

ORIGINAL RESEARCH

Five-year Survival Rate of Prostate Cancer in Iran: Results of the national cancer-registry system during 2010-2015

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Received: January 2020; Accepted: February 2020; Published online: May 2020

Abstract: **Background:** Prostate Cancer is recognized as the second cause of death due to cancers among men worldwide. Due to the lack of local evidence on the survival rate of patients with prostate cancer, this study aimed to estimate the 5-year survival rate of patients afflicted with this condition in Iran. **Materials and Methods:** This study made use of information on 9,772 prostate cancer cases who were registered in the National Cancer Registry during 2010-15. A telephone survey, with a response rate of 35%, was conducted to gather additional information such as death status, demographic characteristics, and clinical profile. Kaplan-Meier estimates was used to estimate five-year survival rates. **Results:** The overall five-year survival rate of prostate cancer was 82% (95% CI: 80-83%). Significantly higher five-year survival rates were observed among retired patients (rate: 94%,95%CI: 92-96), patients receiving a combination of radiotherapy and surgery (rate: 92%,95%CI: 89-94), and patients residing in rural areas (rate: 92%, 95%CI: 90-93). **Conclusion:** We found that various factors such as occupation, area of residence, and the type of medication, may influence on survival rate of prostate cancer. Careful evaluation and understanding of effective factors are required to adopt proper health policies and treatment options. Due to the importance of etiologic and epidemiological data, inclusion of such data into the national registry system for Prostate Cancer is strongly recommended.

Keywords: Survival analysis; Iran; Disease Registry; Prostate Cancer

Cite this article as: Aliakbari F, Ghanbari M A, Khayamzadeh M, Hajian M R, Allameh F, Ahadi M, Sadeghzadeh Z, Akbari M E, Solimani M, Nematollah Sh. Five-year Survival Rate of Prostate Cancer in Iran: Results of the national cancer-registry system during 2010-2015. Mens Health J. 2020; 4(1): e4.

1. Introduction

Nowadays, Prostate Cancer (PCa) is recognized as the most common non-skin cancer and the second cause of death due to cancers among men (1, 2). PCa accounts for nearly 12%

of all new cancer cases, and approximately 10% of all male cancers (3, 4). The estimated incidence rate of PCa varies among different geographic areas, with the highest in developed countries such as the United States (118.2 per 100,000 population) and the lowest in developing countries such as India (4.4 per 100,000 population) (5, 6). However, the observed difference is subject to bias due to the application of different early detection strategies, such as screening programs on Prostate-Specific Antigen (PSA), and varying degrees of accuracy in cancer registration system. On the other hand, potential well-known factors, such as diet, lifestyle, smoking habits, physical activity, ethnicity, and environmental exposure, can also partially explain the observed differ-

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ence in the occurrence of prostate cancer (3, 7-14). Overall, evidence suggests that the global incidence of prostate cancer is increasing (15, 16). Iran is a developing Middle Eastern country with low prevalence of PCa. Previous studies on Iranian population have shown that prostate cancer was ranked the sixth among all cancers and the third among male cancers. Similar to other parts of the world, incidence of PCa is on the rise in Iran. In fact, the age-standardized incidence rate has increased from 5.4 per 100,000 in 2003 to 12.6 per 100,000 in 2012. Considering this rising trend, it is expected that PCa will become a major public health concern in near future in Iran (17-21).

Since the 19th century, various treatments, including Androgen-ablation therapy, prostatectomy, radiation therapy, and chemotherapy, have been used. With the advances of these methods over the years, they have formed the basis of prostate cancer treatment. Once the diagnosis is confirmed, clinicians determine the treatment strategy based on clinical conditions, patient's preference, and possible side effects, to improve survival and prognosis (20, 22-24). With a wider access to Prostate-Specific Antigen (PSA) test, the number of patients diagnosed in the early stages of prostate cancer has increased. In saying that, due to the increasing trend in the incidence of such condition, it is regarded as a major health issue in different societies, including Iran (25, 26). Study of survival and related factors in patients with prostate cancer has a paramount importance as it helps create more valid evidence for health policymakers. This, in return, allows for more efficient treatments. Nevertheless, the current knowledge on the prognosis and survival of prostate cancer in Iran is limited and incomplete. This article used national cancer-registry data to provide valid information on survival and prognosis of prostate cancer among the Iranian male population.

