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The Analysis Study of Association of Sedentary Lifestyle and Prostate Specific Antigen : A Comprehensive Systematic Review

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ABSTRACT

Background: Prostate cancer (PC) is the fifth most common cancer in the world, being the second most frequent among men, behind only non-melanoma skin cancer. Its incidence has been higher in developed countries compared to less developed countries, being more common in men over 50 with the risk increasing with advancing age, with approximately 75% of cases in elderly people over 80 years. The main methods of screening for PC are digital rectal examination, sextant prostate biopsy and prostate-specific antigen (PSA). Its levels can be influenced by prostatic changes and non-malignant changes (age, use of drugs, inflammation of the prostate, race/ethnicity, weight, body mass index (BMI), obesity and diabetes). **The aim:** The aim of this study to show about association of sedentary lifestyle and prostate specific antigen. **Methods:** By the Preferred Reporting Items for Systematic Review and Meta-Analysis (PRISMA) 2020, this study was able to show that it met all of the requirements. This search approach, publications that came out between 2014 and 2024 were taken into account. Several different online reference sources, like Pubmed, SagePub, and Sciencedirect were used to do this. It was decided not to take into account review pieces, works that had already been published, or works that were only half done. **Result:** Eight publications were found to be directly related to our ongoing systematic examination after a rigorous three-level screening approach. Subsequently, a comprehensive analysis of the complete text was conducted, and additional scrutiny was given to these articles. **Conclusion:** Sedentary behavior may be a distinct risk factor, independent of physical activity, for PSA is similar to other studies showing that prolonged sedentary behavior increases an individual's risk for various chronic diseases, including prostate cancer.

Keyword: Prostat cancer, prostate-specific antigen (PSA), sedentary life, risk factor.

INTRODUCTION

The epidemiologic evidence base regarding the etiologic role for physical activity, sedentary behavior, and obesity in cancer incidence has been evolving rapidly over the past three decades, and there is now convincing evidence for these associations. Research has also been conducted to examine the underlying biologic mechanisms that could explain how these risk factors are associated with increased cancer risk. Estimates of the population burden associated with modifiable risk factors and cancer incidence have demonstrated that 30–40% of cancers are potentially preventable and that some of the major risk factors associated with cancer include physical inactivity, sedentary behavior, and obesity. Furthermore, there is a considerable economic cost that could be avoided by decreasing the prevalence of these modifiable risk factors. At present, the global prevalence of inactivity as defined by low levels of physical activity, sedentary behavior, and obesity is high.[1,2]

A recent cross-sectional study that analyzed sedentary behavior and its effects in 1 690 participants showed that lower levels of physical activity, such as sedentary lifestyle habits, were significantly associated with increased prostate-specific antigen (PSA) levels, and, because the presence of BPH could affect PSA levels, it can be inferred that low levels of physical activity may in some way increase the risk of developing BPH.[3]

Prostate cancer is the second most common cancer in men worldwide and has a high survival rate. Having been diagnosed with prostate cancer, however, is associated with poorer mental health (e.g., increased anxiety, depressive symptoms, and psychological distress), functional limitations (e.g., urinary, bowel, and sexual dysfunction), low levels of moderate-to-vigorous physical activity (MVPA), and reduced quality of life. Engaging in physical activity can ameliorate many of the adverse effects of prostate cancer and its treatments, with systematic review findings strongest for the positive effect of physical activity on aerobic endurance, muscular endurance, and quality of life in this population.[4–6]

Another important consideration for these results is the use of different BMI values in Asian populations to define obesity than in Western populations. A lower cut-off BMI value of 27.5 is commonly used in Asian populations compared to the more common cut-off of 30. This is because adverse effects due to obesity are considered to occur at lower

BMI in Asian populations, but this issue remains controversial. In addition, this study did not control for ethnicities, lifestyle, or functional sex hormone levels, which may play a role in prostate cancer development and detection, potentially altering PSA levels.[7]

Patients with locally advanced PCa, in whom vigorous physical activity and absence of tobacco use was documented, had longer and more stable telomeres. Besides, they had a reduction in prostate-specific antigen (PSA) levels compared to sedentary patients. Increased expression of vasoactive intestinal peptide (VIP), which promotes angiogenesis, is related to rapid disease progression in patients with resistance to hormone therapy.[8,9]

METHODS

Protocol

By following the rules provided by Preferred Reporting Items for Systematic Review and Meta-Analysis (PRISMA) 2020, the author of this study made certain that it was up to par with the requirements. This is done to ensure that the conclusions drawn from the inquiry are accurate.

