A Review on Prostate Cancer Diagnosis and Treatment

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ABSTRACT: In Worldwide, prostate cancer is the most frequently diagnosed malignancy and the sixth leading cause of cancer death in men. Diagnosis of prostate cancer is primarily based on prostate-specific antigen (PSA) testing, MRI scans, and prostate tissue biopsies, although PSA testing for screening remains controversial. There are now new diagnostic tools accessible, such as risk stratification bioassay tests, germline testing, and several types of PET scans. Although overdiagnosis and overtreatment have reduced prostate cancer incidence over the past 20 years, the high rate of disease-related mortality cannot be controlled by treatment alone. If the cancer is identified and treated at an early stage, patients with localized disease at a low to moderate risk of recurrence often experience a satisfactory outcome of 99 % overall survival for 10 years .Current medical treatment approaches include surgery, radiation therapy, chemotherapy, hormonal therapy, cryotherapy, radiopharmaceuticals, immunotherapy, focused radiation, other targeted therapies and other methods.These approaches are greater or less efficient either as monotherapy or in multimodal strategy.The vital role in enhancing patient care is emphasizes in this exercise, which is a current, thorough overview of the diagnosis and treatment of patients with prostate cancer

Keyword: Prostate cancer, PSA screening, Etiology, Epidemiology, prostate biopsy

INTRODUCTION:

An estimated 1.3 million new cases of prostate cancer are discovered worldwide each year, making it a serious health concern. Approximately 700 000 of the 10 million men who have been diagnosed with prostate cancer currently have the disease that has spread to other organs. More than 400 000 people die each year from metastatic prostate cancer, and this number is anticipated to more than double by 2040. The expected number of males who have been diagnosed and have been enduring treatment-related morbidity for more than 10 years is similar. [1]

Diagnosis of prostate cancer is primarily based on prostate tissue examination, prostate-specific antigen testing, and MRI scans; however, the value of PSA testing for monitoring is still up for debate. There are now new diagnostic tools accessible, such as different types of PET scans, risk stratification bioassay tests, and DNA testing. When a cancer just affects the prostate, it is said to be localized and perhaps treatable. Combination therapy, rank ligand antagonist, hormone therapy, chemotherapy, radiopharmaceuticals, immunotherapy, concentrated radiation, and other targeted therapies may be employed if the disease has spread outside the prostate. The vital role in enhancing patient care is emphasizes in this exercise, which is a current, thorough overview of the examination and treatment of patients with prostate cancer. [2]

Clinically, prostate cancer is a heterogeneous disease, with some individuals displaying an aggressive disease with metastases and progression and others displaying an indolent disease with little potential to advance. [3]Prostate-specific cancer is regarded as confined and potentially treatable when it only affects the prostate. [4]

Three different cell types can be found in the human prostate: luminal cells (columnar epithelial cells that express differentiation antigens like cytokeratin 8 and prostate-specific antigen, as well as high levels of androgen receptor), basal cells (located at a lower level that express markers like cytokeratin 5 but only low levels of androgen receptor), and rare neuroendocrine cells (characterized by the expression of endocrine markers).

The most frequent no cutaneous malignancy in men is prostate cancer. The most prevalent test for prostate cancer is prostate specific antigen (PSA) detection, as prostate cancer risk increases with PSA level. However, the screening procedures follow clinical guidelines because PSA levels do not reliably detect prostate cancer.
The chance of developing prostate cancer is increased by several inherited genetic changes:
• Prostate cancer risk is increased by inherited mutations in the BRCA1 or BRCA2 genes, particularly in the BRCA2 gene.
• Prostate cancer in its early stages has been correlated to a rare genetic mutation in the HOXB13 gene.
• Prostate cancer risk is increased by genetic alterations in the RNASEL gene.

The growth of prostate cancer cells is specifically influenced by androgens, which are male hormones. The activity of sex hormones is disturbed, and tumour cell growth is hindered by hormone therapy. There are several molecular alterations in prostate cancer cells that have recently been discovered (GSPT1, PTEN, p27, NK X3.1), and these changes are being studied for targeted therapy. [5]

ETIOLOGY:

The major risk factor is age, ethnicity, obesity, Genetic factor and family history.

