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"HISTOPATHOLOGICAL PATTERNS OF PROSTATIC LESIONS: INSIGHTS FROM A CROSS SECTIONAL STUDY."

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ABSTRACT

Background: The prostate, a vital component of the male reproductive system enveloping the urethra, is susceptible to several prevalent conditions such as inflammatory lesions, benign prostatic hyperplasia (BPH), and prostate cancer. Our study aimed to analyse diverse histopathological patterns associated with prostatic lesions, thereby elucidating their intricate pathology and clinical significance.

Materials and Methods: The study was conducted at Department of Pathology, Swami Ramanand Teerth Rural Government medical college, Ambajogai, Maharashtra, India. over an 18-month period focused on analysing histopathological patterns of prostatic lesions. The gross specimens were in the form of transurethral resection of the prostate (TURP). The histopathological procedure involved fixation, staining, and examination for cellular characteristics using 10% formalin, alcohol, xylol, haematoxylin, eosin, and DPX mounting medium, along with surgical tools. Statistical analysis was performed using Microsoft Excel and IBM SPSS Statistics Version 25.

Results: The Present study included 25 TURP specimens, 84% showed benign lesions, while 16% were malignant. Average age of the patients was 61.96 ± 7.8 years. Gleason's scoring revealed a predominance of scores 7 and 8 in malignant cases. Adenocarcinoma constituted 16% of diagnoses, The majority of cases (60%) were diagnosed with BPH with chronic prostatitis and 24% were BPH without prostatitis.

Conclusion: The study highlights the prevalence of benign lesions in prostatic specimens obtained through transurethral resection, with a notable incidence of adenocarcinoma. The predominance of Gleason scores 7 and 8 underscores the importance of accurate histopathological analysis in diagnosing and managing prostate cancer.

Keywords: Prostate cancer, Histopathology, BPH

INTRODUCTION

The prostate gland, positioned below the bladder and enveloping the urethra, serves as a vital male reproductive accessory organ. Its primary role involves producing crucial secretions that are integral to semen composition, facilitating ejaculation, and supporting the viability of sperm [1].The prostate gland's cells commonly develop tumors, typically manifesting during the middle to later stages of life [2]. Prostate cancer ranks as the second most prevalent malignancy in men globally, following lung cancer. Prostate cancer continues to pose a significant global health burden, with estimates from GLOBOCAN 2018 indicating 1,276,106 newly diagnosed cases worldwide in 2018, accounting for 3.8% of all cancer-related deaths in men [3]. The prevalence persists, as evidenced by over 1.4 million new cases and approximately 375,000 deaths recorded in 2020 [4]. There are three primary pathological conditions that primarily impact the prostate gland: inflammatory conditions such as prostatitis, benign enlargement known as benign prostatic hyperplasia (BPH), and various tumors including adenocarcinoma or Prostate carcinoma (CaP), which encompass both premalignant and malignant lesions [5]. Among these three conditions, benign prostatic hyperplasia (BPH) is the most prevalent, frequently observed in older individuals to the extent that it is often considered a typical aspect of aging While its occurrence is limited to just 8% of males in their forties, the prevalence of BPH escalates to 75% by the time they reach their eighties [6]. BPH involves non-cancerous enlargement of the prostate gland, leading to lower urinary tract symptoms, commonly obstructing urine flow due to the gland's position near the urethra, and includes symptoms like increased urination frequency, blood in semen or urine, and persistent pelvic pain whereas prostatitis can manifest as either acute or chronic bacterial prostatitis, chronic non-bacterial prostatitis, or granulomatous prostatitis [5].

The integration of digital rectal examination (DRE), transrectal ultrasonography, serum prostate-specific antigen (PSA) testing, and biopsy procedures constitutes a robust diagnostic approach for detecting different prostatic abnormalities. Histopathological assessment of prostatic biopsies continues to serve as the definitive method for diagnosing both benign and malignant prostatic lesions, maintaining its status as the gold standard in clinical practice [7].

The Gleason Grading revisions have improved PCa death prediction. The International Society of Urological Pathology (ISUP) revised the Gleason system in 2005 and 2014 [8] and studies have shown that the ISUP 2014 GS performed better than the pre-2005 GS [9].