Criteria for Eligibility

For the purpose of this literature review, we compare and contrast association of sedentary lifestyle and prostate specific antigen. It is possible to accomplish this by researching of association of sedentary lifestyle and prostate specific antigen. As the primary purpose of this piece of writing, demonstrating the relevance of the difficulties that have been identified will take place throughout its entirety.

In order for researchers to take part in the study, it was necessary for them to fulfil the following requirements: 1) The paper needs to be written in English, and it needs to determine about association of sedentary lifestyle and prostate specific antigen. In order for the manuscript to be considered for publication, it needs to meet both of these requirements. 2) The studied papers include several that were published after 2014, but before the time period that this systematic review deems to be relevant. Examples of studies that are not permitted include editorials, submissions that do not have a DOI,

review articles that have already been published, and entries that are essentially identical to journal papers that have already been published.

Search Strategy

We used " association of sedentary lifestyle and prostate specific antigen." as keywords. The search for studies to be included in the systematic review was carried out using the PubMed, SagePub, and Sciencedirect databases.

Table 1. Search Strategy

Database	**Search Strategy**	***Hits***
Pubmed	*((*"Prostate specific antigen*"[MeSH Subheading] OR "*Detection*"[All Fields] OR "*Diagnosed*" [All Fields]) AND ("*Diagnostic*"[All Fields] OR "* Prostate cancer*"[All Fields]) AND ("*Risk factor*"[All Fields]) OR ("*Sedentary lifestyle*" [All Fields]))*	79
Science Direct	*((*"Prostate specific antigen*"[MeSH Subheading] OR "*Detection*"[All Fields] OR "*Diagnosed*" [All Fields]) AND ("*Diagnostic*"[All Fields] OR "* Prostate cancer*"[All Fields]) AND ("*Risk factor*"[All Fields]) OR ("*Sedentary lifestyle*" [All Fields]))*	942
Sagepub	*((*"Prostate specific antigen*"[MeSH Subheading] OR "*Detection*"[All Fields] OR "*Diagnosed*" [All Fields]) AND ("*Diagnostic*"[All Fields] OR "* Prostate cancer*"[All Fields]) AND ("*Risk factor*"[All Fields]) OR ("*Sedentary lifestyle*" [All Fields]))*	1170

Data retrieval

After reading the abstract and the title of each study, the writers performed an examination to determine whether or not the study satisfied the inclusion criteria. The writers then decided which previous research they wanted to utilise as sources for their article and selected those studies. After looking at a number of different research, which all seemed to point to the same trend, this conclusion was drawn. All submissions need to be written in English and cannot have been seen anywhere else.

