure 6). Majority of cases had high tumor load in the range of 80-95%.

Table 1: *The New Contemporary Prostate Cancer "ISUP Modified Gleason Grading System* [14]

New Grading System Morphologic Patterns and Grade Group Pattern Composition	
Grade Group	**Pattern Definition**
Grade Group 1 (Gleason score ≤6)	Only individual, discrete, well-formed glands
Grade Group 2 (Gleason score 3 + 4 = 7)	Predominantly well-formed glands with a lesser component of poorly formed/fused/cribriform glands
Grade Group 3 (Gleason score (4+3=7)	Predominantly poorly formed/fused/cribriform glands with a lesser component of well-formed glands[a]
Grade Group 4 (Gleason scores 8)	Only poorly formed/fused/cribriform glands or predominantly well-formed glands with a lesser component lacking glands[b] or predominantly lacking glands with a lesser component of well-formed glands[b]
Grade Group 5 (Gleason score 9-10	Lacks gland formation/necrosis with or without poorly formed/fused/cribriform glands[a]

[a] For cases with more than 95% poorly formed/fused/cribriform glands or lack of glands on a needle core or at radical prostatectomy, the component of less than 5% well-formed glands is not factored into the grade.
[b] Poorly formed/fused/cribriform glands can also be a more minor component.

Table 2: *Age Distribution of Prostate Lesions (n=260)*

Age in Years	Benign Cases 230 (88.46%)	Malignant Cases 30 (11.53%)	Total No. of Cases 260 (100%)
≤50	6 (2.60%)	00	6 (2.30%)
51-60	50 (21.73%)	06 (20%)	56 (21.53%)
61-70	89 (38.69%)	11 (36.6%)	100 (38.46%)
>70	85 (36.95%)	13 (43.33%)	98 (37.69%)
Ratio of benign to malignant cases = 7.66:1			

Table 3: *Categorization of Prostate Cancer Cases with Gleason scoring and grading*

Gleason Grade Group	Total No. of Cases (n=30)	Frequency Percentage %
Grade Group 1 (GS=3+3=6)	02	6.6%
Grade Group 2 (GS=3+4=7)	03	10%
Grade Group 3 (GS=4+3=7)	05	16.66%
Grade Group 4 (GS=4+4, 3+5,5+3=8)	08	26.66%
Grade Group 5 (GS=4+5, 5+4=9), (GS=5+5=10)	10	33.33%
Poorly Differentiated Carcinoma	01	3.33%
Metastatic Urothelial Carcinoma	01	3.33%

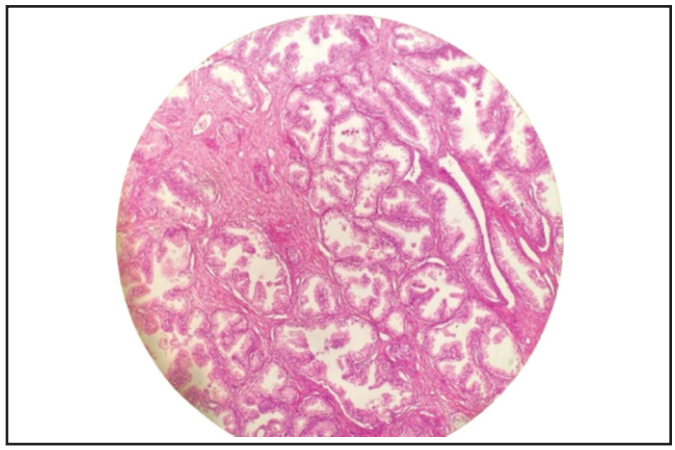

Fig-1: *Benign Prostate Hyperplasia: Benign glandular component showing increased number of glands with papillary infoldings and an intact basal layer.*

