The association between prostatitis and prostate cancer. Systematic review and meta-analysis

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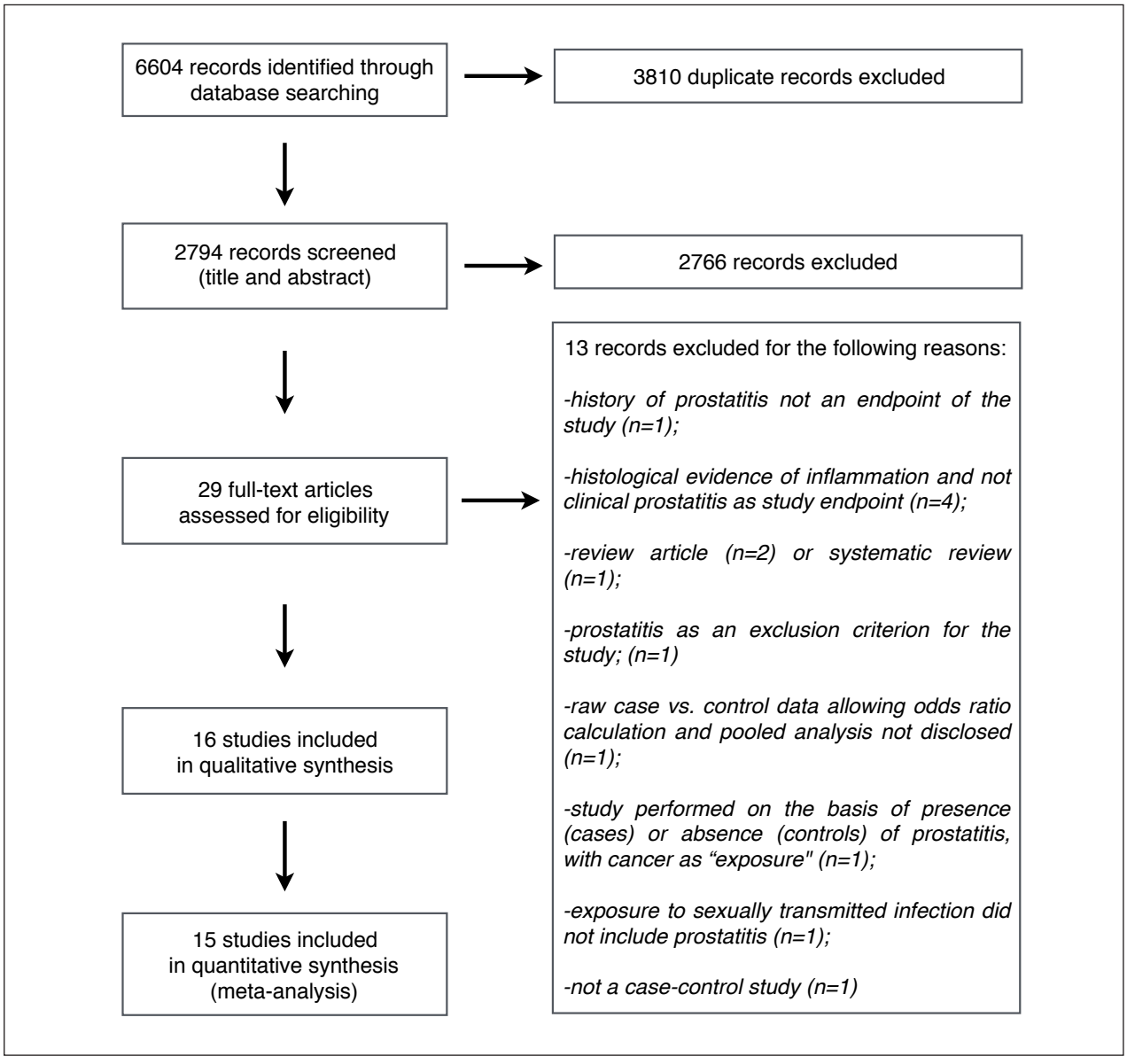
Figure 1.



No conflict of interest declared.