- Age: Prostate cancer is uncommon before the age of 45 and becomes more common after the age of 50.
- Race or ethnicity: Black people experience the syndrome more frequently than do white people. Compared to Black or white people, Asian and Hispanic people are at a lesser risk.
- Family history: Having a close family with a history of prostate cancer increases the likelihood that you may also get the disease.
- Genetic components: genetic components Changes to the BRCA1 and BRCA2 genes, among other inherited traits, may raise the risk. These gene mutations also raise the risk of developing breast cancer. Additionally, prostate and other malignancies are more likely to strike men with Lynch syndrome.
- Nutrition: Some proof According to a reliable source, high-fat diets may raise the risk of prostate cancer. [6]

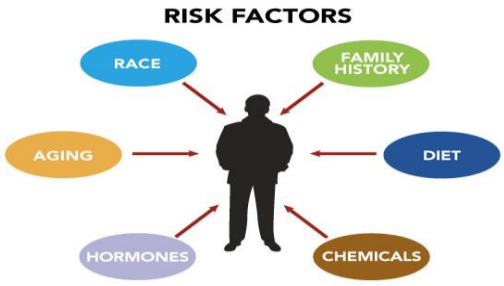

Fig1: Prostate Cancer Risk Factor

Prostate cancer risk factors include male gender, older age, positive family history, increased height, obesity, and hypertension, lack of exercise, persistently elevated testosterone levels, Agent Orange exposure, and ethnicity. [7, 8, 9]

5 Alpha-Reductase Inhibitors:

The role of 5α-reductase inhibitors (5-ARI), like finasteride and dutasteride, may reduce the incidence of low-grade prostate cancer, but they do not seem to have an impact on the risk of high-grade prostate cancer, and as a result, do not appreciably increase survival rate of prostate cancer. When comparing successive prostate-specific antigen (PSA) testing, these drugs will reduce PSA levels by roughly 50 %. Recent research has clarified the long-term safety of 5-ARIs in terms of reducing the incidence of prostate cancer. [10]

The Follow-up with Health Professionals In a study including 38,000 males monitored for more than 20 years, the use of 5 alpha-reductase and prostate cancer were studied.

.There was no relation between the amount of Prostate specific antigen tests, cancer screening, and surgeries performed on men taking the drug and the chances of developing a life threatening disease, overall mortality, or cancer-specific survival. Men receiving 5-alpha-reductase medicines experienced a decrease in the rates of both systemic and targeted illness. [11,12]

Genetics:

The etiology of prostate cancer is unknown, but heredity is certainly involved. Prostate cancer risk is known to be influenced by genetic makeup, race, and family history. [13] In general, people with genetic or hereditary prostate cancer have malignancies that emerge earlier in life, progress more quickly, are more likely to have localized advanced disease, and have a higher chance of recurrence following surgery. [13] (Typically, mutations affect genes that control cell development, cell proliferation, and cell death). Men who have a first-degree relative with prostate cancer are at an increased risk of having the disease themselves. Although it is obvious that family history matters, only 35% of familial risk is now explained by known genes. [14]

- Risk of prostate cancer increases with an affected brother more than with an affected father.
- Although several genes have already been involved, no one gene is entirely responsible for prostate cancer.
- The risk is five times higher for men with two afflicted first-degree relatives.
- The mutations in BRCA2 and HOXB13 that raise relative risk by seven to eight-fold and three-fold, respectively, are those that carry the highest risk. [15]
- In the United States, black males are more influenced than white or Hispanic men, and it is more lethal in black men. [16]

Nutrition:
Generally, consuming a typical Western diet is associated to prostate cancer.

- The risk is not decreased by vitamin supplementation, and some vitamins may even raise it.
- The advanced stage of prostate cancer is linked to high calcium intake. [17]
- Prostate cancer fatalities may be decreased by eating fish, but the incidence rate is unaffected.
- A lower blood level of vitamin D may raise the risk of prostate cancer.
- High unsaturated fats, however, have been found in an animal model to considerably speed up the development of prostate cancer. However, there is some evidence to support the notion that a moderate red wine intake may be advantageous.
- But there is some evidence to suggest that a moderate intake of red wine may be beneficial
- There is little to no proof that eating trans fats, saturated fats, or carbohydrates increases your risk of developing prostate cancer
- However, it has been demonstrated in an animal model that high levels of unsaturated fats greatly speed up the development of prostate cancer
- But there is some proof that a modest red wine consumption may be advantageous. [18]

Infections:
Prostate cancer incidence and development may be influenced by infections.

