ISSN: 2689-8616

Research Article

Advancements in Journal of Urology and Nephrology

Sauna Bathing Habits and Erectile Dysfunction-Tampere Ageing Male Urologic Study (TAMUS)

Antti Pöyhönen[1*], Jonne Åkerla[2,3], Anssi Auvinen[4], Teuvo LJ Tammela[2,3]

[1]*Centre for Military Medicine, The Finnish Defence Forces, Riihimäki, Finland*

[2]*Department of Urology, Tampere University Hospital and Tampere University, Finland*

[3]*Faculty of Medicine and Health Technology, Tampere University, Finland*

[4]*Faculty of Social Sciences, Tampere University, Finland and Tampere University Hospital/Pirkanmaa Hospital District*

[*]Corresponding author
Antti Pöyhönen, Centre for Military Medicine, Tykkikentäntie, FI-33600 Riihimäki, Finland

Submitted: 29 Jun 2022; **Accepted:** 20 Jul 2022; **Published:** 25 Jul 2022

Citation: *Antti Pöyhönen, Jonne Åkerla, Anssi Auvinen, Teuvo LJ Tammela. (2022). Sauna Bathing Habits and Erectile Dysfunction-Tampere Ageing Male Urologic Study (TAMUS). Adv J Uro Nephro, 4(2), 45-49.*

Abstract

Objective: *To evaluate a possible effect of Finnish sauna bathing on erectile dysfunction (ED).*

Materials and Methods: *A population-based study was conducted using a mailed questionnaire sent to 5,537 men in 2019. The frequency of sauna bathing was grouped into three categories: once a month or less, once a week and two or more times per week. ED was assessed using the IIEF-5 questionnaire. The questionnaire comprised also items on sociodemographic, medical history; ED and treatment for ED. Chi-square tests and logistic regression analysis were used for statistical analysis.*

Results: *The study cohort included 2,644 men (47.8% response proportion). Frequency of sauna bathing did not affect to IIEF-5 scores (the mean scores for different groups were all close to 20.5) nor to severity of ED. Logistic regression analysis with adjustment for other risk factor showed no association between sauna bathing frequency and ED. Nevertheless, frequency of sexual intercourse was higher among men sauna bathing two or more times per week as mean monthly number of sexual intercourses was 3.5 compared with 2.8-2.5 in the other groups. Other factors than sauna bathing probably explain differences concerning intercourse amounts. There was no statistically significant difference in the use of medication for ED between sauna bathing groups.*

Conclusions: *In our population-based study, sauna bathing does not have effect on ED, although more frequent sauna bathers had more sexual intercourses and had fewer risk factors for ED. Other factors than sauna bathing probably explain differences concerning intercourse amounts.*

Introduction

Erectile dysfunction (ED) is common and the prevalence of ED increases with age. Prevalence ranges from 2-9% for ages below 40 years old to 10-71% for 70 years old or older and 18-86% for men aged 80 years or older [1]. Sauna has an important part in the Finnish and the Nordic culture. In sauna, water is thrown to hot rocks on a stove to generate steam. Finnish sauna is less humid than many other saunas, as relative humidity is between 10% and 20% and temperature from 80°C to 100°C. In Finnish sauna, one sitting period takes 5-20 minutes at a time, often repeated several times. A cold shower or water plunge commonly follows sauna [2].

The exact mechanism how sauna bathing seems to relieve different conditions is not known. One theory is that sauna bathing increases nitric oxide (NO) bioactivity [3]. A similar mechanism is also used in ED medication [4]. Therefore, it is worth of investigation if sauna affects erectile function. To our knowledge, an association between ED and sauna bathing has not been investigated earlier.

Materials and Methods

This report is part of the Tampere Ageing Male Urologic Study (TAMUS). Material for this study was collected in 2019 as a postal questionnaire was sent to the target population following a reminder questionnaire after three months to men who had not responded

to the initial one. The target population comprised men born in 1924, 1934, 1944, 1954, 1964 or 1974 who resided in Tampere or 11 surrounding municipalities. A similar protocol was used for this study as for previous TAMUS surveys [5,6].

Questionnaire included questions concerning basic demographic information, details about health-related issues e.g. history of diagnosed diseases, possible operations and use of medications.

Sauna bathing habits was evaluated with the following question: "How often do you sauna bath?" with the response alternatives: "not at all", "once a month or less", "once a week", "two times per week or more". For the analysis, those reporting no sauna bathing or bathing once a month or less groups combined, as these represented minimal sauna bathing in the Finnish context.

