

ORIGINAL ARTICLE



The Role of Regular and Long-Term Physical Activity in Preventing the Bladder Cancer

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Submitted April 02, 2024; Accepted in final form June 05, 2024.

ABSTRACT

Background. Cancer is one of the three health dilemmas and the third cause of mortality in Iran. Bladder cancer is the ninth common type of cancer in the world. Physical activity is associated with decreased risk for many cancers. **Objectives.** The main aim of this study is to investigate the effect of regular and long-term physical activity on the risk of bladder cancer. **Methods.** This is a cross-sectional descriptive-analytical research. For this study, 45 sports instructors (mean age = 58.1 ± 1.39), who had regular long-term physical activities in their life (at least 10 years), were selected using simple random sampling, and 31 bladder cancer patients (mean age = 60.3 ± 1.3), were selected using random two-stage cluster sampling. The data was collected in two personal information and physical activity questionnaires. **Results.** The mobility rate and physical activity of bladder cancer patients were very low. There was a significant relationship between having physical activity and the incidence of cancer ($P < 0.001$). With regular physical activity, the chance of morbidity to cancer drops a lot. **Conclusion.** Having long-term and regular physical activity may effective in preventing bladder cancer. So that with regular physical activity, the risk of bladder cancer is reduced.

KEYWORDS: *Bladder Cancer, Preventing, Physical Activity.*

INTRODUCTION

Cancer is a disease that causes changes in cellular activity and normal genes due to molecular defects (1). Cancer is one of the main health problems in Iran and the world (2). In 2018, 1,735,350 new cancer cases and 609,640 cancer deaths are projected to occur in the United States (3). In 2018, there are expected to be over 18 million cancer cases worldwide (4).

Bladder cancer is one of the most important health issues and the most common

malignancies of the urinary tract (5). It is also the second most common genital tumor that causes infection and mortality in both men and women (6). According to published studies, about 2 to 6% of malignant glands are related to bladder cancer, which is the fourth most common cancer in men and the eighth most common cancer in women (7).

This disease has the most expensive treatment compared to other cancers (8). Bladder cancer is

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the third most common cancer in men in Iran (9). According to the statistics of 2008, 386300 new cases of bladder cancer have been reported with 150200 deaths worldwide (10). In developing countries, cancer is one of the most important health issues and its trend is increasing (11).

The causes of bladder cancer don't seem to be yet well understood. Lifestyle, environmental, and occupational risk factors may play more important roles in bladder cancer development (12). There are several factors involved in the development of bladder cancer, including age, sex, alcohol consumption, type of occupation, long-term use of painkillers and anti-cancer drugs, and pointed to a series of unknown chromosomal events (13, 14). The disease is associated with high mortality (15). And the severe complications of this disease, such as unbearable pain, weakening of physical and mental strength, and economic losses to society, indicate the need to gain more knowledge in this area (16).

Exercise and physical activity are among the interventional behaviors in reducing the incidence of cancer. Epidemiological studies show that the incidence of cancer decreases with increasing physical activity (17). There exists a large body of epidemiologic evidence that concludes those who participate in higher levels of physical activity have a reduced likelihood of developing a range of cancers compared to those who engage in lower levels of physical activity (18).

One study said that there is strong evidence between the highest and lowest levels of physical activity and a reduced risk of bladder cancer (19). The evidence supports exercise can prevention of bladder cancer (20). In another study showed that high vs low levels of physical activity were related to decreased bladder cancer risk and in conclusion, Physical activity is associated with decreased risk of bladder cancer (21).

In another study showed that exercise in leisure time is associated with decreased risk of a variety of cancers including bladder cancer (22). According to Shephard et al (2017), habitual physical activity and maintaining it is necessary to prevent the incidence of bladder cancer (23). Physical activity is a factor that can reduce the risk factor of bladder cancer (24).

As it was said before, bladder cancer is one of the leading causes of mortality in human societies at the present time. This primary dilemma imposes heavy mental and economic burdens on

the patients and their families and the societies as well. Nevertheless, studies on the association between physical activity and bladder cancer risk are limited (19-24), the results of the present study help to take a step towards planning and coordination and providing the necessary facilities to deal with the prevention of bladder cancer. So the purpose of the present study was investigating the role of regular and long-term physical activity in preventing Bladder Cancer.