- Herpes, gonorrhea, and syphilis infections appear to raise the risk of getting prostate cancer.
- Prostate cancer incidence has been linked to the Human Papilloma Virus (HPV), although the evidence is contradictory.[19]

External exposure:

- Ionizing radiation and ultraviolet (UV) radiation from the sun have both been related to prostate cancer, although additional research and more precise risk calculations are required.
- There have also been a few reports of individuals' risk levels rising after exposure to cadmium, but these reports are rare, and the risk is at most modest, thus it has a relatively limited effect on overall public health.[20]

Chemical Exposure and Medications:
Some prescription drugs, surgical techniques, and health problems are associated with prostate cancer.

- Antidepressants, metformin, and NSAIDs, particularly those with COX-2 inhibitory action, may reduce the incidence of prostate cancer.
- Via inhibiting tumor-associated macrophages, metformin slows the progression of prostate cancer by blocking the COX 2/PGE2 pathway. Patients on androgen deprivation therapy experience this impact more strongly.
- According to current estimates, 23.7 million men use regular aspirin, which appears to lower the incidence of prostate cancer.
- This impact might result from reduced angiogenesis as well as anti-inflammatory properties.[21]

Sexual Activity:
Prostate cancer risk is greater by having multiple sexual partners over one's lifetime or beginning sexual activity at a young age. Regular ejaculation may lower the overall risk of prostate cancer, but less frequent ejaculation is not related to a rise in the frequency of advanced illness. [22]

Epidemiology:
Millions of men worldwide are affected by prostate cancer. 7% of newly diagnosed cancers in men worldwide (and 15% in industrialized nations) are caused by the condition, which is the second most frequent cancer in males after lung cancer. Additionally, more than 1.2 million new cases are identified each year, and more than 3,50,000 people die from prostate cancer worldwide, making it one of the major causes of cancer-related death among males.[23]
In the United States, the 5-year survival rate is 99 % overall.

- The developed world has a higher incidence of prostate cancer.
- Since 1992, when PSA testing became readily available, incidence rates have increased but the death rate has fallen.
- Ninety-nine percent of prostate cancer cases are in men over 50, although it can be quite malignant in younger men as well.
- African Americans in the US have prostate cancer at a rate that is more than twice as high as that of the overall population.
- Males of Asian and Hispanic heritage are less likely than White men to experience it.
- Prostate cancer risk greater strongly with age and >85% of recently diagnosed individuals are >60 years of age.
- Prostate cancer can be spread quickly and lethal in this age group. [24]

According to American Cancer Society predicts that prostate cancer will be the most prevalent organ cancer among African American men by the year 2022. A total of 41,600 male African Americans have been diagnosed with it, responsible for around 37% of all cancer cases and 17% of all cancer-related mortality. Comparing African Americans to Whites, this rate is 72% higher for the latter group. In comparison to Whites, African Americans have a 1:6 lifetime risk of having prostate cancer or passing away

from it. More than twice as many African American men die from prostate cancer overall as from any other type of cancer (37.9 vs. 17.8 per 100,000). [25]

Prognosis and survival:
Prostate cancer patient prognosis varies greatly and is influenced by the tumor grade and stage at initial diagnosis. If localized prostate cancer is detected at an early stage, the life expectancy for males with the condition might reach 99% over ten years. In the United States, patients with localized or regional disease at the time of diagnosis have a 5-year survival rate of nearly 100%, while patients presenting with distant metastases have a 5-year overall survival rate of only 29%.In patients who undergo treatment, the most important prognostic indicators are patient age and general health at the time of diagnosis, as well as the cancer stage, pre-therapy PSA level, and Gleason score. A poorer prognosis is associated with higher-grade disease, more advanced stage, younger age, increased PSA levels, and a shorter "PSA doubling time".[26]

PSA Screening:
Prostate cancer screening is the main method for identifying localized prostate cancer in asymptomatic patients, the stage at which the condition may be curable. The screening techniques, whether they are all-inclusive, targeted population-based, or individual-based, is to enhance prognostic differentiation between tumors that need immediate, definitive therapy with the intention of curing them and those that are still indolent and can be treated with active surveillance. Measurements of the blood serum biomarker PSA are the basis of screening techniques.