2. Material and Method

In this cross-sectional study, data of patients with PCa was collected from the Office of National Cancer registry in the Ministry of Health and Medical Education (MOH&ME) for the period of 2010-2015.

An additional telephone survey was conducted by trained interviewers to collect data, including survival status, demographic characteristics, age of diagnosis, pathological findings, and clinical profile. According to the study protocol, three telephone calls within two consecutive weeks were considered as a sufficient attempt to collect the data. For the statistical analyses, the age at which the diagnosis took place was categorized into five groups, including less than 50, 50-59, 60-69, 70-79, and +80 years. Treatment types were categorized into surgery, radiotherapy, a combination of both, or none. Using survival analysis set up, Kaplan-Meier survival

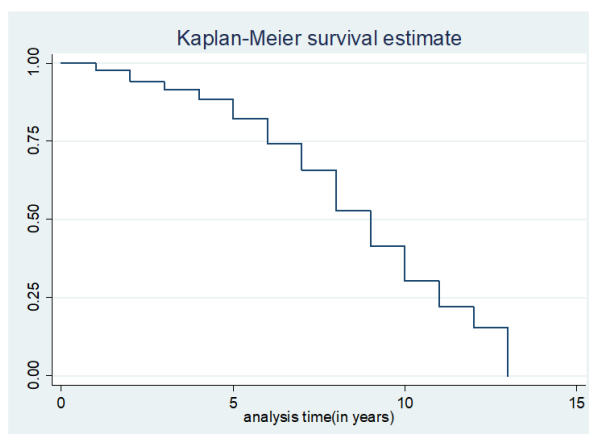


Figure 1: Kaplan-Meier estimates of survival in prostate cancer patients during 2010-15 in Iran.

rates were calculated according to demographic characteristics, treatment type, and resident area. All the analyses were done using STATA version 14 (StataCorp. 2015. Stata Statistical Software: Release 14. College Station, TX: StataCorp LP), and probability values (P-values) less than 0.05 were considered statistically significant.

3. Results

Of 27,469 registered cases of PCa during 2010-15, data on 9,772 patients was gathered through the telephone survey (overall response rate = 35%). The highest and lowest proportions of cases belonged to Tehran (20%) and Sistan-Balochestan (0.4%) provinces, respectively. Kaplan-Meier estimates showed that the overall five-year survival rate of PCa was 82% (95%CI: 80-83%).

The five-year survival rate according to occupation was 88% for farmers (95%CI: 85-91), 86% for government employees (95%CI:80-90), 94% for those retired (95%CI: 92-96), and 90% for patients with other occupations (95%CI: 89-92). As seen from the results, retired PCa patients had significantly higher survival compared to other categories (P-value:0.02).

The annual risk of death (per 1000 person-year at risk) was highest amongst government employees (rate:88.9, 95%CI: 75.7,104.4) and lowest for retired patients (rate:75.12, 95%CI:68.7, 82). The risk was also highest for patients who received no treatment (rate: 101.3, 95%CI:94.7, 108.4) and lowest for those who received surgery (rate: 73.3, 95%CI: 67.5, 79.7). Furthermore, the risk was higher for urban dwellers (rate: 76.6, 95%CI: 72.5,81) compared to those living in rural areas (rate: 85.1, 95%CI: 72.5,81). The risk of death was also highest in patients with elementary education level (mortality rate: 81.9, 95%CI: 76.5, 87.8) and lowest in patients with a bachelor's degree (mortality rate: 67.9, 95%CI: 51.9, 88.9). The annual risk of death was highest for patients who

Table 1: Five-Year survival rate of patients with prostate cancer according to general and clinical characteristics