ED was evaluated using the validated International Index of Erectile Function (IIEF-5) questionnaire [7]. Five questions were: "How do you rate your confidence that you could get and keep an erection?", "When you had erections with sexual stimulation, how often were your erections hard enough for penetration?", "During sexual intercourse, how often were you able to maintain your erection after you have penetrated your partner?", "During sexual intercourse, how difficult was it to maintain your erection to completion of intercourse?", "When you attempted sexual intercourse, how often was it satisfactory for you?" Every question had five answering alternatives: "very low", "low", "moderate", "high" and "very high" scored as 1-5 points per question. As the points were summed up, the total score represented erectile dysfunction. A score 22 -25 indicate normal erectile function, 21 – 17 mild ED, 16- 12 mild to moderate ED, 11-8 moderate ED and 5-7 severe ED. Men using medication for ED were asked to fill out the IIEF-5 questions twice: with and without medication.

Use of medication for ED was assessed for the past five years. The treatments modalities were divided into oral medication and injections. Testosterone replacement therapies were included in the analysis as ED treatment.

To evaluate the possible differences between the medications, IIEF-5 questionnaire with medication was used. Two-sided chi-square test was used to assess statistical significance of associations. Ordinal regression analysis was used to estimate odds ratios and the confidence intervals. SPSS (Statistical Package for Social Sciences) version 27.0 was used in the data analysis.

The Tampere University Hospital Committee for Research Ethics approved the study protocol (tracking number #99050).

Results

The response proportion was 47.8% as 2,644 out of 5,537 men returned the questionnaire. Most men reported sauna bathing once a week (40%), although almost similar proportion of the men used sauna two or more times per week (36%). Men reporting sauna bathing once per month or less comprised a fifth (22%) of the study population, including 167 men (6%) reporting no sauna bathing at all.

In terms of demographic characteristics, the average ages of the sauna bathing groups, were comparable, around 63 years (Table 1). Frequent sauna bathers were more often cohabiting and smoked less. Men with university degree were over-re-presented in the least frequent sauna bathing group and those with intermediate stage education in the most frequent sauna bathers´ group. Frequent sauna bathers reported a previous diagnosis of depression or diabetes less frequently than the other groups. No clear differences were seen in other chronic diseases or operations, which could influence to development of ED.

Table 1: Demographic Characteristics Of Study Participants According To Sauna Bathing Frequency

Sauna bathing									
Number of men	**monthly or less**		**1 time per week**		**2 or more times per week**		**total**		
	579		**1069**		**947**		**2595**		
	n	**(%)**	**n**	**(%)**	**n**	**(%)**	**n**	**(%)**	**p Value**
Mean age (years)	62.3		63.9		61.9		62.8		
Marital status									<0.01
Married or cohabitant	349	(60.3)	793	(74.2)	773	(81.6)	1915	(73.8)	
Bachelor, divorced, widow	229	(39.6)	270	(25.3)	172	(18.2)	671	(25.9)	
Unknown	1	(0.1)	6	(0.1)	2	(0.2)	9	(0.3)	
Education									0.02
Elementary school	87	(15.0)	169	(15.8)	140	(14.8)	396	(153)	
Intermediate stage	214	(37.0)	394	(36.9)	399	(42.1)	1007	(388)	
College	126	(21.8)	224	(21.0)	221	(23.3)	571	(22.0)	
University	150	(25.9)	273	(25.5)	183	(19.3)	606	(23.4)	
Unknown	2	(0.3)	9	(0.8)	4	(0.5)	15	(0.5)	
Current smoker	116	(20.3)	138	(13.1)	133	(14.1)	387	(15.1)	<0.01
Previously diagnosed medical conditions and surgical procedures									
Elevated blood pressure	251	(43.4)	439	(41.1)	378	(39.9)	1068	(41.2)	0.42
Coronary artery disease	66	(11.4)	105	(9.8)	80	(8.4)	251	(9.7)	0.16
Hypercholesterolemia	109	(18.8)	232	(21.7)	188	(19.9)	529	(20.4)	0.34
Diabetes	92	(15.9)	178	(16.7)	115	(12.1)	385	(14.8)	0.01
Depression	87	(15.0)	97	(9.1)	67	(7.1)	251	(9.7)	<0.01
Radical prostatectomy	10	(1.7)	19	(1.8)	17	(1.8)	46	(1.8)	0.99

The mean IIEF-5 scores were similar across sauna bathing groups (Table 2). However, men sauna bathing two or more times per week reported more frequent sexual intercourse than those with less sauna bathing men: the average number of intercourses per month was 3.5 (95 CI 3.2-3.8) among men sauna bathing twice or more per week versus 2.8 (95% CI 2.5-3.0) among men sauna bathing once a week and 2.5 (95% CI 2.2-2.9) for men with less sauna bathing.