Multiple conditions, such as prostate illness, trauma, inflammation, prostitutes, urogenital treatments, surgeries, enlarged prostates, etc., might result in an increased PSA that is unrelated to cancer. Unless the PSA is elevated due to prostatitis or low-grade inflammation, some physician may advise a two to six-week course of prostate-specific antibiotics (typically a quinolone, amoxicillin, or trimethoprim) in an effort to reduce it and prevent further testing for prostate cancer. However, this practice is debatable and not generally advised because studies have not demonstrated a significant benefit to this method. [27]

Only about 20% to 30% of the time may raised PSA levels alone successfully diagnose prostate cancer; however, elevated PSA levels are how 80% of prostate cancers first manifest (usually greater than 4 ng/ml). There must be at least two abnormal PSA values or a palpable nodule on a DRE in order to warrant further testing or a biopsy.

Therefore, there is a significant danger associated with PSA testing that clinically benign prostate cancer will be over diagnosed and overtreated.When making judgments and conducting targeted population screenings, it is also important to include known germline mutations in the homologous repair (HR) pathway genes or a significant family history of prostate cancer as risk factors for early-onset and progression to metastatic prostate cancer. [28]

DIAGNOSIS:
Transrectal ultrasonography (TRSU), which uses sound waves to provide black-and-white images of the prostate, is frequently used in prostate biopsies.
There are a number of more recent methods for identifying prostate cancer.

- One method uses a method called Color Dropper ultrasonography to assess blood flow within the gland. Prostate diagnostics may be more accurate by ensuring that the correct section of the gland is collected because tumors frequently have more blood vessels surrounding them than normal tissue.
- A still more recent technology might improve color dropper even further. A contrast agent with micro bubbles is initially administered into the patient to aid the ultrasound imaging. Early results have proved positive, and this approach is the subject of ongoing research.
- Another method for guiding prostate biopsies uses a combination of MRI and TRUS images.[29]

Additionally, it has been demonstrated that prostate biopsy guided by multiparametric MRI (mpMRI) significantly improves early detection of clinically significant prostate cancer and increases the diagnostic yield of the procedure, allowing for the biopsy of a smaller subset of men as opposed to systematic sampling of all men. Additionally, this technique offers higher sensitivity for discovering and identifying clinically important tumors, and it is utilized to target biopsies to these dangerous regions.

The observation of anterior tumors made possible by mpMRI may enhance the chance of their discovery. MpMRI is now advised to be used as a biopsy technique guideline all over the world since it improves the accuracy of tumor localization and the detection of clinically relevant illness. If DRE and/or imaging results are suspicious or if the PSA value is verified to be elevated or rising without any other cause, a prostate biopsy is performed to test for the existence of prostate cancer. Serum PSA level is a continuous parameter that can be elevated owing not only to prostate cancer but also to BPH and infection; thus, an elevated PSA value (from 3 to 10 ng/ml) must be considered relative to the patient's baseline level and confirmed with repeated assessment after a few weeks under standardized conditions for the individual to avoid unnecessary biopsies.[30]

The presence of these features becomes an important consideration for clinical management.