Variable	N (%)	Number of failure	5-year survival (95%CI)	Mortality rate (95%CI)
Age at diagnosis (years)				
<50	242 (1.80)	4	0.7781 (0.635, 0.870)	93.02(67.10, 128.96)
50-59	1469 (10.91)	11	0.8156(0.769, 0.853)	91.78(80.65, 104.44)
60-69	3573 (26.53)	40	0.8134(0.784, 0.838)	92.09(84.76, 100.05)
70-79	4660 (34.61)	70	0.8119(0.787,0.833)	87.10(81.02, 93.63)
+80	3522 (26.15)	71	0.8461(0.820, 0.868)	81.39(74.96, 88.37)
Education				
Illiterate	1,598(24.56)	72	0.8887(0.866,0.907)	77.02(70.95, 83.61)
Elementary	2,421(37.21)	62	0.9330(0.917,0.945)	81.97(76.51, 87.82)
Below high-school diploma	565(8.68)	12	0.9181(0.871,0.948)	76.96(65.06, 91.05)
High-school diploma-associate degree	1,139(17.50)	22	0.8934(0.850,0.924)	79.56(68.77, 92.03)
Bachelors	539(8.28)	5	0.9111(0.830,0.954)	67.94(51.91, 88.94)
Masters or higher	245 (3.77)	5	0.8727(0.751,0.937)	72.96(52.13, 102.11)
Occupation				
Retired	2870 (43.9)	33	0.9466(0.928,0.960)	75.12(68.76, 82.07)
Farmer	935 (14.3)	41	0.8878(0.858, 0.911)	80.30(72.55, 88.87)
Government employee	419 (6.41)	17	0.8608(0.806,0.901)	88.94(75.70, 104.49)
Other	2310 (35.3)	87	0.9096(0.891,0.924)	79.35(73.96, 85.13)
Resident area				
Urban	5,238 (80.03)	144	0.9079(0.894,0.919)	85.19(78.16, 92.85)
Rural	1,307 (19.97)	35	0.9222(0.900,0.939)	76.68(72.57, 81.01)
Treatment type				
Surgery+ Radiotherapy	1384 (10.1)	33	0.921(0.895,0.941)	85.56(77.44, 94.52)
Surgery	2841(20.9)	60	0.912(0.892,0.929)	73.39(67.53, 79.77)
Radiotherapy	1128 (8.3)	36	0.913(0.885,0.935)	86.12(77.75, 95.38)
No treatment	8230 (60.6)	67	0.675(0.648,0.700)	101.36(94.70, 108.49)

were diagnosed earlier than the age of 50 (mortality rate: 93, 95%CI: 67.1-128.9) and lowest in patients who were diagnosed at the age of 80 or older (mortality rate: 81.4, 95%CI: 74.9, 88.3). The five-year survival rate according to the type of treatment was 92% for the combination of radiotherapy and surgery (95%CI: 89-94), 91% for radiotherapy (95%CI: 88-93), 91% for surgery (95%CI: 89-92), and 67% for no treatment (95%CI: 64-70). The survival rates of various types of treatment did not differ significantly except for those who received no treatment. (P-value<0.001).

The five-year survival rate in terms of the patients' area of residency showed that 90% of patients residing in urban setting (95%CI: 89-91) and 92% of the patients residing in rural setting (95%CI: 90-93) survived up to five years since diagnosis (P-value=0.006). The five-year survival rate according to the patients' level of education was 88% for illiterate patients (95%CI:86-90), 93% for those who only completed elementary education (95%CI:91-94), 91% for patients with education levels below high-school diploma (95%CI:87-94), 89% for patients with associate degrees (95%CI:85-92), 91% for patients with a bachelor's degree (95%CI:83-95), and 87% for patients with postgraduate and higher levels of academic education (95%CI:75-93). The log-rank tests showed no statistically significant difference between survival of various ed-

ucation groups (P-Value = 0.06). The five-year survival rate according to the age at which the diagnosis was carried out was 77% for below 50 (95%CI: 63-87), 81% for 50-59 (95%CI: 76-85), 81% for 60-69 (95%CI:78-83), 81% for 70-79 (95%CI: 78-83), and 84% for above 80 years (95%CI: 82-86). There was statistically significant difference between survival of various age categories (P-value=0.203).

