Prostate cancer in Saudi Arabia in 2002

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ABSTRACT

Epidemiologic studies revealed that there are variations in the geographic and ethnic distribution of cancer of the prostate (CaP) gland. This cancer varies dramatically between being very common in black American men, to rare in Asian and Chinese men. Genetic, familial predisposition and environmental factors in addition to methods of cancer detection and reporting contribute to these variations. Prostate cancer is the ninth most commonly diagnosed cancer in the world yet it ranks first in the United States of America (USA) where resources allow large epidemiological studies. The health policy makers take major decisions such as mass population screening according to data derived from such studies that include information on disease specific mortality rates and incidence rates for each of the ethnic sub-populations living in the USA. Until now, we do not have similar information in the Kingdom of Saudi Arabia (KSA); therefore, policy decisions should consider the possibility of the difference in situations since genetic, familial and environmental conditions are different. Our current local data, although little, indicates that prostate cancer occurs at a lower incidence rate than western countries. The objective of this article is to provide all the available information on the different aspects of CaP gland in KSA. A second more important objective is to attract the attention of the future expectations that need preparation since the possibility of disease prevention does exist.

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Over the past 2 decades cancer of the prostate (CaP) has been the most frequently diagnosed cancer in the Americans and the second most common in European men.[1] The rates are progressively increasing.[2] But this is not the case for eastern countries so far, especially in the Kingdom of Saudi Arabia (KSA).[3] On the contrary, this article will show that this cancer is still not frequently diagnosed in KSA, a great opportunity for us to study its natural history and plan for preventive measures. This review article cannot and will not discuss all aspects of prostate cancer, some of which are the subjects of intense controversies.[4] The details of these subjects can be found in classic sources.[5-8]

Epidemiology. The variation in the geographic and ethnic distribution of prostate cancer in the world's population is shown in **Table 1**.[1-3] The revolution in medical thinking on CaP started when it was realized, in the United States of America (USA) and almost in the entire western hemisphere, that CaP had become the most frequently diagnosed cancer in elderly men in the last 2 decades.[4-7] Cancer of the prostate is the second leading cause of male cancer deaths.[8] Once the public was made aware of these figures, many men demanded to be screened by the recently available advanced methods to rest their worries on disease affection. Subsequently, more and more CaP patients have been diagnosed. More and more clinics and hospitals visits resulted because of that. More radical surgeries were performed especially for patients with asymptomatic preclinical stage of the disease as a result of screening of large numbers of asymptomatic men.[9] However, frequent studies have shown that long term survival at 10 and 15 years is the same no matter what type of treatment was used.[10,11] Indeed, the disease-specific mortality from CaP remained the same during the same period of time.[10,11] There has been no evidence to confirm that the mortality rate from CaP is reduced by early detection, observation only was even recommended as a standard line of management.[4,10,11] Subsequently, urologists became divided into 2 groups:

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one group claims that CaP is a seriously killer disease, then every step should be taken to ensure an early detection and eradication of the disease in order to cure those patients (who may be a healthy asymptomatic fit men) and to save lives.[12,13] The other group claims that no matter what we do, the death rates from CaP, as based on solid statistics, are the same but high prices were paid: worries, morbidities and of course undeniable economical burdens, therefore this aggressive attitude of the first group is groundless.[10,11,14,15] In the middle of all of this, where do we in KSA stand? Which group should we follow? To find our way ahead we should go back to evidence- based medicine. We should look at our own statistics. Is CaP a frequently encountered disease in KSA? What are our own current morbidity and mortality rates? Is this disease expected to be a threat in the future? Do we have any adequate methods for monitoring? Plans for the best suitable methods of treatment? Any thoughts for prevention? This short writing will try to explore these questions and issues concerning CaP in KSA.