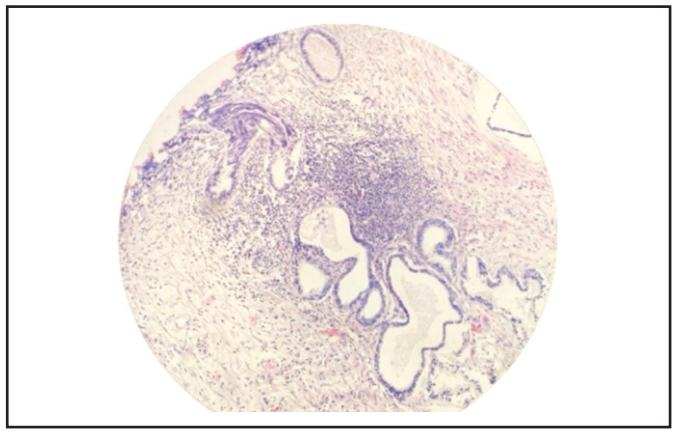

Fig-2: *Chronic Prostatitis:Stroma showing dense*

aggregates of Lympho-plasmacytic cells surrounding dilated prostatic acini.

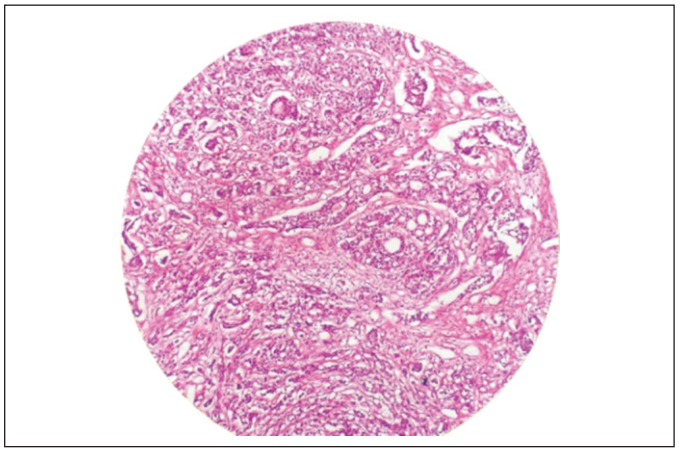

Fig-3: *Carcinoma Prostate: Gleason Grade group 2 (3+4=7) showing a mixture of well-formed and poorly formed glands.*

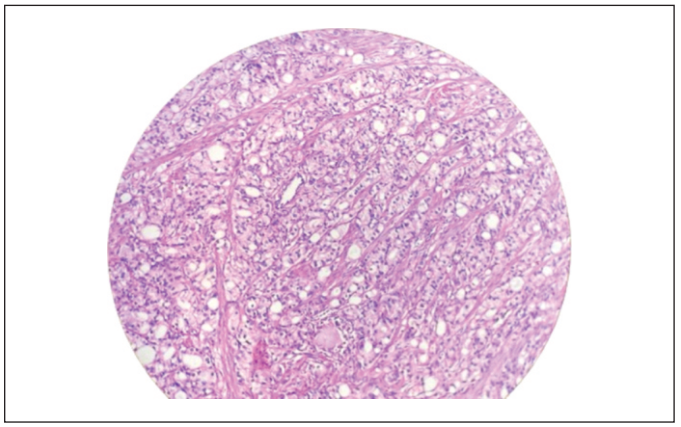

Fig-4: *Carcinoma Prostate: Closely packed small neoplastic glands with pale cytoplasm and hyperchromatic nuclei. Gleason Grade Group* 3(4+3=7).

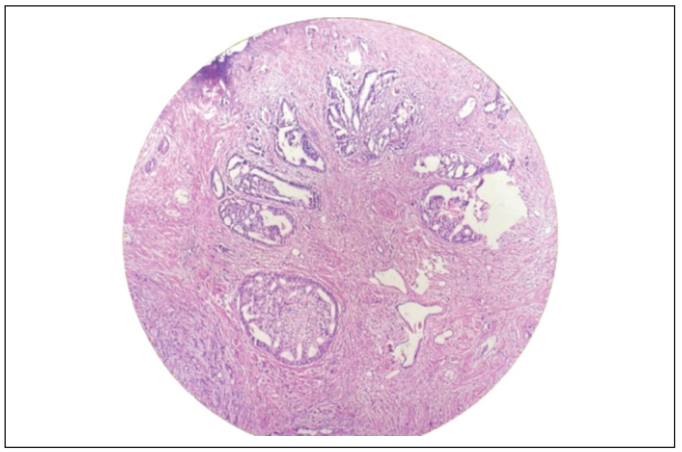

Fig-5: *Carcinoma Prostate showing cribriform morphology of the neoplastic glands Gleason Grade group 4 (4+4=8).*