4. Discussion

This study concentrated on the factors that influence the survival rate of prostate cancer, where receiving appropriate treatment is one of the key factors. According to our findings, there was no statistically significant difference between treatment options. However, untreated prostate cancer patients usually have more probability of death. There are also studies in line with our findings indicating the positive effects of treatment on recovery and survival from prostate cancer. Kelly et.al stated that fatality of prostate cancer has substantially decreased due to widespread treatment advances (27). Furthermore, a survey on frail elderly patients with hormone-refractory prostate cancer concluded that the treatment outcomes were similar (28).

In contrast, in a cohort study on hormonal therapy and radio-



therapy field size, patients with intermediate-risk and high-risk localized prostate cancers, neoadjuvant hormonal therapy plus whole pelvic radiotherapy improved progression-free survival compared with neoadjuvant hormonal therapy plus prostate only radiotherapy and whole pelvic radiotherapy plus adjuvant hormonal therapy at long-term follow-up (29).

Also, a population-based study on localized prostate cancer showed that the majority of patients with this condition underestimated life expectancy without treatment, while overestimated life expectancy with surgery or radiation. These expectations impacted their ability to make informed treatment decisions, and may have resulted in overtreatment (30). Employment status and patient's job have demonstrated significant influence on the survival rate in our study. Retired patients had the highest survival rate, while government employees had the lowest. Various studies and pieces of evidence also support our findings in suggesting that occupation is a considerable influence in the survival rate of prostate cancer (31-33). Although a higher mortality rate was observed in patients with lower levels of education, there was no statistically significant correlation between survival and education level. In saying that, studies suggest that patients with higher education level have significantly lower mortality rate (34, 35).

The mortality risk was higher for urban dwellers compared to those living in rural areas. A systematic review suggests that despite the presence of many variations in the evaluation of geographical disturbance and mortality rate, people in disadvantaged areas, and to a lesser extent more rural areas, face a greater prostate cancer burden (36). A statistically significant difference was observed in the survival rate of various age groups. In fact, the mortality rate was higher in patients with the diagnosis age of below 50. Some studies support our findings and declare that younger men who have lower grade cancer are more likely to be treated with prostatectomy, while younger men with high grade and locally advanced prostate cancer have a poor prognosis compared to elderlies (37). In contrast, another study suggests that elderly patients are more likely to have high-risk prostate cancer at diagnosis and are less likely to receive local therapy (38).

This is a retrospective study of this subject. Thereby, a number of key statistics could not be measured. There was no access to the staging of patients. Thus, this important factor could not be investigated. We also did not have access to a number of patients, and had instances where they did not respond to our communication efforts, such as phone calls. Considering the need for descriptive and epidemiological studies on the prevalence and prognostic factors of prostate cancer and its importance in health policymaking and decision making, we recommend that the Ministry of Health and health policymakers implement a detailed pa-

tient registration system. This can play an important role in the various stages of prevention and treatment.

5. Conclusion

There are different factors in the prognosis and survival of prostate cancer patients. Careful evaluation and thorough understanding of these factors can play an important role in how health policies and treatment choices are made. Regarding the necessity of etiologic, prognostic, and epidemiological studies, better access to the National Registry's data on prostate cancer can greatly contribute to our understanding of this condition.

6. Appendix

6.1. Acknowledgements

We wish to thank the Ministry of Health and Medical Education (MOH) of Iran for the provision of data and their sincere support. We would also like to thank the two research centers namely Men's Health and Reproductive Health Research Center and Cancer Research Center for their administrative and professional support throughout the study.

6.2. Author contribution

All the authors have shared the same workload and thereby are entitled to equal acknowledgement.

6.3. Funding/Support

None.

6.4. Conflict of interest

The authors declare no conflict of interest.

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