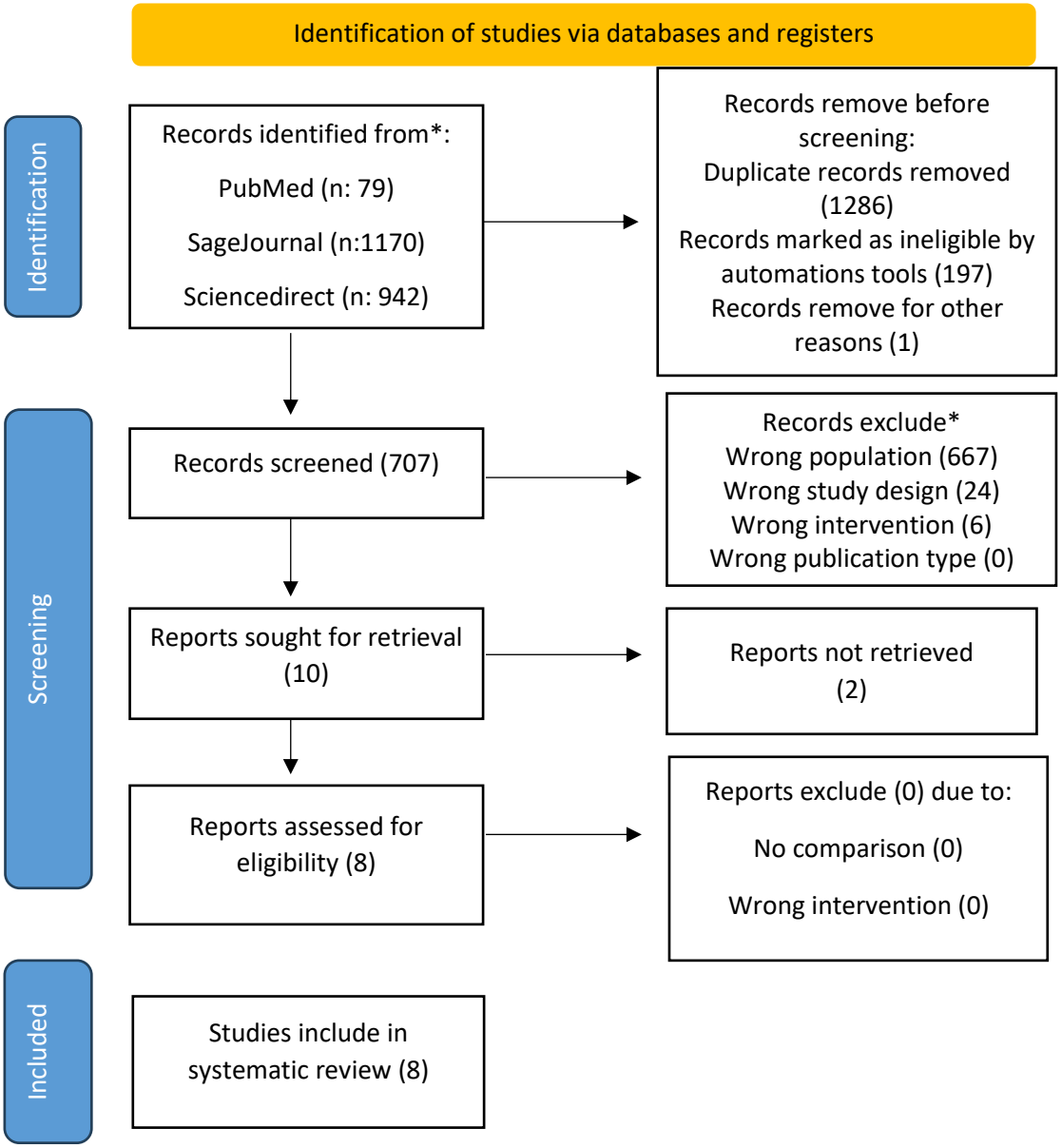

Figure 1. Article search flowchart

Only those papers that were able to satisfy all of the inclusion criteria were taken into consideration for the systematic review. This reduces the number of results to only those that are pertinent to the search. We do not take into consideration the conclusions

of any study that does not satisfy our requirements. After this, the findings of the research will be analysed in great detail. The following pieces of information were uncovered as a result of the inquiry that was carried out for the purpose of this study: names, authors, publication dates, location, study activities, and parameters.

Quality Assessment and Data Synthesis

Each author did their own study on the research that was included in the publication's title and abstract before making a decision about which publications to explore further. The next step will be to evaluate all of the articles that are suitable for inclusion in the review because they match the criteria set forth for that purpose in the review. After that, we'll determine which articles to include in the review depending on the findings that we've uncovered. This criteria is utilised in the process of selecting papers for further assessment. in order to simplify the process as much as feasible when selecting papers to evaluate. Which earlier investigations were carried out, and what elements of those studies made it appropriate to include them in the review, are being discussed here.