An extensive effort was made to trace all CaP cases that were reported from 1975-1996, with the conclusion that, in KSA the incidence of CaP is very low compared to the western countries.[16] All papers and presentations concerning CaP were reviewed in details.[16] A subsequent report from the eastern region supported this conclusion.[17] The obvious main reason for this low incidence rate is that: CaP is only common in aged male population that is lacking in KSA whose population is predominantly young.[18] Even when ranked among other genitourinary (GU) cancers, CaP comes as second common after bladder cancer which is the most common GU cancer seen in KSA.[18,19] We reported our own experience with this cancer.[20] Although it was a series of small number of patients, but the report was successful in stimulating the interest of others in a previously locally neglected subject and in drawing the attention to the fact that 55% of the patients presented in an advanced stage of the disease.[20] Whether the incidence will rise with aging of the male population and with more wide spread use of prostate-specific antigen (PSA) and performing more surgeries for presumed benign prostatic hypertrophy (BPH) remains to be seen.[16] The low incidence of CaP in the elderly Saudi males was confirmed to be a fact not a myth (namely under diagnosed or overlooked) by examining the rate of cancer discovered in prostatic specimens removed at surgery carried out for a clinically presumed benign disease. The international rate for this incidentally discovered cancer is 10-20%.[2,21-24] We have determined our own rates, still lower than the western rates.[25] When we looked at other centers in the country they were even lower.[26-30] **Table 2** is an update of these rates. Compared with international rates of 10-20%, the 1997-1998 national cancer registry reported carcinoma in situ to represent 2% of all of the prostate cancer cases.[3] In 1997, King Abdul-Aziz University in Jeddah, KSA reported 7% rate of incidental prostate cancer detected in surgical specimens removed from clinically presumed benign disease (stages T1a and T1b).[25] The calculated average rate from all Saudi centers was 3.3%, which is considerably low as shown in **Table 2**. Whether these rates will change in the future due to changing the dietary habits and other environmentally related risk factors also remain to be observed. In a study to explore the relationship of CaP to the nutritional status of Saudis, the incidence rate of CaP was 3.1 per 100,000 person per year in 2,270 screened Saudi males.[31] Although this was a single hospital study that neglected to measure the patients serum androgens and other sex hormones incriminated in cancer predisposition, yet the low incidence of this cancer was reconfirmed despite a high fat diet with 50% saturated fat content.[31] Unfortunately, this study failed to document important data such as the ethnic origin of the patients and their detailed dietary habits other than fat intake since there is the possibility of protective diet intake including flavonoids and isoflavonoids present in tomatoes and tea, both are favored by Saudis.[31] As a prospective controlled study, this work was of limited vision as it missed the chance of studying other important risk factors that interplay together in the development of prostate cancer, an opportunity to understand why this cancer occurs at a low frequency rate in Saudi men in order to further utilize this information for prevention.[31] The exact morbidity and mortality rates from this cancer on the national scale are not known in KSA. However, there was a major effort to study hospital deaths in one hospital.[32] Death rate from prostate cancer during 1991-1995 at Asir Central Hospital, Asir, KSA was 1.5% (4 cases) among 261 cancer deaths.[32] Among cancer deaths, CaP was in the thirteenth position compared to the second position in USA.[32] This is a very low rate, although in the epidemiological sense this rate should be expressed as a number per 100,000 populations per year. In Scandinavian countries, whose population is known to live to advanced ages, this figure is high at a rate of 22 per 100,000 per year.[1,2,14] The dense population in the southern area of Asir is also known to have prolonged longevity.[32] There are 2 studies from the Dhahran Health Center in Saudi ARAMCO, KSA.[33,34] In 1998, a study was presented to reveal that there were 137 CaP cases seen over the previous 10 years.[33] Until 1995 most of the patients presented in advanced and metastatic disease.[33] In 1995, a prostate-specific antigen (PSA) screening program was established for Saudi ARAMCO employees and their dependants.[33] This has resulted in a shift in the presentation to organ confined tumor in up to 53-60% of the cases.[33] In the following year, the second study revealed that there were 20 patients with clinically organ confined disease who underwent radical prostatectomy attempting for cure by disease eradication.[34] Pathologically, 9 (45%) were upstaged postoperatively, 3 found to have nodal metastasis and 6 had malignancy involving surgical margins. Out of the 11 patients with organ confined disease; 33.3% returned with

recurrences.[34] The other postoperative complications and morbidities following this major surgery were not detailed.[34] A recent interview in one of the national leading newspapers quoted one of the urologists stating that there is a significant and marked increase in the incidence rates of CaP gland (**Figure 1**). To our knowledge, there has been no corresponding report published in a peer reviewed scientific medical journal. The latest data from the National Cancer Registry (NCR) report for the years 1997-1998 issued in October 2001 revealed that prostate cancer is still in the sixth rank among all cancers in males. The age standardized rate (ASR) for males was 3.4 per 100,000 population.[3]