This study was planned to analyse diverse spectrum of histopathological patterns associated with prostatic lesions in transurethral resection prostate (TURP) in a tertiary care centre and analyse Gleason Grading for the malignant lesions with no emphasis on findings of laboratory results.

MATERIALS AND METHODS

The study was designed as a cross-sectional investigation, conducted over an 18-month period from January 1, 2021, to June 30, 2022. The study population comprised all prostate specimens referred to the Pathology department for histopathological examination at Swami Ramanand Teerth Rural Government medical college, Ambajogai, Maharashtra, India. Inclusion criteria encompassed all prostate specimens received during the study period whereas poorly preserved specimen and inadequate biopsies for histopathological reporting were excluded.

The histopathological procedure began with the examination of the patient's clinical profile using the provided proforma. Surgical specimens were obtained and fixed in 10% formalin to preserve their structure. After fixation, a gross examination was conducted to assess various characteristics, including size, shape, colour, consistency, and the cut surface of the specimens. The most representative areas of each case were identified, and tissue sections of size 1.5 x 1 were taken for further processing. A unique number assigned in the gross room was carried throughout the process to track the tissue sample.

In the laboratory, tissue processing involved twelve separate stages, completing the cycle in approximately eighteen hours. The process started with fixation in 10% formalin followed by dehydration using ascending grades of alcohol (75%, 95%, and 100%) for about 5 hours in 6-7 jars. Subsequently, the tissues were cleared using xylene for 3 hours in 2 jars, followed by paraffin impregnation for 6 hours in two thermostat-fitted wax baths. Tissue sections of 4–5 μm thickness

were then cut and stained using the haematoxylin and eosin stain. Special stains and Immunohistochemistry were utilized whenever necessary.
For the Haematoxylin and Eosin staining method, sections were deparaffinized and hydrated through graded alcohols to water. Fixation pigments were removed if necessary. The sections were stained in alum haematoxylin (progressive) for 20-45 minutes and then washed well in running tap water until they 'blue' for 5 minutes or less. Differentiation was carried out in 1% acid alcohol for 5-10 seconds, followed by another tap water wash until the sections were blue again for 10-15 minutes. The sections were then blued by dipping in an alkaline solution (e.g., ammonia water), followed by a 5-minute tap water wash. Subsequently, staining in 1% eosin Y for 10 minutes was performed, followed by washing in running tap water for 1-5 minutes. The sections were dehydrated through alcohols, cleared, and mounted.
The results of the staining process were as follows: Nuclei appeared blue/black, cytoplasm in varying shades of pink, muscle fibres deep pink/red, red blood cells orange/red, and fibrin deep pink.
Chemicals used in the procedure included 10% formalin, absolute alcohol, xylol, Ehrlich's Haematoxylin solution, eosin, 1% acid alcohol, DPX mounting medium, and paraffin wax. Instruments required for the procedure included a scalpel and scissors, forceps, scale, cassettes, L mould, camera, rotator microscope, slides and cover slips, gloves, and gauze pieces.

Sample size estimation: Sample size was based on the reported incidence of prostate cancer in India, with a desired confidence level of 95% and a margin of error of 5%. The calculation yielded a required sample size of 25 after adjusting for the finite population size within the institute.
Statistical analysis was performed using Microsoft Excel spreadsheets and IBM SPSS Statistics Version 25. Categorical variables were analysed using frequencies, percentages, and cross-tabulations, with distribution represented through pie charts or bar graphs. P values ≤ 0.05 were considered significant.

RESULTS

Table 1: Distribution of prostate lesions between benign and malignant types.