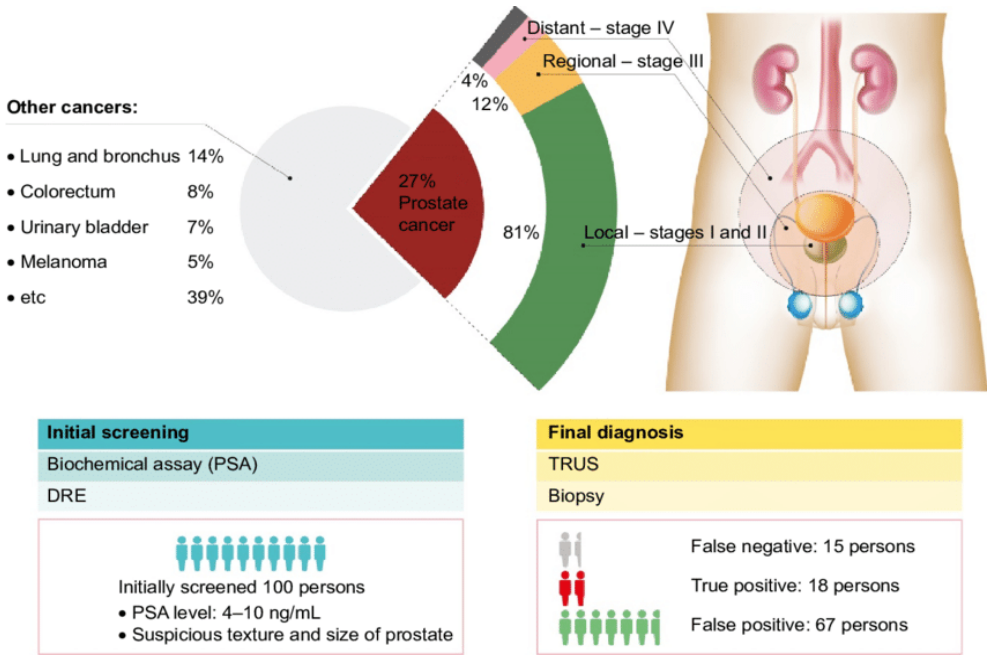

Fig 2: Prostate Cancer Diagnostic Statistic [31]

In the United States, one in four men are diagnosed with prostate cancer since it accounts for 27% of all occurrences of male cancer. For each prostate cancer diagnosis with an undetermined stage, the localized, regional, and metastasized tumor tissue is responsible for 81%, 16%, and 4% of all diagnoses, respectively. Following the initial screening, 85 out of every 100 people typically have a prostate cancer prognosis, with the remaining 15 subjects being free of the disease. Of the 85 individuals whose initial screening result was positive, only 18 received a prostate cancer diagnosis. Surprisingly, the other 15 individuals—who were initially thought to be free of prostate cancer based on the screening results—were later found to have the disease.[31]

Table no.1: Prostate cancer risk classification at diagnosis and after treatment

Type of risk	Measured variables	Low risk	Intermediate risk	High risk
Before treatment (at Diagnosis)				
Organ confinement, % Likelihood	PSA, GS, T-Cat OC	OC 88%, EPE 11%, SV+ 1%, LN+ 0%	OC 38–58%, EPE 36–48%, SV+ 4–7%, LN+ 2–6%	OC 5–12%, EPE 23–33%, SV+ 22–23%, LN+ 32–48%
D'Amico risk group (Risk of BCR)	PSA, GS, T-Cat	PSA <10 ng/ml and GS ≤6 and T-Cat T1–T2a	PSA 10–20 ng/ml or GS 7 or T-Cat T2b	GS 8–10 or PSA >20 ng/ml or T-Cat T2c–T3
ISUP grade group (Risk of BCR)	GS	Grade 1: GS 3+3=6	Grade 2 (low intermediate risk): GS 3+4=7 (predominantly well-formed Grade 3 (high intermediate risk): GS 4+3=7 (predominantly poorly formed)	Grade 4: GS 4+4=8; (only poorly Formed) Grade 5: GS 9 or 10 (lacking gland formation with or without poorly-formed)
Before treatment and after treatment				
Kattannomogram (pre-surgery OR; post-surgery BCR)	Age, PSA, GS, T-Cat, percent positive	Pre-radical prostatectomy nomogram (no prior treatment	Pre-radical prostatectomy nomogram (no prior treatment)	Pre-radical prostatectomy nomogram (No prior treatment)

	biopsies, prostatectomy report		Post-radical prostatectomy nomogram (PSA <0.1 ng/ml after surgery	Post-radical prostatectomy nomogram (PSA <0.1 ng/ml after surgery) Salvage radiation therapy nomogram (PSA <0.05 ng/ml after surgery