MATERIALS AND METHODS

Study Sample. This article is a cross-sectional descriptive-analytical study that was conducted in 2022. Participants in this study were patients with bladder cancer in Shiraz hospitals and sports coaches in Shiraz. The study sample consisted of 31 patients using a two-stage cluster sampling of patients admitted to Faghihi Martyr and Namazi hospitals (Shiraz Urological Surgery Centers) and 45 instructors who were selected using a simple random sampling method. Athletes must have had regular physical activity for the past 10 years. The proposal of this study was approved by the ethical committee of Shiraz University of Medical Sciences. The purpose of this study was fully explained to the participants and their names were not mentioned in the questionnaires.

Data Collection. For collecting the information, two questionnaires were used: a personal information questionnaire, which contains the person's demographic information, smoking habit, etc, and a "Beck physical activity" questionnaire.

Beck Physical Activity Questionnaire includes two sections of personal demographic information such as age, sex, marital status, housing status, level of education, history of individual and family illness, height, weight, and occupation, and special questions according to the purpose of the research. Such as questions about the person's job and the amount of activity during work and leisure. In total, the special questions of this questionnaire included 16 questions. The questionnaire used a 5-point Likert scale in which the options were never, rarely, sometimes, often, and always, 0 for never and 4 for always.

Statistical Methods. Data were described as mean (M) and standard deviation (SD). Treatment effects were analyzed by SPSS software version 21. The data was analyzed through methods such as descriptive statistics and inferential statistics including T-Test, ANOVA, and nonparametric Chi-2 Independence test.

RESULTS

According to the demographic information, 75% of the participants were male, 80.3% were married and 69.8% had diplomas and associate degrees (Table 1). Also, the average age of the athlete participants was 58.1 ± 1.39 years, and 60.3 ± 11.3 years for patients with bladder cancer. There is no significant difference between the weight of the athletes and the patients ($P=0.34$). The results showed that the average physical activity rate among bladder cancer patients was

1.82 ± 0.38 , which is moderate based on the Likert scale. None of the patients had a long-term regular activity (Table 2).

According to the results of the independent T-test, there is a significant relation between mobility and health status ($P<0.001$) and it is observed that athletes have a higher rate of activity than bladder cancer patients, this can indicate that physical activity can be considered as a preventing factor for bladder cancer (Table 3).

Table 1. Investigating the relationship between mobility and health status variables Mobility

Health status	mean \pm sd	t-test	DF	P
Patient	1.82 ± 0.38	13.29	59	$<0.001^*$
Healthy (athlete)	2.99 ± 0.31			

*, $p<0.05$

Table 2. Investigating the relationship between gender and the chance of bladder cancer incidence

Gender	Abundance patient	Abundance athlete	t-test	DF	P
Man	28(90.3%)	30(65.9%)	20.161	1	$<0.001^*$
Woman	3(9.7%)	15(34.1%)			
Total	31	45			

*, $p<0.05$

Table 3. Investigating the relationship between the variable level of health and developing background diseases

		Athlete	Patient	Total	t-test	P
Background diseases	No	Abundance	32	11	43	12.421 $<0.001^*$
		Expected amount	24.8	16.2	43	
	Yes	Abundance	9	19	28	
		Expected amount	16.2	11.8	28	
	Total		41	30	71	

*, $p<0.05$

DISCUSSION

The results of the present study showed that the acceptable level of exercise activity that existed in coaches reduced the risk of developing bladder cancer in this group. While physical activity status was unfavorable in all patients. The results of the present study also showed a significant relationship between the level of physical activity and prevention of bladder cancer.

The results of the present study were consistent with the results of Keimling et al (2014) who showed that high levels of physical activity were associated with a reduced risk of bladder cancer (21). They suggested that there's

no strong evidence that the association between physical activity and bladder cancer varied by study design, gender, physical activity intensity, component or measure of physical activity, timing in the life of physical activity, type of physical activity assessment, adjustment factors, or study geographic region (21).

Also in line with the present study, Li et al (2020) and Wannamethee et al (2001), showed that there is a direct and significant relationship between physical activity and bladder cancer (25) and exercise plays an important role in preventing bladder cancer (26). The researchers concluded that in older women, the risk of bladder cancer may be reduced by doing the

levels of physical activity recommended by the guidelines, and this is a significant advantage when they have at least 15 MET/ hours per week of total physical activity or 8.75 MET/ hours per week of walking (25). The present research samples were almost old and their average age was 60 years.