Clinical presentations. There are no specific symptoms of the early CaP.[4-8] It is either discovered incidentally or searched for by PSA screening and digital rectal examination (DRE).[4-8] Transrectal ultrasonography (TRUS) and transrectal ultrasound guided needle biopsy follows if one or both tests were abnormal.[4-8] Late stages of CaP may present by lower urinary tract obstructive symptoms similar to those of BPH. Rarely, CaP presents by renal failure due ureteral obstruction. Symptoms of metastasis include bone pains, pathological fractures, spinal cord compression or symptoms of other organ involvement that occur rarely.[4-8] Early detection is by screening of asymptomatic men or during the evaluation of BPH. Another situation in which CaP is discovered incidentally is after transurethral resection of the prostate (TURP) carried out for a clinically presumed BPH, when the histopathological examination of the excised tissues reveals cancerous tissue. This is designated as stage T1a and T1b. Stage T1c is CaP diagnosed by needle biopsy carried out due to elevated serum PSA level. Currently, this latter stage is the most commonly described in the American literature. Reports from the ARAMCO health center seem to follow the same tract due to the initiation of a PSA based screening program for all male employees aged ≥50 years including their dependants.[33,41] The rest of the staging system is shown in **Table 3**.[8] A survey conducted among urologists practicing in the western region of KSA revealed that only 47% of them would commonly use PSA for screening for CaP.[35] A survey conducted on the national scale revealed that PSA is available only to 29% of the Saudi Ministry of Health (MOH) hospitals in KSA and 100% of all other hospitals.[36] Therefore, MOH hospitals would not be a valid source of data in regard to PSA based screening for prostate cancer among BPH and other patients.[37] **Table 4** summarizes the clinical presentation of CaP patients in KSA.[20,33,38-40] The rates of incidental cancer discovered after prostatectomy for a presumed clinically benign disease (stages T1a and T1b) in KSA are detailed in **Table 2**. We have to wait future reports on rates of incidental cancer discovered by PSA screening (stage T1c) in the different parts of KSA suspectively it will be highest in ARAMCO patients since there has been a PSA screening program initiated in 1995 and lowest in MOH patients since they have the lowest availability of PSA testing. We also suspected a general increase in the incidence of this disease with a shift towards early diagnosis at early stages due to increased awareness and improvement of health care.

Diagnostic modalities. As mentioned previously, CaP presents in different ways and none of them is specific to the disease. On physical examination DRE is of paramount importance. Unfortunately, DRE have been proven to be an insensitive method for CaP discovery even when carried out by experts.[41,42] All urologists in the western region replied that they are performing this examination routinely.[35] In one hospital our own examination was shown not to be carried out adequately in the non-urological surgical and medical services.[43] However, abnormality of the gland suspicious of cancer can be palpated in the form of a discrete nodule, more than a nodule, firmness, hard mass or a sheath such hard area. Extracapsular penetration can also be palpated during DRE. As mentioned previously serum PSA measurement have been proven to be a very sensitive method to aid in the initial diagnosis, monitoring of disease progression, evaluation of treatment efficacy and finally detection of early relapse and determination of prognosis.[4-9] There are many issues concerning PSA that cannot be discussed here due to space limitation. The best to mention is to take into consideration the amount of PSA in relation to the size of the gland (PSA density), meaning that even large benign gland can produce abundant PSA but small glands are not supposed to unless they are affected with cancer or other diseases that make the cells break down and release their intracellular PSA into the circulation. The second issue is to take the age of the patient into consideration. Age-related PSA is discussed elsewhere,[4] defined as a specific pattern of increase in the PSA serum level with increased age.[4] There is an increase in the size of the gland itself with aging in general.[44] **Table 5** shows the age-specific PSA reference ranges.[1] Measurement of the free and total PSA and calculating the free or total ratio have been shown to help in reducing the rate of performing unnecessary biopsies in a situation when CaP is suspected namely abnormal gland on DRE, mildly elevated PSA or abnormality seen on ultrasonographic scanning of the gland.[4-9] All of these issues should be studied in the Saudi patients in specific if we believe that there might be differences in the genetic make up that is responsible for the low prevalence of CaP, size of the prostate gland, androgen dependant PSA production and finally CaP behavior in the individual patient.[8,9,45] Transrectal ultrasonography have been shown to the best imaging procedure in visualizing the prostatic tumor, staging of the localized tumor and an accurate method to guide needle biopsy. When cancer nodule is present it appears as a discrete hypoechoeic area. However, TRUS has not been shown to be a useful method of initial screening nor it is a sensitive method when used alone in the diagnosis since approximately 30% of the tumors are isoechoeic.[5-9] When the 3 modalities (DRE, PSA and TRUS) were