Table 2. Critical appraisal of Study

Parameters	(Galvao,LL et al., 2020)	(Fassier, P et al., 2016)	(Lopriinzi, PD & Kohli, M., 2014)	(Nunzio, CD et al., 2023)	(Hwang, T et al., 2023)	(Kim, SH et al., 2014)	(Cho, S et al., 2019)	(Lynch, BM et al., 2014)
1. Bias related to temporal precedence Is it clear in the study what is the "cause" and what is the "effect" (ie, there is no confusion about which variable comes first)?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
2. Bias related to selection and allocation Was there a control group?	No.	No.	No.	No.	No.	No.	No.	No.
3. Bias related to confounding factors Were participants included in any comparisons similar?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
4. Bias related to								

administration of intervention/exposure								
Were the participants included in any comparisons receiving similar treatment/care, other than the exposure or intervention of interest?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
5. Bias related to assessment, detection, and measurement of the outcome								
Were there multiple measurements of the outcome, both pre and post the intervention/exposure?	No.	Yes	No.	No.	No.	No.	No.	No.
Were the outcomes of participants included in any comparisons measured in the same way?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Were outcomes measured in a reliable way?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
6. Bias related to participant retention								
Was follow-up complete and, if not, were differences between groups in terms of their follow-up adequately described and analyzed?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
7. Statistical conclusion validity								
Was appropriate statistical analysis used?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

RESULT

Using reputable resources like Science Direct, PubMed, and SagePub, our research team first gathered 2191 publications. A thorough three-level screening strategy was used to identify only eight papers as directly relevant to our ongoing systematic evaluation. Next, a thorough study of the entire text and further examination of these articles were

selected. Table 1 compiles the literature that was analyzed for this analysis in order to make it easier to view.

Table 1. The litelature include in this study

Author	Origin	Method	Sample	Result
Galvao,LL et al., 2020[10]	Brazil	We performed a cross-sectional study with 96 elderly men. A high level of PSA was defined by >4.0 ng/mL. In order to identify sociodemographic, health, functional and behavioral variables, which may be associated with high levels of PSA, we carried out a multivariate analysis using Poisson regression.	96	The prevalence of high levels of PSA was 21.9% (*n* = 21). High levels of PSA was associated with years of study, race/ethnicity and family arrangement, health perception, systolic blood pressure, diastolic blood pressure, metabolic diseases, alcohol consumption and sedentary behavior.
Fassier, P et al., 2016[11]	France	Subjects (n=942) were incident cancer cases diagnosed in	942	Overall and vigorous PA decreased after diagnosis (*P*=0.006, −32.8±36.8MET-hour/week on average, in

		the NutriNet-Santé cohort between 2009 and 2015. PA and sedentary behavior were prospectively collected with the 7-day short version of the IPAQ questionnaire every year since subjects' inclusion (i.e., an average of 2 year before diagnosis).		those who decreased their overall PA and $P=0.005$, −21.1±36.8 MET-hour/week for vigorous PA, respectively), especially in prostate (−39.5±36.3 MET-hour/week) and skin (−35.9±38 MET-hour/week) cancers, in men (−40.8±46.3MET-hour/week), and in those professionally inactive (−34.2±37.1 MET-hour/week) (all $P<0.05$). Patients with higher PA level before diagnosis were more likely to decrease their PA (odds ratio [OR]: 4.67 [3.21–6.81], $P<0.0001$). Overweight patients more likely to decrease moderate PA (OR: 1.45 [1.11–1.89], $P=0.006$) and walking (OR: 1.30 [1.10–1.70], $P=0.04$). Sitting time increased ($P=0.02$, +2.44±2.43 hour/day on average, in those who increased their sitting time), especially in women (+2.48±2.48 hour/day), older patients (+2.48±2.57 hour/day), and those professionally inactive (2.41±2.40 hour/day) (all $P<0.05$). Patients less sedentary before diagnosis were more likely to increase their sitting time (OR: 3.29 [2.45–4.42], $P<0.0001$).

