

The Incidence of Testicular Cancer in Iran from 1996 to 2017: A Systematic Review and Meta-analysis

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Abstract

Objective: Testicular cancer (TC), although it is one of the most unusual cancers, seems to be increasing. There is no accurate information on the incidence of this cancer in Iran. The present study is conducted to evaluate the incidence rates of TC in Iran. **Methods:** A systematic search was conducted on all published studies of TC incidence using Medline/PubMed, Scopus, Embase, Web of Science, Google Scholar and four Iranian databases (Scientific Information Database, MagIran, IranMedex and IranDoc) until June 2018. This systematic review was done according to the preferred reporting items for systematic reviews and meta-analyses. **Result:** The database searching yielded 132 potentially relevant studies. A total of 11 studies were included in the study. The results of the random-effects model were demonstrated that the age-standardised rate (ASR) of TC was 1.13, 95% confidence interval (0.97–1.29) among Iranian males. **Conclusion:** ASR for TC in Iran is lower than the world average; however, it has a higher incidence than other Asian countries.

Keywords: Incidence, Iran, systematic review, testicular neoplasms

INTRODUCTION

Testicular cancer (TC), although it is one of the most unusual cancers, seems to be increasing.^[1] Age-standardised rate (ASR) of TC is 1.5 in 100,000 worldwide.^[2] The incidence of this disease in developed countries was higher than in developing countries (5.2 per 100,000 vs. 0.7 per 100,000).^[3] The incidence of this cancer has increased in recent years in the United States and several other countries.^[4] The most common areas for this cancer are Western and Northern Europe (8.7 per 100,000 for Western Europe and 7.2 per 100,000 for Northern Europe). The lowest level of this cancer has been detected in Central Africa with ASR <0.2 per 100,000.^[2,3] Cancer does not have a high mortality rate, and according to the reported death rate, its ASR is around 0.3 per 100,000 worldwide.^[5] Known risk factors for TC are limited. Possible risk factors for this cancer include undescended testicle,^[6] familial history of TC and HIV infection.^[7-9] Undescended testicle is one of the main risk factors for TC.^[10] The condition occurs when testicles do not

move from inside the abdomen to the outside of the body in childhood. Another possible risk factor for TC is family history, so that cancer in the father or in the brother will increase the odds of developing TC.^[11-13] Other risk factors, such as HIV infection and lentil disease, are the subject of this cancer;^[14,15] however, further studies are needed. Most of the TCs occur between the ages of 20 and 34 years. The average age at detection of TC is 33 years but can be observed at any age, such as childhood or aging.^[16,17] Due to the current treatment of this disease, survival has been reported to be desirable. TC in Iran is higher than neighbouring areas. Crude rate in

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Iran is equal to 1.9 and ASR equal to 1.7.^[18] This cancer is one of the most common urological cancers, so that a study in Iran showed that 7% of urological cancers were associated with TC.^[19] Studies on the epidemiology of cancer in Iran are limited in general. According to reports, TC is not one of the major cancers in Iran.^[20] There is no complete and accurate information on the incidence of this cancer in Iran, and studies have revealed the incidence of this cancer in different regions. Precise information on the incidence of this cancer is necessary for planning. Therefore, this study was conducted to determine the ASR of TC in Iran through a systematic review and meta-analysis.

METHODS

The systematic review and meta-analysis were designed in 2018 and undertaken in accordance with the preferred reporting items for systematic reviews and meta-analyses guideline.^[21]

Search strategy of systematic reviews

A literature search of published studies was conducted using international databases such as Medline/PubMed, Scopus, Web of Science, Google Scholar and Embase for English papers and Iranian databases such as Scientific Information Database (www.sid.ir), MagIran (www.magiran.com), IranMedex (www.barakatks.com) and IranDoc (www.irandoc.ac.ir), for Persian papers.

The Medical Subject Headings keywords included ‘Testicular Neoplasms’, ‘T Testicular cancer’, ‘Testicular Tumour’, ‘Cancer of T Testicular’, ‘Neoplasms of Thyroid’, ‘Testis Cancer’, ‘Testis Neoplasm’, ‘Testis Tumour’, ‘Epidemiology’, ‘Incidence’ and ‘Iran’. The obtained papers were imported into an EndNote X7 (Thomson Reuters, Carlsbad, CA, USA)

library, and the duplicates were removed. No language and time limitations were considered.

Inclusion and exclusion criteria

All studies with results of ASR of TC and reports of Iranian populations were included in this review. Furthermore, studies with following criteria were not considered in this review; studies which reported prevalence rate, studies with inadequate sample size and other types of articles (all type of conference abstracts, poster papers, letters, comments and editorial).

Quality assessment

To assess the quality of the articles, a checklist prepared by The Joanna Briggs Institute was used.^[22] The purpose of this appraisal is to assess the methodological quality of a study and to determine the extent to which a study has addressed the possibility of bias in its design, conduct and analysis. All papers were evaluated on the basis of data relevance and methodological rigor. The results of quality assessment are presented in Table 1.