Specimen	Benign lesions	Malignant lesions	Total
TURP	21	4	25
%	84%	16%	100%

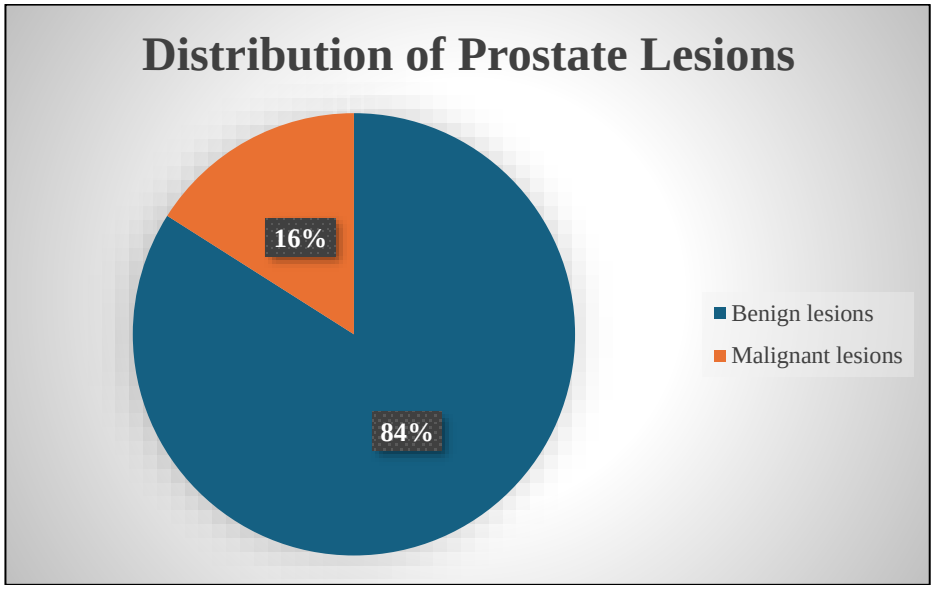

Figure No.1: Distribution of prostate lesions between benign and malignant types.

All 25 specimens were obtained through transurethral resection of the prostate (TURP). Out of 25 specimens analysed, 21 (84%) were diagnosed as benign lesions, while 4 (16%) were identified as malignant lesions.

Table 2: Average Age of cases having Benign and Malignant Prostate Lesions

Lesion Type	Mean Age	SD	P
Malignant (N=4)	63.75	5.97	0.635
Benign (N=21)	61.62	8.39	

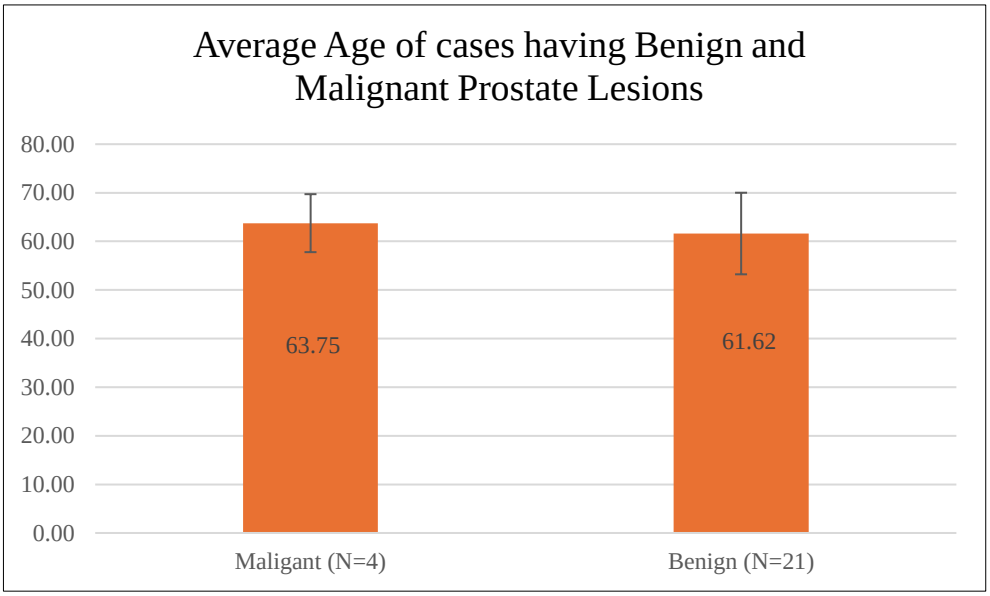

Figure No.2: Average Age of cases having Benign and Malignant Prostate Lesions

The average age in the malignant group (n=4) was 63.75 ± 5.97 years whereas average age in the benign lesions was 61.62 ± 8.39 years. There was no statistically significant difference in the average age between malignant and benign lesions. (p=0.635).