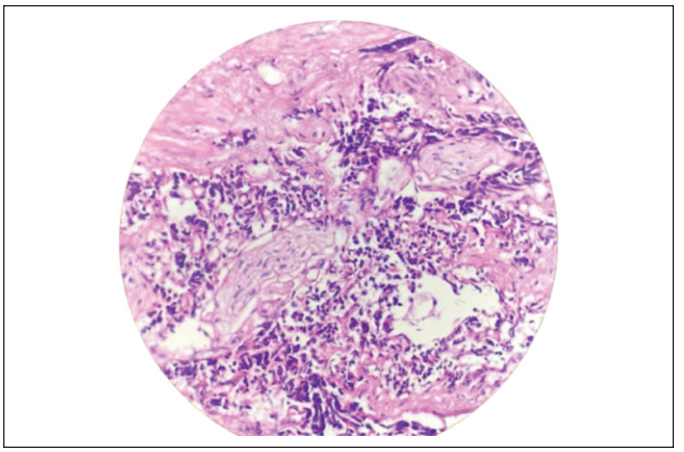

Fig-6: *Perineural invasion: Two nerves circumferentially surrounded by neoplastic cells.*

Discussion

Prostate biopsies comprise a significant proportion of surgical samples received in a running Histopathology laboratory. Among these, prostate cancer in the most commonly diagnosed malignancy in elderly men.[15] Some Asian countries like Lebanon, Kuwait, United Arab Emirates, Qatar and Japan have a high incidence of carcinoma prostate.[16] There is no country wide statistical data available to estimate the exact prevalence of carcinoma prostate in Pakistan as it is a low socioeconomic country with its healthcare system facing several challenges and setbacks. However, according to a large meta-analysis study by Sohail Akhtar and colleagues published in 2023 which included data from 11 articles between 2000 and 2023 from different geographical areas of Pakistan the pooled prevalence of prostate cancer was 5.20%.[17] According, to the Pakistan National Cancer Registry prostate cancer is the 2nd most common malignancy among males in Pakistan.[9]

In the present study, different types of prostate surgical biopsies included TURP, CNB and RP specimens. TURP specimens comprised of 251 (96.53%) cases, indicating that this is the commonest received prostate surgical specimen. A study conducted by Srinivasan and Wang in 2019 concluded that TURP is considered the gold standard treatment for surgical management of enlarged prostates.[18]

In the current study maximum number of 230 (88.46%)

cases were diagnosed as benign lesions which comprised 200 (86.95%) cases of BPH and 30 (13.04%) cases of BPH with associated prostatitis. Almost similar results were quoted by Satyasri and Sinha in 2018 who reported 279 (86.91%) cases of nodular hyperplasia and 117 (42.09%) cases with an associated element of prostatitis.[19] Another study by Sabalpara et al in 2019, quoted BPH as the sole benign entity with no case of prostatitis.[20] A recent study at King Edward Medical University, Lahore, Pakistan in 2021 showed 461 (73.30%) cases of BPH and 88 (14%) cases of BPH associated with prostatitis.[21] These results are in accordance with the present study at CPMC/CPTH. A study conducted by Sumaya et al in 2020 reported a maximum of 37 (41.1%) cases of prostate lesions in the age group of 61-70 years, followed by the 71-80 years age group with 23 (25.6%) cases 22. In the current study similar results are observed in the 61-70 years age group and 98 (37.69%) cases in >70 years age category.