combined together the cancer detection is said to improve and the yield is higher. However, Al-Hazmi et al[46] reported a biopsy based cancer detection rate of 35% in Saudi men with suspected cancer due to either abnormal prostate on DRE or abnormally elevated PSA. Another report from Dhahran Health Centre, KSA, revealed a cancer detection rate of 27.5% when combined PSA, DRE and TRUS were used.[47] Still when there is an abnormally elevated PSA the western cancer detection rate is higher in the range of 65-80%.[1,9] Other standard imaging techniques such as plain x-rays, abdominal ultrasonography, computerize tomography (CT) scan, magnetic resonance imaging (MRI) and nuclear bone scan are useful in the evaluation of the kidneys, liver, lymph node and bone involvement.[8-12]

Treatment modalities. The current methods of treatment of CaP are determined according to the stage of the disease.[5-9] The clinical staging system is mentioned in **Table 3**.[8] In general, there are 4 methods of treatment. Continuous observation only has been recommended for the early and asymptomatic metastatic disease.[10,11] Observation entitles periodic clinical evaluation, DRE, PSA and possible TRUS when indicated.[10,11] Curative surgical intervention for the fit patient with a reasonable life expectancy means the radical excision of the prostate gland harboring a localized cancer. This radical retropubic prostatectomy has become one of the most commonly performed operations in the USA with a concomitant fall in the rate of performing TURP for BPH.[5-9] It is rarely performed in KSA, even in the major cancer centers such as King Faisal Specialist Hospital and Research Centre (KFSH&RC), Riyadh, KSA. Adversely and significantly affecting the quality of life, this operation commonly results in urinary incontinence, erectile impotence and bladder neck stenosis. Most of the operated Saudi patients had this operation carried out in the USA.[20] Twenty patients were subjected to this operation during 1989-1998 at the Dhahran Health Center, KSA.[34] Laparoscopic radical prostatectomy is now one of the treatment modalities available recently with very good quality of life and minimal complications. Other surgical intervention that can be used, usually for advanced stages, is the surgical removal of the testes, and the source of the androgen. Cancer of the prostate is a hormone (androgen), dependant tumor in its early stages and well, differentiated forms. Surgical castration or bilateral orchiectomy is a simple, effective, cost effective and acceptable operation especially for the very elderly, symptomatic, non-complaint or poor patients. Other surgical intervention can be used to repair pathological fractures or to decompress metastasis to the spinal canal. Similarly, palliative radiotherapy can be used to alleviate the pain of metastatic bony lesions, vertebral column metastasis and as a trial to control local tumor recurrences following radical retropubic prostatectomy. Curative radical radiotherapy using external beam irradiation and intraprostatic radiotherapy using radioactive seeds and needles have also been in use.[5-9] We have no experience with type of therapy due to the small number of patients we encountered. Medical treatment in the form of medical castration by using monthly injections of luteinizing hormone-releasing hormone (LH-RH) analogue to suppress the anterior pituitary gland is commonly used in KSA and the rest of the world. It is an effective method to temporary controls the advanced stages of the disease. There are several preparations intended to act as depot with an effect lasting from 4-12 weeks post injection.[5-9] Therefore, the injection is either given deep intramuscularly or a bullet administered subcutaneously. However, it is costly, requires an alert and complaint patient. All androgen suppressive therapy is expected to result in loss of libido and erectile potency. There are also oral antiandrogen preparations. The best timing for their use is at the initiation of LH-RH analogue therapy to prevent the flare up of the disease that may accompany the initial rise in the serum testosterone level from LH stimulated release before its depletion. Still, these preparations are expensive, hepatotoxic and require compliance.[5-9] Unfortunately, there are no encouraging reports to indicate complete or partial responses to any of the known chemotherapeutic agents whether used alone or in combination.[5-9] Eventually, the tumor will escape the hormonal dependant state and the host will die either due to the cancer (cancer death) or due to other reason (non cancer death). It is important to document in the death certificate whether the patient died with CaP but from other reason for example cardiac or from CaP itself. The majority of CaP deaths are due to metastasis.[42] This documentation of the morbidity and mortality rate helps in strategic planning of our health policy as mentioned earlier in the article.

Discussion.