Estimating anticipated treatment outcomes both before and after prostatectomy, as well as the chance of dying from prostate cancer in the event of a post-surgery biochemical relapse (BCR). The use of these instruments, which are frequently employed in conjunction with D'Amico risk group and International Society of Urological Pathology (ISUP) grade group. [32]. EPE, extra prostatic extension; BCR, biochemical recurrence; CSS, cancer-specific survival; LN+, or positive pelvic lymph nodes; GS, or Gleason score; OC, or organ confinement; OR, or overall recurrence; OS, or overall survival; PSA, or prostate-specific antigen; Seminal vesicle positivity, or SV+, T-cat, Tumor category (also known as tumor-node-metastasis categorization)

Patients are classified as low risk (cT1–cT2a, PSA <10 ng/ml and ISUP grade 1), intermediate risk (cT2b or PSA>10–20 ng/ml or ISUP grade 2 or 3) or high risk (>cT2bor PSA >20 ng/ml or ISUP grade >3), which is used to guide the staging evaluation and to inform management decisions. [33]

TREATMENT:

1. Radiation Therapy:

The second-most important therapeutic approach for locally advanced, high-risk prostate tumours is radiotherapy. External-beam radiotherapy (EBRT), and brachytherapy are widely used treatment strategies for prostate cancer, which have a significant clinical and technological development in recent decades. The advantage of a dose escalation up to the total doses of 76-78 Gy concerning biochemical tumor control has been showed by some randomized trials, which additionally concerns the disease-specific survival for high-risk patients. Other randomized trials demonstrated the benefits of an additional adjuvant antiandrogen therapy to EBRT for patients with locally advanced cancers. A radiation dose of at least 74 Gy should be the standard of care for all men with localized prostate cancer who choose treatment with EBRT.[34] The two strategies (brachytherapy and surgery) have similar cost profile for prostate cancer treatment in France. The employs radiation to either eradicate cancer cells or stop them from proliferating. Options for prostate cancer in its early stages include:

A) External radiation therapy: In this procedure, radiation is directed toward the cancer cells via a device outside the body. A type of external radiation known as conventional radiation therapy employs a software to help guide and target a particular spot, reducing the risk to normal tissue and enabling a high dose of radiation to target the prostate cancer**.**

Complication forms external radiation therapy:

- Up to 15% of patients have a higher chance of developing hematuria, especially if they take anticoagulants. Oral pentosanpolysulfate and hyperbaric oxygen therapy are used to treat the hemorrhagic effects of radiation cystitis.
- Erectile dysfunction is another very typical problem reported in 30% to45% of men who were potent before starting radiation therapy, and may require cystoscopy and ongoing bladder irrigation.
- Fatigue and a higher risk of fracture are additional potential problems.

After definitive radiation therapy, there is a small increase in the prevalence of subsequent cancers. [35]

B) Internal radiation therapy: This procedure, also known as brachytherapy, employs radioactive seeds that a physician inserts close to the prostate. A surgeon utilises imaging tests like computed tomography or ultrasound to assist direct where to place the radioactive material.

Therapy will depend on a number of variables, recent technologies like conformal radiation therapy (CRT), intensity modulated radiation therapy (IMRT), and proton beam radiation aid doctors in lowering the number of radiation they administer to normal tissues.

These techniques are predicted to decrease the negative effects of radiation therapy while increasing its effectiveness. Other types of radiation therapy are also becoming more efficient thanks to technology. A new computer software helps doctors better plan the radiation dosages and strategies for both cryotherapy and external radiation therapy**.** [29]

2. Hormone therapy:

Recently, a number of innovative types of hormone therapy have been developed. The first line of treatment for metastatic prostate cancer is considered to be androgen deprivation therapy (ADT), which can be administered medically or surgically. The mainstay of therapy is the inhibition of various hormones, receptors, or enzymes involved in the androgen synthesis pathway. Particularly for locally advanced and metastatic disease, ADT is usually used as the main treatment for prostate cancer. Additionally, it is applied as an adjuvant or neoadjuvant therapy following surgery or radiation treatment. ADT is frequently the treatment of choice for chronic therapy but does not treat prostate cancer when taken alone.