As regards age group of carcinoma prostate in the present study, a maximum of 13 (43.33%) cases are noted in the age group >70 years followed by 11 (36.6%) cases in the age group of 61-70 years. This finding is in accordance with the study by Bhatta et al who observed that benign lesions are more common in the age group of 61-70 years and malignant cases predominate in the age group of 71-80 years 4. The Gleason grading system is the single most important and powerful prognostic predictor in carcinoma prostate. It plays a crucial role in prognosis, clinical management and therapeutic options.[11] In the present study 30 (11.53%) out of 260 cases were diagnosed as carcinoma prostate. These comprised of maximum cases in Gleason grade group 5 which included 10 (33.33%) cases followed by 8 (26.66%) in grade group 4. Collectively grade group 3,2 and 1 constituted of 5 (16.66%), 3 (10%) and 2 (6.6%) cases respectively. Similar results were observed in a study conducted in 2018 which also showed 37.30% cases in grade group 5 4. Another study by Shah et al reported a Gleason grade group 5 in 40% cases followed by 30% cases in grade group 4[23]. A study by Loeb et al in 2016 observed that only 1% of men had Gleason grade group 5 on biopsy whereas grade group 1 was the highest occurring grade comprising of 67%.[24] This observation is in contrast to the present study and many other similar studies. A high Gleason score and grade is associated with a poor prognosis.

Perineural invasion (PNI and lymphovascular invasion (LVI) are associated with a poor disease outcome.[25] PNI is associated with extra prostatic extension of tumor and ultimate recurrence. In the present study PNI was observed in 24 (80%) cases, majority of which showed high Gleason scores and grades.

Conclusion

All prostatic lesions predominate in the older age group. Benign lesions outnumber malignant lesions by a ratio of almost 8:1 with the commonest biopsy being TURP. Majority of prostate cancers had high Gleason grade groups of 4 & 5.

Conflict of Interest: *None*

Source of Funding: *None*

References

1. Aaron L, Franco O, Hayward SW. Review of prostate anatomy and embryology and the etiology of BPH. Urol Clin North Am. 2016; 43(3): 279–288. doi: 10.1016/j.ucl.2016.04.012.
2. Kruslin B, Tomas D, Dzombeta T, et al. Inflammation in prostatic hyperplasia and carcinoma—basic scientific approach. Front Oncol. 2017; 7:77. doi: http://doi.org/10.3389/fonc.2017.00077.
3. Dhingra N, Bhagwat D. Benign prostatic hyperplasia: An overview of existing treatment. Indian J. Pharmacol. 2011; 43(1):6–12. doi: 10.4103/0253-7613.75657.
4. Bhatta S, Hirachan S. Prostatic lesions: histopathological study in a tertiary care hospital. JMMIHS. 2018; 4(1): 12-9. doi:10.3126/jmmihs.v4i1.21133.
5. Siegel R, Miller KD, Wagle NS, Jemal A. Cancer statistics, 2023. CA Cancer J Clin. 2023; 73 (1):17-48. doi: 10.3322/caac.21763.
6. Siegal R, Miller KD, Jemal A. Cancer statistics, 2012. CA Cancer J Clin. 2012; 62(1):10–29. doi: 10.3322/caac.20138.
7. Fitzmaurice C, Akinyemiju TF, et al. Global, Regional, and National Cancer Incidence, Mortality, Years of Life Lost, Years Lived With Disability, and Disability-Adjusted Life-Years for 29 Cancer Groups, 1990 to 2016: A Systematic Analysis for the Global Burden of Disease Study. JAMA Oncol. 2018; 4(11):1553-1568. doi: 10.1001/jamaoncol.2018.2706.
8. Rawla P. Epidemiology of prostate cancer. World J Oncol. 2019; 10(2): 63–89. doi: 10.14740/wjon1191.