This part will be devoted to discuss the various risk factors involved in the development of CaP in relation to the local environment in KSA.[48] The 2 well known risk factors for developing prostate cancer are increased aging and the presence of gonadal androgenic hormones.[5,6] Other unestablished factors recently studied are: hereditary and familial factors, descendants of the black American race, high fat diet, smoking, alcohol intake, vitamin D deficiency, prior vasectomy, the increased use of TURP for BPH and finally the widespread use of PSA as a screening tool for prostate cancer.[48]

Aging. Autopsy studies performed in USA revealed that microscopic foci of well differentiated adenocarcinoma of the prostate are highly prevalent in men over the age of 50.[6] Subsequently it is realized that this cancer is prevalent in aging populations and infrequent in younger populations.[4-9] With the improvement in the general living conditions and medical care it is expected that the age distribution will change globally towards an increase in the life expectancy.[6] The current population in KSA is mainly formed of younger age groups.[18] Therefore, the low current prostate cancer detection rate is consistent with the fewer number of aged males in this country.

Table 1 - The variation in the geographic and ethnic distribution of prostate cancer in the world's population.[1-3]

Country	Year	Prevalence rate*
United States of America		
Black	1997	137
White	1997	101
Japanese	1997	47
Chinese	1997	20
Europe	1997	20-50
Japan: Miyangi	1997	9
China: Shanghai	1997	2
Kingdom of Saudi Arabia	1997	3.4
Kuwait	1985	4.4
Algeria: Se'tif	1985	2
India: Ahmadabad	1985	4.1

*new cases per 100,000 mean per year

Table 2 - Rates of incidentally discovered carcinoma of the prostate (stages T1a and T1b) in surgical specimens removed for clinically benign disease in the Kingdom of Saudi Arabia.

Author	Year of report	Centers	City/area	Incidence rate %
Taha[26]	1993	King Faisal University	Al-Khobar	1.1
Al Jasser et al[27]	1995	Security Forces Hospital	Riyadh	4
Ghali et al[28]	1996	King Saud University	Asir	1.6
Mosli[25]	1997	King Abdul-Aziz University	Jeddah	7.2
Al Zahrani et al[29]	1999	King Faisal Specialist Hospital and Research Centre	Riyadh	3
Al Masry[30]	2000	Bin-Jalawi Hospital	Al-Ahsa	2.8
Present study	2003	Average reports from Saudi Centers		3.3

Table 3 - Clinical staging of prostate cancer.[8]

Stage		Description
Incidental finding; no tumor palpable		
Whitmore-Jewett	TNM (1992)	
A1	T1a	Tumor found by chance in <5% of excised tissue
A2	T1b	Tumor found by chance in >5% of excised tissue
	T1c	Tumor confirmed by needle biopsy (raised PSA)
	Tx	Local tumor cannot be evaluated
	To	No local tumor detectable
Intracapsular palpable tumor		
B1	T2a	Tumor limited to half of one lobe or less
B2	T2b	Tumor has spread to half of one lobe but not both
B3	T2c	Tumor has spread into both lobes
Extracapsular tumor		
C1	T3a	Unilateral extracapsular spread
C2	T3b	Bilateral extracapsular spread
	T3c	Tumor has spread to one or both seminal vesicles
	T4	Tumor is attached or has invaded adjacent structures other than the seminal vesicles
Disseminated tumor		
D1	Nx	Loco-regional lymph nodes cannot be evaluated
	N0	No lymph node involvement
	N1	Lymph nodes <2 cm in diameter
	N2	One node only >2cm or <5cm; multiple <5cm
D2	Mx	Distant metastasis cannot be evaluated
	M0	No distant metastasis
	M1	Distant metastasis present
D3 tumor has become resistant to hormonal therapy		a - lymph nodes other than regional nodes, b - skeletal, c - other sites

PSA - prostate-specific antigen, TNM - tumor node metastasis

Gonadal androgenic hormones. The presence of gonadal androgenic hormones is required for CaP development and in the absence of gonadal androgens, the prepubertal prostate atrophies and cancer does not develop. Androgen deprivation is a well established method to control CaP.[5-9]