The suppression of the prostatic stroma in addition to the tumour is an emerging notion in the treatment of prostate cancer, even though the focus of cancer treatment is normally on the cancer cells themselves. It has been demonstrated that the prostatic stroma aids prostate cancer and may contribute to the development of tumorigenic or invasive phenotypes in cells. [36] Hot flashes, decreased libido, and loss of bone density leading to osteopenia or osteoporosis are all side effects of hormone therapy.

Regarding a potential link between long-term androgen deprivation therapy and cardiovascular risk and metabolic syndrome, there are contradicting studies. Long-term hormone therapy for prostate cancer has a propensity to decrease insulin sensitivity while increasing clotting risk, LDL cholesterol, body fat, triglycerides**.**

The most common side effect of hormonal therapy is hot flashes in up to 80%of man on hormonal therapy. These hot flashes, which some people experience up to ten times every day, can occasionally be quite painful. Along with heat flashes, other symptoms including irritation, anxiety, or heart palpitations are occasionally observed. Men who experience hot flashes after beginning hormonal therapy frequently report that they gradually get less frequent and intense, and that they go away within 3 to 4 months of finishing the anti-androgen therapy. [37]

Cyproterone 100 mg/day or oral medroxyprogesterone 20 mg/day are the most efficient preventive treatments for hot flashes. [26] There is also an injection form of medroxyprogesterone. It contains the artificial hormone progestin, a progesterone-receptor agonist that is readily absorbed when taken as a pill and is typically regarded as the best treatment for extreme hot flashes in men. Cyproterone, a synthetic progesterone derivative, is used to treat advanced prostate cancer overseas but has not received FDA approval in the US. Hot flashes can be effectively managed with it as well. A synthetic progesterone called megestrol (Megace) is excellent at reducing hot flashes. However, some research indicates it can hasten the progression of prostate cancer. [38]

Estrogen therapy is beneficial for removing male hot flashes but is not advised due to the risk of gynecomastia, thromboembolisms, and blood clots. Finasteride and dutasteride are examples of 5 alpha reductase inhibitors that prevent testosterone from being converted to the more active form of the hormone dihydrotestosterone (DHT). Prostate cancer is treated using these drugs.

Differencial diagnosis:

- Acute bacterial prostatitis
- Prostatic abscess
- Chronic bacterial prostatitis
- Benign prostatic hyperplasia
- Nonbacterial prostatitis
- Tuberculosis of the genitourinary system

3. Surgery:

The most common type of surgery for prostate cancer is a radial prostatectomy. If it is considered that the prostate cancer has not spread outside of the gland, surgery is frequently used to try to cure it.

In males with prostate cancer, surgery is considered a part of the multimodality methods rather than a monotherapy. The two most commonly used surgical procedures for prostate cancer are radical prostatectomy and pelvic lymphadenectomy (PLDN). [39] Due to concerns about potential adverse effects include a high rate of positive surgical margins, a chance of lymph node metastases, and a high likelihood of PSA recurrence, RP has traditionally been recommended for high-risk prostate cancer.

Traditionally, RP for high-risk prostate cancer has been discouraged because of concerns regarding the side effects such as high rates of positive surgical margins, risk of lymph node metastasis, and high rates of PSA recurrence. However, it has been demonstrated that surgery is superior to watchful waiting in terms of mortality, risk of local advancement, and risk of metastasis
The most of these operations are now performed laparoscopic surgery or robotically. Between robotic and open surgery, there does not appear to be much of a difference in overall side effects or survival rates. The best chance for a complete recovery from localized prostate cancer as well as a significant improvement in general survival, cancer-specific survival, and the occurrence of distant metastases is provided by radical prostatectomy. These advantages over other conclusive, curative treatments are most noticeable in males who are under 65 at the time of diagnosis and do not become apparent until ten years after therapy for localized disease. If the tumour has spread to distant structures or is fixed to nearby structures, radical prostatectomy is not the best course of treatment. [40]. the method of surgery performed to treat prostate cancer. The objective is to completely eradicate the cancer while minimizing surgical risks and adverse effects.