Loprinzi, PD & Kohli, M., 2014[12]	USA	Data from the 2003–2006 National Health and Nutrition Examination Survey were used. Sedentary behavior was objectively measured using an accelerometer in 1690 participants who were included in the analytic sample. Multivariate linear regression analysis across potential clinical and biological modifiers of PSA levels were used to examine the association between sedentary behavior and PSA levels.	1690	After controlling for covariates, a positive association between sedentary behavior and PSA was detected among distinctive patient groups, including non-Hispanic whites, overweight/obese subjects, hypertensive participants, and participants with evidence of diabetes and those reported to have benign prostate hypertrophy.
Nunzio, CD et al., 2023[13]	Italy	Between 2016 and 2018, a consecutive series of men who underwent prostate	291	A total of 291 patients were enrolled; 17.5% of them (*n* = 51) presented with MetS. PCa was diagnosed in 110 (38%) patients overall while 51 presented high-grade disease. At multivariable

		biopsy at three institutions were prospectively enrolled. PA was self-assessed by patients through the Physical Activity Scale for the Elderly (PASE) questionnaire; MetS was assessed according to Adult Treatment Panel III criteria.		analysis, age (OR 1.04; 95%CI: 1.00–1.08; p = 0.048), prostate volume (PV) (OR 0.98; 95%CI: 0.79–0.99; p = 0.004), suspicious digital rectal examination (OR 2.35; 95%CI: 1.11–4.98; p = 0.02), total PSA value (OR 1.12; 95%CI: 1.05–1.2; p < 0.001), and PASE score (OR 0.99; 95%CI: 0.98–0.99; p = 0.01) were independent predictors of tumor diagnosis. The latter two also predicted high-grade PCa. MetS was not associated with PCa diagnosis and aggressiveness. The novel nomogram displayed fair discrimination for PCa diagnosis (AUC = 0.76), adequate calibration (p > 0.05) and provided a net benefit in the range of probabilities between 20% and 90%.
Hwang, T et al., 2023[14]	South Korea	The PCa risk prediction model including PSA levels and individual risk factors was constructed using a cohort of 69,319 participants from the Kangbuk	69319	The risk prediction model included age, smoking status, alcohol consumption, family history of PCa, past medical history of dyslipidemia, cholesterol levels, and PSA level. Especially, an elevated PSA level was a significant risk factor of PCa (hazard ratio [HR]: 1.77, 95% confidence interval [CI]: [1.67–1.88]). This model performed well with

		Samsung Health Study. 201 registered PCa incidences were observed. A Cox proportional hazards regression model was used to generate the 5-year risk of PCa. The performance of the model was assessed using standards of discrimination and calibration.		sufficient discrimination ability and satisfactory calibration (C-statistic: 0.911, 0.874; Nam-D'Agostino test statistic:19.76, 4.21 in the development and validation cohort, respectively).
Kim, SH et al., 2014[15]	Korea	A total of 1,958 healthy male workers (1,699 were production workers and 259 were office workers) took PSA measurement for analysis.	1958	After adjusting for age, body mass index, hypertension, regular exercise, alcohol drinking and smoking, which were significantly related to serum PSA levels or known related factors of serum PSA levels, the geometric mean PSA levels were significantly high in the office workers ($p = 0.017$), the older age group ($p < 0.001$), the group with hypertension ($p = 0.046$) and the group of individuals that do not exercise regularly ($p = 0.015$) and the office workers were more likely to have a serum PSA level