9. Janjua TK, Yousuf MA, Iqbal MT, et al. Incidental finding of prostate cancer in Transurethral Resection of Prostate (TURP) specimens: a retrospective analysis from a Tertiary Care Hospital in Pakistan. Pan Afr Med J. 2021; 39:20. doi:10.11604/pamj.2021.39.20.26931.
10. Gordetsky J, Epstein J. Grading of prostatic adenocarcinoma: current state and prognostic implications. Diagn Pathol. 2016; 11:25. doi:10.1186/s13000-016-0478-2.
11. Montironi R, Cimadamore A, Cheng L, et al. Prostate cancer grading in 2018: limitations, implementations, cribriform morphology, and biological markers. IJBM. 2018; 33(4): 331-334. doi: https://doi.org/10.1177/1724600818781296.
12. Gleason DF, Mellinger GT. Prediction of prognostic adenocarcinoma by combined histological grading and clinical staging. J Urol. 1974; 111(1):58-64. doi: 10.1016/s0022-5347(17)59889-4.
13. Yelave R, Shahnaaz Z, Pawar V. Histopathological study of prostatic lesions in a tertiary care hospital. J Diagn Pathol Oncol. 2020; 5(2):200-7. doi:10.18231/j.jdpo.2020.039.
14. Kryvenko ON, Epstein JI. Prostate cancer grading: a decade after the 2005 modified Gleason grading system. Arch Pathol Lab Med. 2016; 140(10):1140-52. doi: 10.5858/arpa.2015-0487-SA.
15. Bray F, Ferlay J, Soerjomataram I, et al. Global cancer statistics 2018: GLOBOCAN estimates of incidence and mortality worldwide for 36 cancers in 185 countries. CA Cancer J Clin. 2018; 68(6):394–424. doi: 10.3322/caac.21492.
16. Ferlay J, Soerjomataram I, Dikshit R, et al. Cancer incidence and mortality worldwide: sources, methods and major patterns in GLOBOCAN 2012. Int. J. Cancer. 2015; 136(5):E359–E386. doi: 10.1002/ijc.29210.
17. Akhtar S, Hassan F, Ahmad S, et al. The prevalence of prostate cancer in Pakistan: A systematic review and meta-analysis. Heliyon. 2023; 9(10):e20350. doi: 10.1016/j.heliyon.2023.e20350.
18. Srinivasan A, Wang R. An update on minimally invasive surgery for benign prostatic hyperplasia: Techniques, risks and efficacy. World J Mens Health. 2019; 37: e48. doi: http:// doi.org/ 10.5534/wjmh.190076.
19. Satyasri K, Sinha S, Kartheek BVS. Spectrum of prostatic lesions in a tertiary care hospital - a 5½-year retrospective study. J Evolution Med Dent Sci. 2018; 7(36): 3991-6. doi:10.14260/jemds/2018/891.
20. Sabalpara MA, Parikh SB, Parikh BJ. Histopathological study of prostatic lesions. Natl J Integr Res Med. 2019; 10(5):58-63.
https://DOI.10.70284/njirm.v1015.2560.
21. Arshad M, Niazi S, Qurat-Ul-Ain. Histopathological study of prostatic lesions in a tertiary care hospital, Lahore. JSMDC. 2021; 7(02):54-60.
22. Sumaya, Das M, Nagesha KR. Spectrum of histopathological lesions of prostate in a tertiary care center. Int J Clin Diagn Pathol. 2020; 3(1):110-3. doi: 10.33545/pathol.2020.v3.ilb.163.
23. Shah R, Karki S, Shah N, et al. Histopathological study of prostatic diseases in B.P.K.I.H.S, Nepal: a hospital based study. Int J Health Sci Res. 2019; 9(2):77-83. ISSN: 2249-9571.
24. Loeb S, Folkvaljon Y, Robinson D, et al. Evaluation of the 2015 Gleason grade groups in a nationwide population-based cohort. Eur Urol. 2016; 69(6): 1135-41. doi: 10.1016/j.eururo.2015.11.036.
25. Epstein JI. Prostate cancer grading: a decade after the 2005 modified system. Mod Pathol. 2018; 31(S1): S47-63. doi:10.1038/modpathol.2017.133.

Authors Contribution

KB, MA: Conceptualization of Project
SN, NM: Data Collection
MA, ZR: Literature Search
ZR: Statistical Analysis
NM, ZMA: Drafting, Revision
KB, SN: Writing of Manuscript