Diet. It has been postulated that low fat diet consumption may lead to lower serum testosterone levels.[4] To establish any relationship between hormonal levels in the different age groups and the risk of development of prostate cancer an extensive research work is required. This opportunity was missed when a large study has concentrated only on the contradiction of how the Saudi diet high in saturated fat is associated with low frequency of prostate cancer.[31] However, several studies have considered the Mediterranean style diet to be protective against endocrine cancer.[49] It appears that prostate cancer results from an interplay between endogenous hormones and environmental influences that include, most prominently, dietary fat.[49] Even the different types of fat may play a different role.[49] Olive oil seems protective but the link of pork fat to this cancer has not been established.[50] On the contrary, Jews who do not eat pork still had a higher incidence of CaP than non-Jews living in Palestine.[49] The current Saudi diet is rich in non-pork red meat and is not devoid of fat.[31] It is hard to speculate the long term impact of the current dietary habits of the present predominantly young generation on the future development of prostate cancer.[31]

Race. Black American men represented a particularly high risk group for the development of prostate cancer and they have the highest incidence of prostate cancer in the world.[51-55] In this group of men and in those with positive family history, the general recommendation to undergo annual screening for prostate cancer with DRE and PSA for men ≥50 is modified to start at a much earlier age.[5] Thirteen percent of the patients of our own series were black.[17] Whether the high risk of prostate cancer is limited to the black

Table 4 - The clinical presentation of CaP patients in the Kingdom of Saudi Arabia.

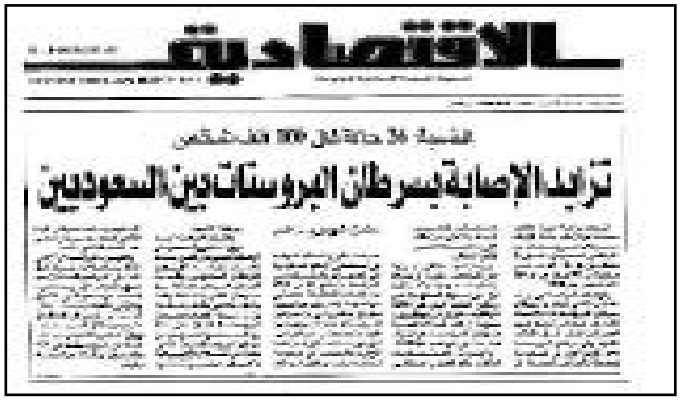
Author	Center	City/area	Year of report	n of patients	Study period (years)	Prostatism %	Renal failure %	Stages T1a and T1b %	PSA screening stage T1c %	Localized disease %	Metastatic stages %
Al-Otaibi et al[38]	RAFH	Riyadh	1995	126	12	unknown	unknown	19	unknown	52	(48)
Al-Khudair et al[39]	KFNGH	Riyadh	1996	74	12	30	unknown	36	unknown	50.7	(49.3)
Mosli[20]	KAUH	Jeddah	1997	55	11	65	5	27	4	45	(55)
Abomelha et al[40]	RAFH	Riyadh	1998	90	17	89	unknown	9	unknown	35	(65)
Al-Otaibi and Feehan[33]	DHC	Dhahran	1998	137	10	unknown	unknown	unknown	probably high	53-60	(33-47)

RAFH - Riyadh Armed Forces Hospital, KFNGH - King Fahd National Guard Hospital, KAUH - King Abdul-Aziz University Hospital, DHC - Dhahran Health Centre, PSA - prostate-specific antigen, CaP - cancer of the prostate

Table 5 - Age-specific PSA normal reference ranges (ng/mL).[1]

Age range (years)	White American patients	Black American patients	Asian patients
40-49	0.0 - 2.5	0.0 - 2.0	0.0 - 2.0
50-59	0.0 - 3.5	0.0 - 4.0	0.0 - 3.0
60-69	0.0 - 4.5	0.0 - 4.5	0.0 - 4.0
70-79	0.0 - 6.5	0.0 - 5.5	0.0 - 5.0

PSA - prostate-specific antigen


الاقتصادية

تزايد الإصابة بسرطان البروستات بين السعوديين

Figure 1 - A newspaper clipping stating that there is an increase in the incidence rate of prostate cancer among Saudi men to 26 per 100,000 per year.