4. Cryosurgery:

Cryotherapy can be the first surgical treatment for prostate cancer, but it is probably most common useful as salvage surgical therapy after radiation therapy has failed. Additional radiation or major surgery in these situations—which are indicated by persisting or increasing PSA following radiation therapy—is frequently highly challenging, dangerous, or even impossible. Although it is frequently used in these situations, hormonal therapy is not a cure-all.

It was first employed in London in the 19th century to treat breast and cervical cancers. Freezing technology has been utilized to kill cancer cells for many years. In order to perform modern cryotherapy, closed circulation liquid Nitrogen probes had to be developed. In 1966, benign prostatic hyperplasia was one of the first conditions for which this new technology was applied. [41]

5. Chemotherapy:
In the current era, docetaxel and modified hormonal therapy are usually used. The conventional first-line chemotherapy drug for CRPC, docetaxel, has a median survival benefit of 2 to 3 months.The second-Line chemotherapy treatment is cabazitaxel. [42]

In around 50 % of patients, starting a second-generation hormonal medication like enzalutamide or apalutamide may result in a brief rise in PSMA uptake on PET/CTs known as a "flare."

- Platinum-based chemotherapy, such as carboplatin, oxaliplatin, or cisplatin, can be used next; these drugs are typically combined with paclitaxel, capecitabine, or estramustine.
- In more aggressive tumours, docetaxel or cabazitaxel combined with carboplatin is frequently advised.
- Mitoxantrone has a relatively small part in the chemotherapy of prostate cancer, despite the fact that a few patients who had failed docetaxel have responded to it. More so than survival, it might have a stronger impact on symptom reduction
- For neuroendocrine tumours, which are frequently particularly aggressive, etoposide is recommended in combination with carboplatin or cisplatin.
- Patient who have the DNA mismatch repair genes MLH1, MSH2, MSH6, and PMS2 may benefit from an immunotherapy medication like pembrolizumab. [43]
- Denosumab or zoledronic acid will be beneficial for patients with castrate-resistant prostate cancer with bone metastases to reduce bone pain and fractures.
- As they have all shown increases in quality of life, Sipuleucel-T, Uranium 223, and Lutetium 177 therapies should be utilized properly in castrate-resistant prostate cancer patients for both palliative and therapeutic effects.
- As they have all demonstrated improvements in quality of life, clinical symptom reduction, cancer-specific as well as overall survival, sipuleucel-T, radium-223, and lutetium 177 treatments should be used appropriately in castrate-resistant prostate cancer patients for both palliative and therapeutic benefits. [44]

6. Dieatory starategies and lifestyle changes:
In Prostate cancer treatment is one of the potential advantages of several nutrients. Dietary change is crucial for cancer prevention since some dietary components may help to lower risk while others may raise it. Because nutrition has a significant role in the development of prostate cancer, avoiding foods high in fat and cholesterol may assist to manage or prevent the disease. [45]

Neutraceutical substances most frequently exhibit antioxidant capabilities in combination with other antineoplastic activity in laboratory tests. Dietary antioxidants should be useful against prostate cancer because oxidative stress, androgen exposure, and ageing all raise the risk of prostate cancer.

Selenium's impact on human trials, however, is uncertain. Nutritional dosages of anti-oxidant vitamins, such as vitamin E, and minerals, such as selenium, may aid in the chemoprevention of prostate cancer, according to Meyer et al. However, vitamin E and selenium did not perform as well in clinical trials. [46]

CONCLUSION:
Although prostate cancer is one of the most common and life-threatening disorders, accurate diagnosis, treatment, and other control strategy are among the main objectives of many prostate cancer treatments. Prostate cancer assessment and management may benefit from an integrated treatment approach that combines local and systemic medicines. However, the choice of treatment strategy is dependent on many factors, like patient preference, and quality of life aspects. It is anticipated that within the next few years, treatment modalities like chemotherapy, immunotherapy, cryotherapy, radiation therapy, and surgery will become significantly more advanced with fewer side effects. And most importantly, using proper dietary strategies and lifestyle management techniques can reduce the risk of developing prostate cancer.

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