Table 3: Distribution of Age Groups between Benign and Malignant Prostate Lesions.

Age groups (years)		Malignant (N=4)	Benign (N=21)	Total	P
40- 49	Number	0	1	1	0.87
	%	0.0%	4.8%	4.0%	
50-59	Number	1	8	9	
	%	25.0%	38.1%	36.0%	
60-69	Number	3	10	13	
	%	75.0%	47.6%	52.0%	
70-79	Number	0	1	1	
	%	0.0%	4.8%	4.0%	
>80	Number	0	1	1	
	%	0.0%	4.8%	4.0%	

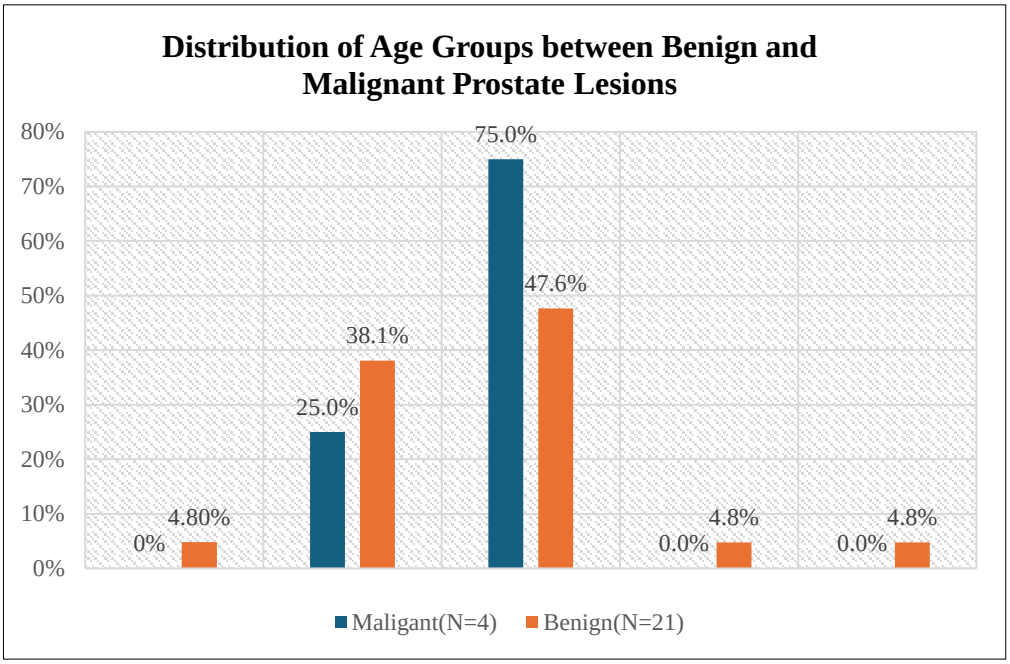

Figure No. 3: Distribution of Age Groups between Benign and Malignant Prostate Lesions

In the age group of 40-49, there were no malignant cases and one benign case, accounting for 4.8% of the total cases. For the 50-59 age group, there was one malignant case and eight benign cases, representing 25.0% and 38.1% of the total cases, respectively. In the 60-69 age group, three cases were malignant, and ten cases were benign, making up 75.0% and 47.6% of the total cases, respectively. No malignant cases were reported in the 70-79 and >80 age groups. Age distribution between benign and malignant groups was found comparable. (p=0.87)

Table 4: Gleason's grading system for carcinoma

Sr. No	Pathologyno.	Histopathological Diagnosis	GLEASON'S GRADE group	GLEASON'S SCORE
1	382/21	Adenocarcinoma of prostate	2	3+4=7
2	860/21	Adenocarcinoma of prostate	3	4+3=7
3	1396/21	Adenocarcinoma of prostate	3	4+3=7
4	1615/21	Adenocarcinoma of prostate	4	4+4=8

All those four malignant cases were graded using Gleason's scoring system, where the primary grade was assigned to the dominant pattern and the secondary grade to the subdominant pattern. The two numeric grades were added to obtain the combined Gleason's score. Additionally, the Gleason's Grade group was assigned according to the Gleason's score from the 2014 modified Gleason Grading system.