In contrast, Koebnick et al. (2008) showed that there was no statistically significant relationship between physical activity and bladder cancer. The researchers also found that there was a statistically significant relationship between gender, education, smoking status, and other potential factors with bladder cancer (27). On the other hand, Alaranta et al. 2006 (28) showed that the rate of smoking in athletes is lower than in the general population. Another study found that athletes smoked 3 times less than the control group (29). Therefore, it can be said that less smoking habit in athletes may reduce their risk of bladder cancer. Therefore, less consumption as a result of physical activity may be effective in preventing bladder cancer. However, the difference between the effect of physical activity in our study and that of Koebnick et al (27) may be due to the fact that our statistical population includes athletes who exercised regularly for several years, whereas, in the study of Corina et al., it is not clear how long and the way these athletes trained.

According to an analysis from The Iowa Women's Health Study, women who participated in regular physical activity had a 34% lower risk of bladder cancer (HR 0.66; 95% CI: 0.43-1.01) than those who did not! (30). Although the biological mechanism relating physical activity to bladder cancer is not yet fully understood, several hypothesized pathways have been put forth to explain a potential association between physical activity and cancer, including an increase in energy expenditure, modification of the hormone balance, enhancement of the immune system, and reduction of chronic inflammation (31). There is proof that exercise boosts the removal of carcinogens from the body, encourages DNA repair, differentiation, and apoptosis, lessens chronic inflammation, and improves immunological function—all of which are linked to the development of cancer (32).

Our results support these findings on the lower risk of bladder cancer among women who

engaged in a higher amount of physical activity and indicate a potential dose-response association. Current PAGA guidelines recommend that engaging in physical activity could also be related to lower risks of several cancers including bladder cancer (33).

CONCLUSION

In conclusion, our results suggest that physical activity may be related to reduce risk of bladder cancer. Further investigation using objective measurements of physical activity is warranted to clarify these findings.

APPLICABLE REMARKS

- Current study supports the idea of the prior studies regarding the prevention of bladder cancer by increasing long-term regular physical activity level regardless of gender, intensity, type of physical activity and other criteria.
- Based on the results of previous research and the present study, we claim that there is a positive relationship between the level of physical activity and the prevention of bladder cancer.

ACKNOWLEDGMENTS

We want to thank to all members of Shiraz Urological Surgery Centers in Faghihi Martyr and Namazi hospitals and Professor Majid Chahardah Cherick.

AUTHORS' CONTRIBUTIONS

Study concept and design: Mitra Khademosharie, Mehran Shafiei, Seyed Morteza Tayebi. Acquisition of data: Mehran Shafiei, Atefeh Ariabod. Analysis and interpretation of data: Ali Gharibiyani. Drafting the manuscript: Mehran Shafiei, Zahra Omidikootahi. Critical revision of the manuscript for important intellectual content: Mitra Khademosharie. Statistical analysis: Ali Gharibiyani, Mitra Khademosharie. Administrative, technical, and material support: Mehran Shafiei, Mitra Khademosharie. Study supervision: Mitra Khademosharie, Seyed Morteza Tayebi.