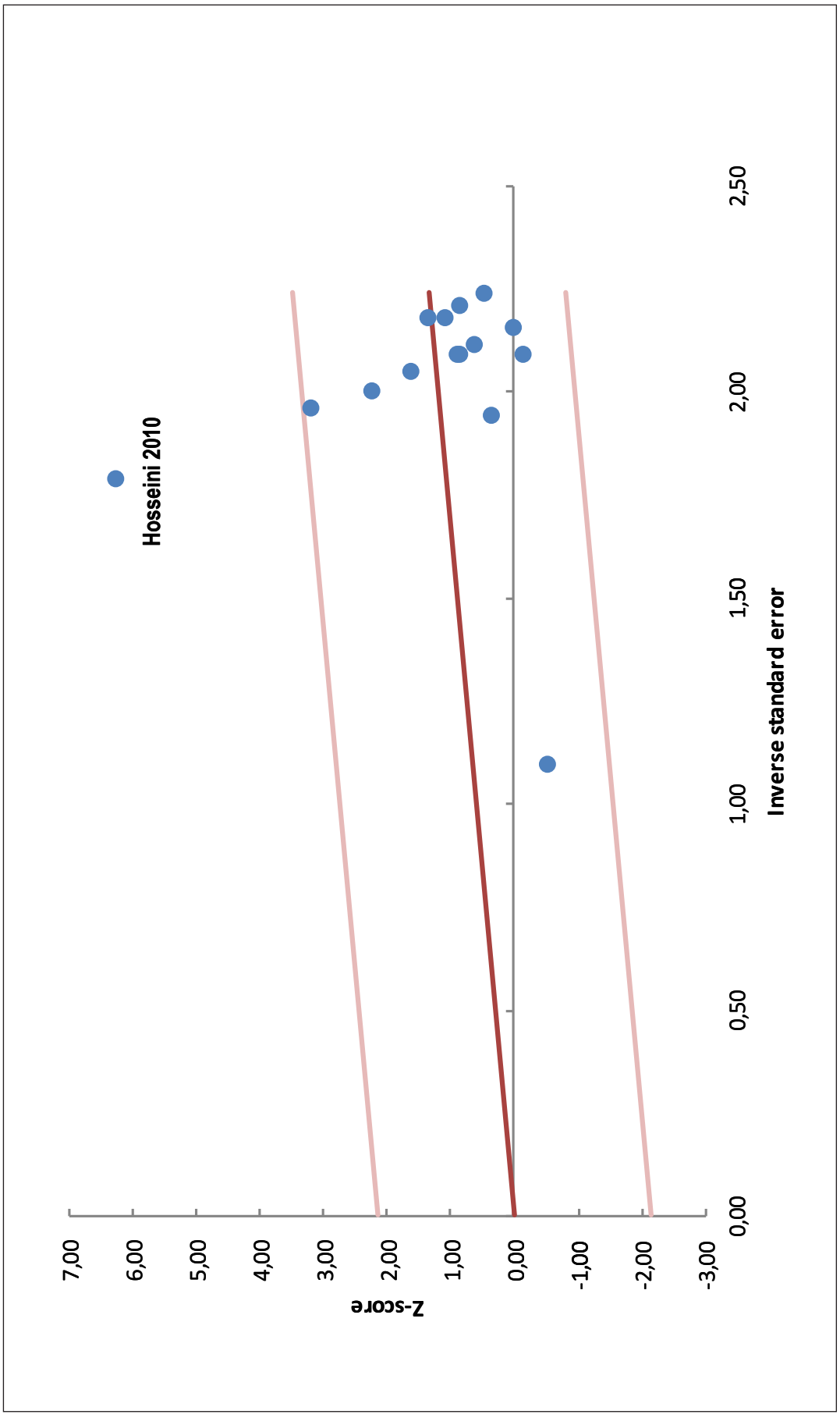

Hosseini 2010
Z-score
7,00
6,00
5,00
4,00
3,00
2,00
1,00
0,00
-1,00
-2,00
-3,00
Inverse standard error
0,00
0,50
1,00
1,50
2,00
2,50

Figure 2.

Table 1.
Patient characteristics and study data.