Table 5: Incidence of carcinoma with reference to Gleason's score

Gleason's score	Number of cases	%
6	0	0%
7	3	75%
8	1	25%
9	0	0%
Total	4	100%

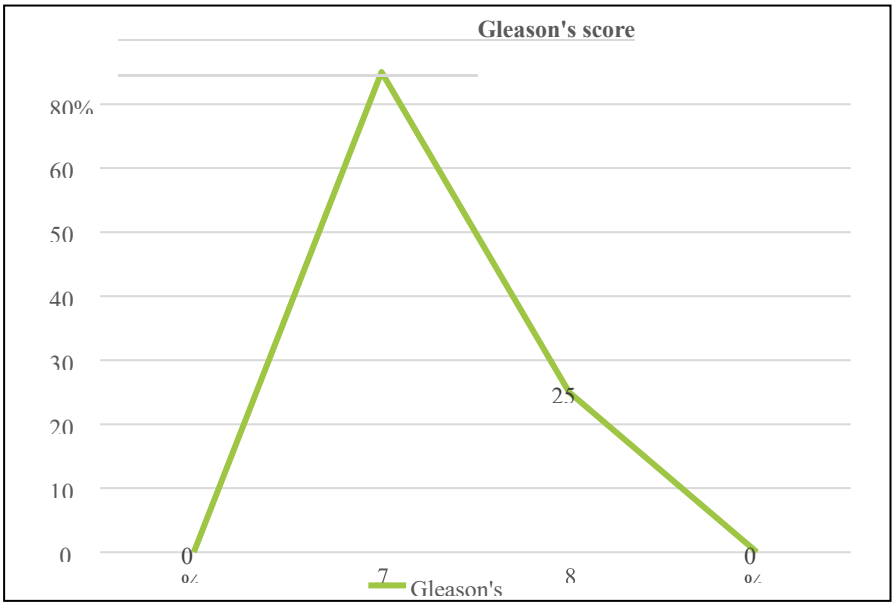

Figure No. 4: Incidence of carcinoma with reference to Gleason's score

The Gleason's score of 7 was assigned to three cases, which constituted 75% of the incidence of adenocarcinoma cases. Additionally, a Gleason's score of 8 was given to one case, accounting for 25% of the incidence. It was noted that the maximum number of cases belonged to Gleason's score of 7.

Table 6: Final histopathological diagnosis

Sr.No.	Diagnosis	No. of cases	%
1	Adenocarcinoma of prostate	4	16%
2	Benign prostatic hyperplasiawith chronic prostatitis	15	60%
3	Benign prostatic hyperplasia without prostatitis	6	24%