				of ≥4.0 (OR 7.73, 95% CI: 2.78-21.46) or 2.5 ng/mL (OR 2.74, 95% CI: 1.49-5.08). After stratifying by age and adjusting aforementioned covariates, office workers 50 years of age and older had the significantly higher geometric mean PSA levels (p = 0.017) and were more likely to have a serum PSA level of ≥4.0 ng/mL (OR 12.90, 95% CI: 3.65-45.64) or 2.5 ng/mL (OR 3.90, 95% CI: 1.64-9.25) than production workers 50 years of age and older.
Cho, S et al., 2019[16]	Korea	This study included 3,195 male production workers who work in a large tire manufacturing factory. Serum PSA levels were measured and the data on related factors were obtained.	3195	The mean serum PSA level was 0.98 ± 0.79 ng/mL. PSA levels were significantly lower in the younger age group, the obese group, and regular exercise group. PSA levels were lower in night shift workers (n = 2,832) compared to day workers (n = 363), but the difference was not statistically significant.
Lynch, BM et al., 2014[17]	Australia	We examined the prospective associations of self-reported daily sitting time and daily television/vi	170481	No strong or significant association with prostate cancer risk was seen in fully adjusted models for either daily sitting or television/video time. There was some suggestion of effect modification by body mass index (interaction for television/video time

		deo viewing time with risk of developing or dying from prostate cancer among 170,481 men in the NIH-AARP Diet and Health Study.		and body mass index, p = 0.02). For total prostate cancer risk, television/video time was associated with a slightly elevated, but non-significant increased amongst obese men (HR=1.28, 95%CI: 0.98, 1.69); a null association was observed amongst overweight men (HR=1.04, 0.89, 1.22); and, for men with a normal body mass index, television/video time was associated with a non-significant risk decrease (HR=0.82, 95%CI: 0.66, 1.01).

DISCUSSION

Prostate cancer is the most common cancer among men in the Western world. Over 90% of all men diagnosed with prostate cancer in the US are diagnosed with localized disease for which survival rates are high, meaning that the number of men ever diagnosed with prostate cancer is growing.[18,19]

Sedentary behaviour (SB) is increasing in the modern society, and appears to differ from physical inactivity; SB is characterized by sitting or lying down, and is defined as any waking behaviour that are done in sitting or reclining posture that expends ≤1.5 metabolic equivalents (METs). It has been demonstrated that SB may increase the risk of obesity and cardiovascular disease (CVD) mortality, which may be partly independent of PA. Biological mechanisms are still not completely known, but adiposity, metabolic (glucose, insulin), hormonal (sex hormones), inflammatory and vitamin D deficiency among others have been proposed as important factors in the development and progression of some cancers. In epidemiological studies, SB has often been expressed by proxy measures of sitting time, such as television viewing and computer use.[20,21]

Identifying lifestyle factors that influence survival is therefore important. Physical activity and sedentary time (i.e. waking time spent on an activity intensity level ≤1.5

METs, metabolic equivalents, while in a sitting, lying or reclining posture) are two separate, modifiable behaviors. While the positive effects of physical activity in relation to chronic disease and mortality are well studied, sedentary behavior is still an emerging field of research. Sedentary time has, nevertheless, been recognized as a risk factor for several chronic diseases independent of time spent in moderate-to-vigorous physical activity (MVPA), including cancer mortality in the general population.[22,23]

Prostate cancer is the second most common cancer among men, accounting for 13.5% of all male cancer cases worldwide. Established risk factors include age, family history of prostate cancer, and African-American ethnicity. There is increasing evidence that greater body fatness is related to risk of advanced prostate cancer, and research into additional modifiable risk factors such as diet and physical activity has gathered particular attention throughout the past years. Among these lifestyle factors, sedentary behavior has recently emerged as a potential determinant of prostate cancer risk. Although sedentary behavior has often been equated with physical inactivity, it actually represents a distinct risk factor independent of whether individuals meet physical activity recommendations. As such, sedentary behavior is defined as "any waking behavior characterized by an energy expenditure ≤ 1.5 metabolic equivalents, while in a sitting, reclining, or lying posture".[24,25]

CONCLUSION

In conclusion, males without a diagnosis of prostate cancer who engage in more sedentary behavior have higher levels of PSA compared with their male counterparts. This finding that sedentary behavior may be a distinct risk factor, independent of physical activity, for PSA is similar to other studies showing that prolonged sedentary behavior increases an individual's risk for various chronic diseases, including prostate cancer.

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