Risk of bias across studies

Random-effects model was used for minimising risk of bias across the studies.^[23,24]

Statistical analysis

STATA version 12.0 (Stata Corp LP, College Station, TX, USA) software was used to perform all analysis. Statistical heterogeneity between the results of obtained studies was assessed using Cochran’s *Q* statistic (with a significance level of $P \leq 0.1$) combined with I^2 statistic (with a significance level of $>50\%$). The meta-analysis was conducted with a random-effects model (with inverse variance method) in the studies with significant heterogeneity ($P \leq 0.1$ and $I^2 \geq 50\%$).

Table 1: Joanna Briggs Institute critical appraisal checklist applied for included studies

Author name/year	Sample was representative?	Participants appropriately recruited?	Sample size was adequate?	Study participants and the setting described?	Data analysis conducted	Objective, standard criteria, reliably used?	Appropriate statistical analysis used	Confounding factors/subgroups/differences identified and accounted?	Subpopulations identified using objective criteria
Sadjadi, 2003	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes
Babaei, 2005	No	Yes	Yes	Unclear	Yes	Yes	Yes	Yes	No
Sadjadi, 2007	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No
Mehrabani, 2008	Yes	No	No	Unclear	Yes	Yes	No	Yes	Yes
Somi, 2008	Yes	Yes	Yes	Unclear	Yes	Yes	No	No	Yes
Babaei, 2009	Yes	Yes	Yes	Yes	Unclear	Yes	Yes	Yes	Yes
Mousavi, 2009	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	No
Masoompour, 2011	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Fateh, 2013	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Unclear
Roshandel, 2014	No	Yes	Yes	Yes	Unclear	Yes	Yes	Yes	Yes
Almasi, 2016	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes

RESULTS

Description of literature search

The database, grey literature searches and hand searching yielded 132 potentially relevant studies. In total, 81 unique studies were reviewed and 37 studies were entered into the second stage of evaluation. Overall, our review included 11 unique studies. Study retrieval and selection has been outlined in Figure 1. Some studies were excluded from the review due to not being relevant to the topic ($n = 46$), incorrect study population ($n = 14$), inadequate data ($n = 7$) and duplicate study ($n = 3$). The flowchart of the included studies in this review has been shown in Figure 1.

Description of the included studies

The included studies were published from 2003 to 2016. Based on geographical locations, three studies were conducted in all states of Iran,^[20,25,26] two in Fars Province,^[27,28] two in Ardabil Province,^[29,30] one in East Azerbaijan Province,^[31] one in Semnan Province,^[32] one in Kerman Province^[33] and one in Shahroud city.^[34] All the studies have reported ASRs. The main characteristics of the selected studies are presented in Table 2.

The results of individual studies

The highest ASR was reported from Shahroud city between 2000 and 2010 (2.18 per 100,000).^[34] The lowest ASR was reported from Fars Province between 1998 and 2002 (0.4 per 100,000).^[28]

The results of meta-analysis

The results of the random-effects model were demonstrated that the ASR of TC was 1.13, 95% confidence interval (0.97–1.29) among Iranian males. In addition, the results of Cochran's test showed the heterogeneity of the studies ($Q = 610.5$, $df = 12$, $I^2 = 98\%$, $P < 0.001$). The forest plots of the random-effects meta-analysis for ASR of TC in Iran are presented in Figure 2.

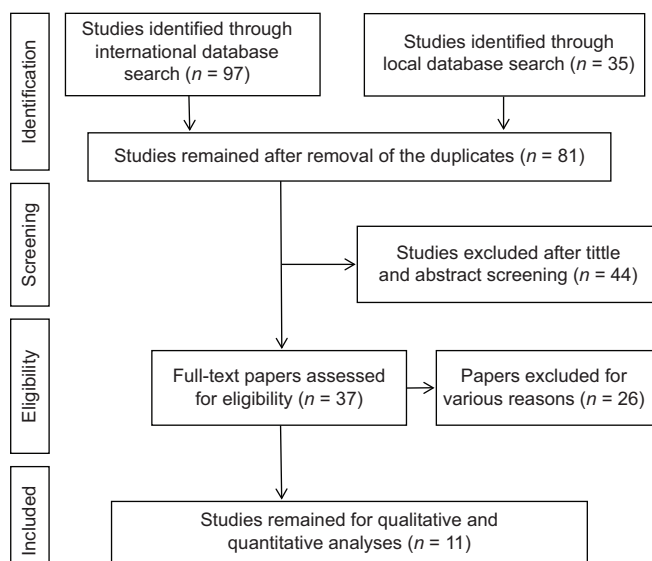


Figure 1: Flowchart of the included eligible studies in the systematic review.

Publication bias

Publication bias was assessed using Egger's tests.^[35] Results of Egger's tests showed lack of publication bias ($P = 0.165$).