STUDY ID (first author, year, [reference])	LOCATION	STUDY DESIGN	AGE	MAIN COHORT				TOTAL CASES	TOTAL CONTROLS	TOTAL POPULATION	NOTABLE STUDY FEATURES	NOTE
				NONEXPOSED CASES	EXPOSED CASES	NONEXPOSED CONTROLS	EXPOSED CONTROLS					
Boehm 2016, [18]	Canada	Case-control	Cases, 64; controls, 65 (mean)	1661	223	1831	134	1884	1965	3849	//	//
Chao 2010, [21]; Cheng 2010, [20]	USA	Case-control	Cases, 61.5; controls, 58.1 (mean)	1420	139	70596	4788	1559	75384	76943	//	Both reports describe data from a single study. General population data extracted from Chao 2010; African-American subgroup data extracted from Cheng 2010. Data were computed from percentages presented in published article
Hosseini 2009, [20]	Iran	Case-control	Not disclosed	21	116	117	20	137	137	274	//	Extreme outlier odds ratio
Huang 2008, [23]	USA	Patient history report from sexual-transmitted infection study	Not disclosed	790	78	1194	89	868	1283	2151	//	Data were computed from percentages presented in published article
Nair-Shalliker 2016, [16]	Australia	Case-control	Cases, 65; controls 59 (median)	1083	97	837	25	1180	862	2042	//	//
Patel 2005, [27]	USA	Case-control	Same age range for cases and controls (50-74)	583	86	558	38	669	596	1265	Cases diagnosed between 1997 and 1998; 47% of population was African-American	//
Pelucchi 2006, [26]	Italy	Case-control	Cases, 67; controls, 61 (median)	278	2	681	8	280	689	969	Data collected between 1985 and 1992 (previous definitions of prostatitis), and analyzed in 2006	//
Roberts 2004, [29]	USA	Case-control	Same median age and age range for cases (70.2; 63.8-76.1) and controls (70.1; 63.6-76.8)	384	25	761	42	409	803	1212	Cancer diagnosed between 1980 and 1996; data analyzed in 2004, based on post-1999 definition of prostatitis and CPCPPS	Acute prostatitis cases were excluded; chronic bacterial or abacterial prostatitis (single or multiple episodes) included in the present meta-analysis. It is unknown whetherDid "multiple episodes" cohort included acute prostatitis cases.
Rosenblatt 2001, [30]	USA	Case-control	Same age range for cases and controls (40-64)	666	87	646	57	753	703	1456	Cancer diagnosed between 1993 and 1996; data analyzed in 2001	Patients diagnosed either before or after 3 years from reference date were included in computations
Rothman 2004, [28]	USA	Case-control	Age-matched; age range of cases and controls: 40-64	660	90	644	58	750	702	1452	Data collected between 1993 and 1996 (older definitions of prostatitis), and analyzed in 2004	//

Rybicki 2016, [17]	USA	Case-control	Not disclosed	502	72	497	77	574	574	1148	Cohorts contain matched numbers of acute prostatitis cases	Acute prostatitis cases were excluded from the present meta-analysis
Sarma 2006, [25]	USA	Case-control	Age distributions provided	95	34	659	47	129	706	835	Performed exclusively on African-American subjects	Outlier odds ratio
Sutcliffe 2006, [24]	USA	Case-control	Age range: 40 to 75 years	1809	421	270480	51543	2230	322023	324253	Data collected between 1986 and 1992 (older definitions of prostatitis), and analyzed in 2006	//
Weinmann 2010, [19]	USA	Case-control	Only age range at death of cases disclosed (45-84)	649	119	784	145	768	929	1697	Only lethal prostate cancer cases included in the study; nonlethal cases might have been included in the control cohort	//
Wright 2012, [31]	USA	Case-control study investigating the link between PCa and circumcision	Six different age strata provided	1535	217	1513	132	1752	1645	3397	Data from two separate studies were merged together, including patients diagnosed with cancer between 1993 and 1996 (study 1), and between 2002 and 2005 (study 2)	A study investigating the association between PCa and circumcision. Data on history of prostatitis extracted from patient baseline clinical characteristics.

Table 2.
Newcastle-Ottawa scale and risk of bias assessment.

Patel 2005, [27]	Cancer registry, no independent validation	* Randomized selection of cases	* Community controls	Not provided; 6.7% of controls had a history of prostate cancer	** Age and ethnicity matched; adjusted for age, ethnicity, family history of PCa in 1st degree relatives, education level	Patient self-report (interview)	* Yes	20% cases; 27.3% controls	5*, poor	High (higher rates of sexually-transmitted diseases (STD) in the case cohort might imply more intensive medical uro-genital follow-up and higher indolent PCa detection rates)
Pelucchi 2006, [26]	* Histologically confirmed PCa within the preceding year	Cases with short survival times (advanced metastatic spread) may be underrepresented	Hospital controls	Not provided	* Multiple logistic regression adjustments included age, study center	- Patient self-report (questionnaire)	* Yes	* "Fewer than 3% of patients and controls refused to be interviewed"	4*, poor	Unknown (higher percentages of control subjects had STD of any kind)
Roberts 2004, [29]	Record linkage; data extracted from cancer registry, with no independent validation	Random sampling	* Non-hospitalized controls constituted of former patients registered in Mayo Clinic databases	Not provided	** Year of birth, duration of medical record and county residency matched; adjusted for age and number of episodes of prostatitis	* Medical records	* Yes	Unclear	5*, poor	Low (potential influence of PCa detection bias minimized by analyzing strata of cancer and prostatitis diagnoses performed before and after initiation of PSA screening [year 1987])
Rosenblatt 2001, [30]	Data extracted from cancer registry, with no independent validation	Cases with short survival times (advanced metastatic spread) may be underrepresented	* Community controls	Not provided	* Age-matched; adjusted for age, ethnicity, family history of PCa and number of pSA tests within 5 years before the reference date	Patient self-report (interview)	* Yes	* Cases, 17.9; controls, 24.2	4*, poor	High (compared to controls, higher proportions of cases were African-American, had family history of PCa, a history of BPH, more frequent DRE and PSA tests)
Rothman 2004, [28]	* Ascertained on city cancer registry, in the frame of NCI surveillance program, histologically confirmed and staged cases	Cases with short survival times (advanced metastatic spread) may be underrepresented	* Randomly selected community controls	Not provided	* Age and location matched; adjusted for age, ethnicity, family history of PCa in 1st degree relatives, education level	Patient self-report (interview)	* Yes	* Cases, 17.9; controls, 24.2	5*, fair	High (DRE examination significantly more prevalent in exposed population; might have increased PCa detection rate)
Rybicki 2016, [17]	Unclear	Unclear	Both cases and controls were selected from a cohort of men with benign prostate specimen	* No evidence of malignancy	** Matched for age, race and type of specimen	* Medical records	* Yes	* Same rate for both groups	6*, poor	High (more intensive prostatitis follow-up might increase indolent PCa detection rate in cases)