Americans or generalized to include other black populations in mixed racial cultures deserves to be observed. In our mixed population, the cancer registry should consider the ethnic and racial variations.[51-55]

Genetics and familial predisposition. With regard to family history, prostate cancer is believed to occur in 3 forms: (1) sporadic occurring randomly in the population, (2) familial the unpredictable clustering of the disease in families and (3) hereditary early onset of disease and clustering in individual families.[56-58] In our series 47% of the patients were ≤70 years of age.[20] Members of the immediate family of some of the patients are now coming forward willing to be screened by DRE and PSA but no case of familial prostate cancer has been discovered so far. The effect of consanguinity commonly seen in Saudi marriages is to be studied in the light of this current knowledge of the hereditary aspects of prostate cancer. It is imperative that family history be carefully taken and recorded in every case for future analysis.[56-58]

Smoking and alcohol intake. Alcohol consumption is prohibited under Islamic laws in KSA so it was presumed that the Saudi population is lowest in alcohol consumption in the world. On the contrary smoking seems a prevalent habit. However, data has been presented to show that neither smoking nor alcohol consumption seriously increases the risk of prostate cancer.[59]

Vasectomy. History of vasectomy, an operation rarely performed in this country, did not appear to influence the incidence of prostate cancer neither did the characteristics of sex life.[1,59]

Increased detection. In another study, the correlations between the incidence rates of prostate cancer and those of TURP suggest that increased treatment of BPH has led to increased detection of prostate cancer.[60] An increase towards the diagnosis of early stages and incidental adenocarcinomas recovered by TURP may indicate early detection rather than elevated risk.[60] Based on the previous discussion indicating the high prevalence of microscopic cancer with increased age, the increased rates of pathological examinations of prostatic tissues obtained by resection or biopsy in elderly men will no doubt be associated with increased "cancer detection" rates. This unestablished risk factor is anticipated in this country with the significant improvement of medical care and the increased number of both urologic surgeons trained to perform TURP and the increased number of elderly males undergoing TURP for symptomatic BPH.[37]

Vitamin D and ultraviolet rays. Data was presented to support the hypothesis that the exposure to ultraviolet (UV) rays and abundance of vitamin D may protect against clinical prostate cancer.[61] However, it is disappointing to know that our own studies have shown that the Saudi population is at a significant risk of vitamin D deficiency.[62] The traditional Arabic attire and head cover may play a role in diminished exposure to UV rays.[62] During the most sunny seasons exposure to UV rays was found to be minimum to avoid the extreme associated heat.[63] Vitamin D deficiency and lack of exposure to UV is an unestablished risk factor for developing prostate cancer that may be paradoxically playing a role against the low rate of prostate cancer seen in this sunny country.

Prostate-specific antigen screening programs. Screening based on PSA identifies some men with prostate cancer who have significantly increased proportion of organ-confined tumors compared with those detected through evaluation for an abnormal DRE alone.[42,64] A subsequent study reported that increased incidence of prostate cancer is likely a result of widespread use of PSA.[64] However, a survey conducted in the western region of KSA to examine the current practice in evaluating prostatic diseases revealed that 47% of the surveyed centres do not use PSA freely and that PSA was available to 29% only of the MOH hospitals in KSA.[35,36] Therefore, the risk of widespread use of PSA to increase prostate cancer detection is probably not present at this time at least in the majority of KSA. In other words, the low rates of prostate cancer detection are consistent with the current less use of PSA as a screening tool.

Preventive measures. Keeping aside the discussion of the investigational use of drugs such as Finastride as a prophylactic therapy for men at risk of developing prostate cancer, logic and practical measures include avoiding consanguineous marriages in families with cancer history, dietary modifications and close PSA monitoring of older men receiving prolonged androgen therapy. It has been shown that men of ethnic origin known to have low prostate cancer risk such as Asians living in Asia significantly increase their risk by living in a geographically high risk country such as the USA (**Table 1**).[1] Whether living in KSA at the present time constitutes a factor to reduce the risk for developing CaP remains to be seen.

In conclusion, carcinoma of the prostate occurs at a low frequency rates in KSA at the end of the year 2002. This should encourage us to keep the medical care given to the small number of patients encountered at the highest possible standards. We should recognize patients at risk, mainly aged male relatives of CaP patients and offer them screening. Screening of individuals descending from black African race could also be justified. However, it appears from the data presented in this review article that screening of the general aged male population in KSA does not seem to be justified at the present time.

Uniform reporting of the different aspects of the disease would be highly welcomed for disease monitoring. We will keep monitoring this disease and welcome any collaborative work in tracking newly diagnosed cases, their mode of presentation, staging, and methods of treatment, outcome and finally rates of survival. All this input will add to our knowledge and the search for the reason of this low incidence rate may lead us to find a way to keep the incidence as low as possible or even to find effective preventive measures.

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