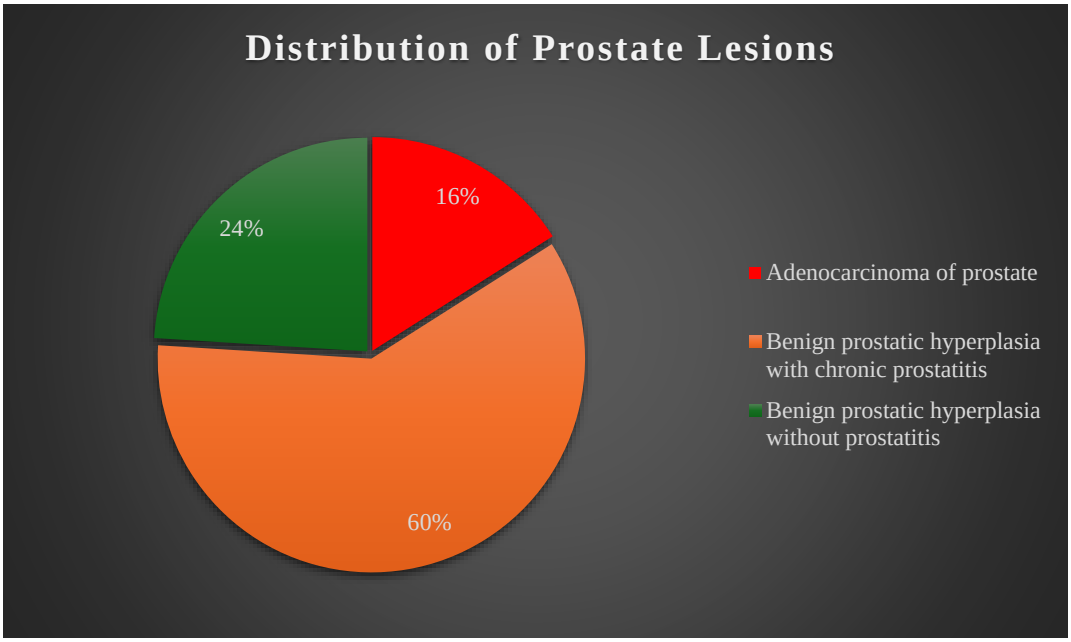

Figure No.5: Final histopathological diagnosis

The final histopathological diagnosis of prostate specimens indicated that four cases were diagnosed with adenocarcinoma of the prostate, constituting 16% of the total diagnoses. The majority of cases, comprising 84%, were diagnosed with benign prostatic hyperplasia. Out of these 84% cases, 60% of were benign prostatic hyperplasia with chronic prostatitis, and 24% of cases were benign prostatic hyperplasia without chronic prostatitis.

DISCUSSION

Benign prostatic hyperplasia (BPH) and adenocarcinoma represent the predominant pathological conditions affecting the prostate gland. In our study all samples obtained were TURP, which was comparable to studies conducted by Bhatta S. et al.[10] and Issac AS. et.al.[11], wherein majority of specimens were TURP thereby indicating a congruent diagnostic methodology.

The present study reveals a benign prostatic hyperplasia (BPH) prevalence of 84%, aligning closely with several past studies. Notably, Mahajan et al.[12] reported a BPH rate of 83%, Garalla et al.[13] found 82%, and Issac et al.[11] observed 76.70%. However, Bhatta et al.[10] documented a notably higher BPH prevalence at 89.58%. Conversely, adenocarcinoma of the prostate demonstrates slight variability across studies, with rates ranging from 8.34% to 18%. These findings emphasize the consistent prevalence of BPH across studies, while some variations in adenocarcinoma rates which could be dependent upon number of cases enrolled and types of specimens.

In the present study mean age for benign and malignant lesions were 61.62 ± 8.39 years and 63.75 ± 5.97 years respectively. There was no significant difference in the mean age between patients with benign and malignant lesions (p value 0.635). This finding is in agreement with the study by Mahajan S. et al.[12]. Puttaswamy K. et al.[14] found that both benign and malignant lesions were prevalent in the age group of 51-80 years, while Sanjaykumar C et al.[15] reported similar findings. The age group most frequently affected by both benign and malignant lesions was 60-69 years, while malignant lesions were more prevalent in the 70-79 age range. These findings were consistent with those reported by Joshee A. et al. [16] and Bhatta S. et al.[10].

The present study's findings regarding the prevalence of benign prostatic hyperplasia (BPH) with chronic prostatitis, at 60%, aligned closely with the study by Mahajan et al.[12] which reported a prevalence of 57.50%. Nwafor et al. [17] reported a very high prevalence of 82.3%, while Deshmukh BD. et al.[18] reported a lower prevalence of 30.43%. These variations highlighted diversity in findings across studies, possibly influenced by factors like sample size and diagnostic criteria.

Adenocarcinomas were graded according to Gleason's system, most common predominant grades observed in this study were grade 3 whereas the most common score obtained was 7 in 3 cases of adenocarcinoma studies conducted by Mahajan S. et al.[12] Garalla HM. et al.[13], Issac AS. et al. [11], Bhatta S. et al.[10], Nwafor CC. et al.[17], Joshee A. et al.[16], and Deshmukh BD. et al.[18] also reported the commonest Gleason score of 7. On the other hand, Bhatta S. et al.[10] and Deshmukh BD. et al. [18] reported higher scores of 9. This shows consistency across studies in the severity of prostate adenocarcinoma and highlights reliability of modified Gleason scoring system.

Conclusion: The study highlights the prevalence of benign lesions in prostatic specimens obtained through transurethral resection, with a notable incidence of adenocarcinoma. The predominance of Gleason scores 7 and 8 underscores the importance of accurate histopathological analysis in diagnosing and managing prostate cancer.

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