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Rosenblatt 2001, [30]	Data extracted from cancer registry, with no independent validation	Cases with short survival times (advanced metastatic spread) may be underrepresented	* Community controls	Not provided	* Age-matched; adjusted for age, ethnicity, family history of PCa and number of pSA tests within 5 years before the reference date	Patient self-report (interview)	* Yes	* Cases, 17.9; controls, 24.2	4*, poor	High (compared to controls, higher proportions of cases were African-American, had family history of PCa, a history of BPH, more frequent DRE and PSA tests)
Rothman 2004, [28]	* Ascertained on city cancer registry, in the frame of NCI surveillance program, histologically confirmed and staged cases	Cases with short survival times (advanced metastatic spread) may be underrepresented	* Randomly selected community controls	Not provided	* Age and location matched; adjusted for age, ethnicity, family history of PCa in 1st degree relatives, education level	Patient self-report (interview)	* Yes	* Cases, 17.9; controls, 24.2	5*, fair	High (DRE examination significantly more prevalent in exposed population; might have increased PCa detection rate)
Rybicki 2016, [17]	Unclear	Unclear	Both cases and controls were selected from a cohort of men with benign prostate specimen	* No evidence of malignancy	** Matched for age, race and type of specimen	* Medical records	* Yes	* Same rate for both groups	6*, poor	High (more intensive prostatitis follow-up might increase indolent PCa detection rate in cases)

Sarma 2006, [25]	Independent validation for 27/129; cancer registry for remaining cases	Doubtful due to high non-response rate in cases; moreover, authors state that cases with short survival times (advanced metastatic spread) may be underrepresented	⁎ Community controls	⁎ No history of PCa, confirmed by clinical tests (PSA, DRE, ultrasound)	⁎ Adjusted for age, income, history of PSA and DRE examination, smoking habit, family history of PCa, alcohol consumption, income;	Patient self-report (interview); interview not blinded to case/ control status	⁎ Yes	48,6 % in cases; ~13,75 % in controls	4⁎, poor	High ("A significantly greater proportion of cases reported having undergone DRE (p 0.0005) or PSA testing (p 0.0008) in the previous 5 years")
Sutcliffe 2006, [24]	Patient self-report (questionnaire), confirmed in about 90% of cases by medical records or pathology report	Cases with short survival times (advanced metastatic spread) may be underrepresented	⁎ Community controls	No reported history of PCa	⁎ Adjusted for age, ethnicity, family history of PCa, body mass index, energy intake, tomato sauce/red meat/fish/ fructose/calcium/ vitaminE/zinc intake, vasectomy, diabetes	Patient self-report (questionnaire)	⁎ Yes	⁎ Minor (6%) non-response rate to follow-up assessments	4⁎, poor	High (more intensive prostatitis follow-up might increase indolent PCa detection rate in cases)
Weinmann 2010, [19]	⁎ Medical records	Only lethal PCa cases included	⁎ Community controls	Controls might have been patients diagnosed with non-lethal prostate cancer or any other history of cancer	⁎⁎ Age-matched, health plan-matched, ethnicity-matched; adjusted for age, ethnicity, health plan, history of PCa screening	⁎ Health care plan medical records	⁎ Yes	Unknown	6⁎, fair	High (a higher percentage of cases had confounding prostatic comorbidities/ treatments, e.g. BPH, transurethral resection)
Wright 2012, [31]	Cancer registry	Cases with short survival times (advanced metastatic spread) may be underrepresented, as 66% of cases had less aggressive disease	⁎ Community controls	⁎ No history of PCa	⁎ Age-matched by 5-year age groups	Patient self-report (interview)	⁎ Yes	Unknown	5⁎, poor	High (a greater proportion of cases had PSA testing)