CONFLICT OF INTEREST

The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

REFERENCES

1. Hajian K, Firouzjahi A, Kia M. Pattern of age distribution of different cancers in Babol, 2001. 2003.
2. Kosha A, Farahbakhsh M, Abdollahi S, Goltzari M, Sayf M. Cancer epidemiology in East Azerbaijan province in 1386. *Med J Med Sci*. 2008;32:74-9.
3. Siegel RL, Miller KD, Jemal A. Cancer statistics, 2018. *CA: a cancer journal for clinicians*. 2018;68(1):7-30. [doi:10.3322/caac.21442] [PMid:29313949]
4. Sung H, Ferlay J, Siegel RL, Laversanne M, Soerjomataram I, Jemal A, Bray F. Global cancer statistics 2020: GLOBOCAN estimates of incidence and mortality worldwide for 36 cancers in 185 countries. *CA: a cancer journal for clinicians*. 2021;71(3):209-49. [doi:10.3322/caac.21660] [PMid:33538338]
5. Vedder MM, Márquez M, de Bekker-Grob EW, Calle ML, Dyrskjöt L, Kogevinas M, et al. Risk prediction scores for recurrence and progression of non-muscle invasive bladder cancer: an international validation in primary tumours. *PloS one*. 2014;9(6):e96849. [doi:10.1371/journal.pone.0096849] [PMid:24905984]
6. Wu S, Li F, Huang X, Hua Q, Huang T, Liu Z, et al. The association of tea consumption with bladder cancer risk: a meta-analysis. *Asia Pacific journal of clinical nutrition*. 2013;22(1):128-37.
7. Wong M, Fung FD, Leung C, Cheung WW, Goggins WB, Ng C. The global epidemiology of bladder cancer: a joinpoint regression analysis of its incidence and mortality trends and projection. *Scientific reports*. 2018;8(1):1-12. [doi:10.1038/s41598-018-19199-z] [PMid:29348548]
8. Busby JE, Kamat AM. Chemoprevention for bladder cancer. *The Journal of urology*. 2006;176(5):1914-20. [doi:10.1016/j.juro.2006.07.004] [PMid:17070211]
9. Pourabdian S, Janghorbani M, Khoubi J, Tahjvidi M, Mohebbi I. Relationship between high risk occupation particularly aromatic amines exposure and bladder cancer in Isfahan: a case-control study. *Urmia Medical Journal*. 2010;21(2):224-34.
10. Jemal A, Bray F, Center MM, Ferlay J, Ward E, Forman D. Global cancer statistics. *CA: a cancer journal for clinicians*. 2011;61(2):69-90. [doi:10.3322/caac.20107] [PMid:21296855]
11. Van Lier EA, van Kranen HJ, van Vliet JA, Rahamat-Langendoen JC. Estimated number of new cancer cases attributable to infection in the Netherlands in 2003. *Cancer letters*. 2008;272(2):226-31. [doi:10.1016/j.canlet.2008.07.007] [PMid:18752887]
12. Fioriti D, Pietropaolo V, Dal Forno S, Laurenti C, Chiarini F, Degener A. Urothelial Bladder Carcinoma and Viral Infections: Different Association with Human Polyomaviruses and Papilloma Viruses. *International Journal of Immunopathology and Pharmacology*. 2003;16(3):283-8. [doi:10.1177/039463200301600315] [PMid:14611733]
13. Sur M, Cooper K, Allard U. Investigation of human papillomavirus in transitional cell carcinomas of the urinary bladder in South Africa. *Pathology*. 2001;33(1):17-20. [doi:10.1080/00313020120034849] [PMid:11280602]
14. Karagas MR, Park S, Warren A, Hamilton J, Nelson HH, Mott LA, Kelsey KT. Gender, smoking, glutathione-S-transferase variants and bladder cancer incidence: a population-based study. *Cancer letters*. 2005;219(1):63-9. [doi:10.1016/j.canlet.2004.10.006] [PMid:15694665]
15. Mohammad BA, Rezaeeianzadeh A, Tabbatabaei Shr. Application of life table in survival analysis of patients with bladder cancer. 2011.
16. Esmail Nasab N, Moradi G, Zareie M, Ghaderi E, Gheytsi B. Survey of epidemiologic status and incidence rates of cancers in the patients above 15 years old in Kurdistan province. *Scientific Journal of Kurdistan University of Medical Sciences*. 2007;11(4):18-25.
17. Ramírez K, Acevedo F, Herrera ME, Ibáñez C, Sánchez C. Actividad física y cáncer de mama: un tratamiento dirigido. *Revista médica de Chile*. 2017;145(1):75-84. [doi:10.4067/S0034-98872017000100011] [PMid:28393973]
18. Brown JC, Winters-Stone K, Lee A, Schmitz KH. Cancer, physical activity, and exercise. *Comprehensive Physiology*. 2012;2(4):2775. [doi:10.1002/cphy.c120005] [PMid:23720265]
19. McTiernan A, Friedenreich CM, Katzmarzyk PT, Powell KE, Macko R, Buchner D, et al. Physical activity in cancer prevention and survival: a systematic review. *Medicine and science in sports and exercise*. 2019;51(6):1252. [doi:10.1249/MSS.0000000000001937] [PMid:31095082]
20. Patel AV, Friedenreich CM, Moore SC, Hayes SC, Silver JK, Campbell KL, et al. American College of Sports Medicine roundtable report on physical activity, sedentary behavior, and cancer prevention and