DISCUSSION

Cancer is the third case of death in Iranian population.^[36] Little studies have been done on the epidemiology of cancer in developing countries such as Iran.^[37-42] Significant differences have been observed between the incidence of this cancer in developed and developing regions.^[43] This difference could be due to the exposure of people with potential risk factors or more accurate reporting in developed regions.^[9,44,45] The result of this study showed that ASR of TC in Iranian male has a low global average (1.13 per 100,000). Compared to other parts of Asia, Iran has a relatively high incidence.^[18] The highest incidence in Asia is related to Western Asia (ASR of 1.7 per 100,000), while in the East Asia region (0.5 per 100,000), it has a low incidence.^[18] In the neighbouring countries of Iran, Turkey has a relatively ASR (3.2 per 100,000).^[46] This difference can be due to environmental contexts, familial history, diagnostic methods and lifestyle.^[45,47] In a study that examined the role of the social development index and TC in Asia, there was a positive and significant correlation between this index and the ASR of TC in Asian countries ($r = 0.298$, $P = 0.009$).^[18]

The results of our study showed that the highest ASR of TC in Iranian males was in Shahroud city (2.18 in 100,000). The high incidence rate in this province can be attributed to the demographic characteristics of people living in this area, lifestyle, diet, genetics, exposure to more likely risk factors and more accurate reporting of TC cases.^[48,49] According to the results of our study, the lowest rate of ASR in TC was in Fars Province (0.4 per 100,000). One of the possible reasons for this issue can be low reporting and more cases of other cancers in the area. The findings in this province in recent years also confirm this finding.^[50,51] According to the studies conducted

Table 2: Basic characteristics of the studies included in the review

Order	Author, year	Time period	Location	ASR
1	Sadjadi, 2003	1996-1999	Ardabil	0.7
2	Babaei, 2005	1996-2000	Semnan	0.58
3	Sadjadi, 2007	1996-2000	Kerman	0.7
4	Somi, 2008	2006-2007	East Azerbaijan	1.94
5	Mehrabani, 2008	1990-2005	Fars	0.53
6	Babaei, 2009	2000-2004	Ardabil	1.1
7	Mousavi, 2009	2003-2004	Iran	1.05
		2004-2005		1.37
		2005-2006		1.44
8	Masoompour 2011	1998-2002	Fars	0.4
9	Fateh, 2013	2000-2010	Shahroud	2.18
10	Roshandel, 2014	2012	Iran	1.7
11	Almasi, 2016	2012	Iran	1.7

ASR: Alkali-Silica reaction

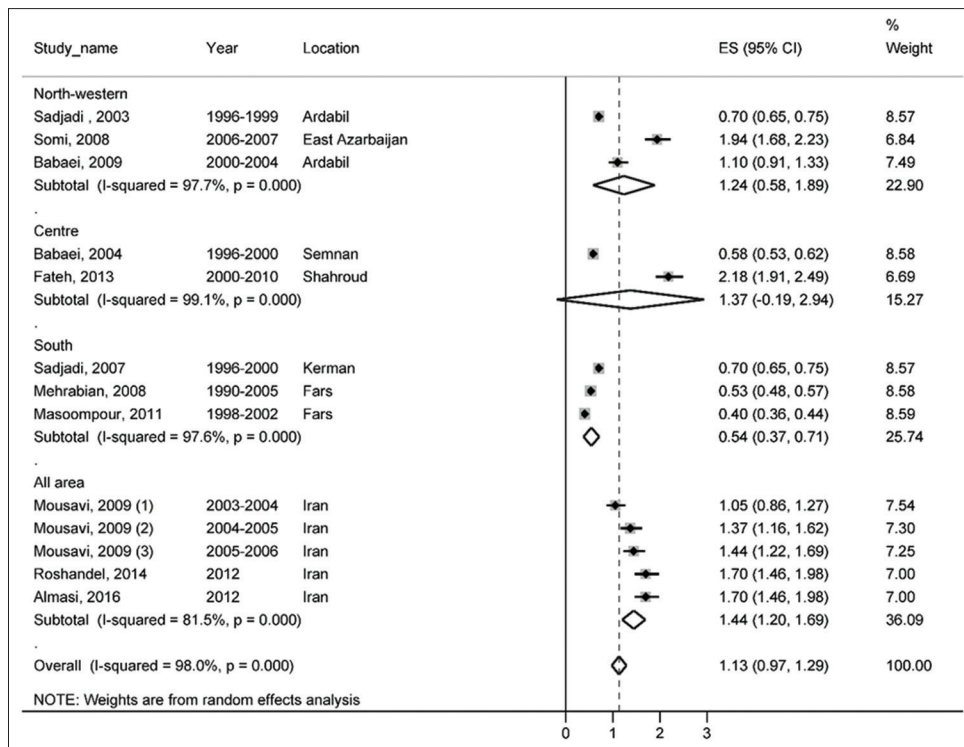


Figure 2: Forest plot of the random-effects meta-analysis for age-standardised rate of testicular cancer in males in the Iran.

in Fars Province, TC has been found to be <0.5 per 100,000 in all studies.^[52]

CONCLUSION

Based on our findings, ASR for TC in Iran is lower than the world average; however, it has a higher incidence than other Asian countries.

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Conflicts of interest

There are no conflicts of interest.

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