- control. *Medicine and science in sports and exercise*. 2019;51(11):2391. [doi:10.1249/MSS.0000000000002117] [PMid:31626056]
21. Keimling M, Behrens G, Schmid D, Jochem C, Leitzmann M. The association between physical activity and bladder cancer: systematic review and meta-analysis. *British journal of cancer*. 2014;110(7):1862-70. [doi:10.1038/bjc.2014.77] [PMid:24594995]
 22. Moore SC, Lee I-M, Weiderpass E, Campbell PT, Sampson JN, Kitahara CM, et al. Association of leisure-time physical activity with risk of 26 types of cancer in 1.44 million adults. *JAMA internal medicine*. 2016;176(6):816-25. [doi:10.1001/jamainternmed.2016.1548] [PMid:27183032]
 23. Shephard RJ. Physical activity in the prevention and management of bladder cancer. *The Journal of Sports Medicine and Physical Fitness*. 2017;57(10):1359-66. [doi:10.23736/S0022-4707.17.06830-X] [PMid:28116879]
 24. Saginala K, Barsouk A, Aluru JS, Rawla P, Padala SA, Barsouk A. Epidemiology of bladder cancer. *Medical sciences*. 2020;8(1):15. [doi:10.3390/medsci8010015] [PMid:32183076]
 25. Li Y, Hendryx MS, Xun P, He K, Shadyab AH, Lane DS, et al. Physical activity and risk of bladder cancer among postmenopausal women. *International journal of cancer*. 2020;147(10):2717-24. [doi:10.1002/ijc.33042] [PMid:32390249]
 26. Wannamethee S, Shaper A, Walker M. Physical activity and risk of cancer in middle-aged men. *British journal of cancer*. 2001;85(9):1311-6. [doi:10.1054/bjoc.2001.2096] [PMid:11720466]
 27. Koebnick C, Michaud D, Moore SC, Park Y, Hollenbeck A, Ballard-Barbash R, et al. Body mass index, physical activity, and bladder cancer in a large prospective study. *Cancer Epidemiology and Prevention Biomarkers*. 2008;17(5):1214-21. [doi:10.1158/1055-9965.EPI-08-0026] [PMid:18483344]
 28. Alaranta A, Alaranta H, Patja K, Palmu P, Prättälä R, Martelin T, Helenius I. Snuff use and smoking in Finnish olympic athletes. *International journal of sports medicine*. 2006;27(07):581-6. [doi:10.1055/s-2005-865826] [PMid:16802255]
 29. Sormunen J, Bäckmand HM, Sarna S, Kujala UM, Kaprio J, Dyba T, Pukkala E. Lifetime physical activity and cancer incidence—a cohort study of male former elite athletes in Finland. *Journal of Science and Medicine in Sport*. 2014;17(5):479-84. [doi:10.1016/j.jsams.2013.10.239] [PMid:24239090]
 30. Tripathi A, Folsom AR, Anderson KE. Risk factors for urinary bladder carcinoma in postmenopausal women: the Iowa Women's Health Study. *Cancer: Interdisciplinary International Journal of the American Cancer Society*. 2002;95(11):2316-23. [doi:10.1002/cncr.10975] [PMid:12436437]
 31. Cannioto R, Etter JL, Guterman LB, Joseph JM, Gulati NR, Schmitt KL, et al. The association of lifetime physical inactivity with bladder and renal cancer risk: A hospital-based case-control analysis. *Cancer epidemiology*. 2017;49:24-9. [doi:10.1016/j.canep.2017.04.017] [PMid:28528291]
 32. Rogers CJ, Colbert LH, Greiner JW, Perkins SN, Hursting SD. Physical activity and cancer prevention. *Sports Medicine*. 2008;38(4):271-96. [doi:10.2165/00007256-200838040-00002] [PMid:18348589]
 33. Piercy KL, Troiano RP, Ballard RM, Carlson SA, Fulton JE, Galuska DA, et al. The physical activity guidelines for Americans. *Jama*. 2018;320(19):2020-8. [doi:10.1001/jama.2018.14854] [PMid:30418471]