The mean IIEF-5 scores when ED medication was used were also similar regardless of sauna bathing frequency (Table 2). The findings were similar for the whole study cohort and the men reporting use of ED medication. As different categories for severity of ED were compared, mild ED was less common in the group with the most frequent sauna bathing (21.7%) than among men with less sauna bathing (26.8% and 29.3%).

Table 2: Erectile Function According To Sauna Bathing

	monthly or less	1 time per week	2 or more times per week	total
Mean intercourses per month (95%CI)	2.5 (2.2 - 2.9)	2.8 (2.5 - 3.0)	3.5 (3.2 - 3.8)	3.0 (2.9 – 3.2)
IIEF-5 mean points (95%CI)	20.7 (20.2 – 21.2)	20.2 (19.9 – 20.7)	20.3 (19.9 – 20.7)	20.4 (20.1 – 20.6)
Classification of ED n (%) (p=0.53)				
no ED	192 (56.5)	385 (54.1)	393 (54.8)	970 (54.9)
mild ED	90 (26.5)	179 (25.2)	188 (26.2)	457 (25.8)
mild to moderate ED	39 (11.5)	76 (10.7)	68 (9.5)	183 (10.4)
moderate ED	11 (3.2)	40 (5.6)	41 (5.7)	92 (5.2)
severe ED	8 (2.4)	31 (4.4)	27 (3.8)	66 (3.7)
	340	711	717	1768
IIEF-5 mean points (95% CI) if treatment was used	20.6 (19.8 – 21.4)	19.8 (19.2 – 20.5)	20.5 (19.9 – 21.1)	20.3 (19.9 – 20.6)
Classification of ED n (%) if treatment was used (p=0.36)				
No ED	77 (55.0)	133 (50.2)	155 (58.1)	365 (54.3)
mild ED	41 (29.3)	71 (26.8)	58 (21.7)	170 (25.3)
mild to moderate ED	13 (9.3)	31 (11.7)	28 (10.5)	72 (10.7)
moderate ED	3 (2.1)	19 (7.2)	16 (6.0)	38 (5.7)
severe ED	6 (4.3)	11 (4.2)	10 (3.7)	27 (4.0)
	140	265	267	672

However, no association between prevalence of ED and frequency of sauna bathing was found (OR 0.05, 95% CI -0.18-0.84 p=0.474). Older men, men living alone or men having history of diabetes, elevated blood pressure, depression, high cholesterol levels and radical prostatectomy had statistically significant risk elevation (mostly OR 0.3 – 0.6) for ED.

Use of ED medication did not materially differ between sauna bathing groups (Table 3). Frequent sauna bathers seemed to use more oral ED medications, but no statistically significant difference was demonstrated.

Table 3: Treatment for ED in last 5 years According To Sauna Bathing Frequency

	monthly or less		1 time per week		2 or more times per week		total		p Value
	n	(%)	n	(%)	n	(%)	n	(%)	
Treatment for ED	77	(13.3)	149	(13.9)	158	(16.7)	384	(14.8)	0.18
No treatment	490	(84.6)	905	(84.7)	778	(82.2)	2173	(83.7)	
Unknown	12	(2.1)	15	(1.4)	11	(1.1)	38	(1.5)	
What kind of treatment									
Oral	67	(11.6)	145	(13.6)	149	(15.7)	361	(139)	0.07
Injection	5	(0.9)	5	(0.5)	6	(0.6)	16	(0.6)	0.62
Testosterone	2	(0.3)	2	(0.2)	7	(0.7)	11	(0.4)	0.22

Discussion

Sauna bathing has been reported to influence positively several medical conditions and physiological processes. The mechanism for such effects remains unknown, but a potential candidate is nitric oxide, which is also used for treatment of ED. Therefore, it is reasonable to study if there is connection between sauna bathing and ED. We are not aware of any previous studies concerning the relation between the sauna bathing and ED. In our study, we did not find any evidence of long-term effect of sauna bathing on ED development, although more frequent sauna bathers reported more intercourses than the men sauna bathing only once a week or less. Furthermore, they also used more oral medication for ED. These findings could be explained by active lifestyle of frequent sauna bathers.

Previous research suggests that regular infrared and/or Finnish sauna bathing may provide beneficial effects particularly with cardiovascular and rheumatological diseases [8]. Sauna bathing may decrease the risk of vascular diseases, neurocognitive diseases, pulmonary diseases and also other conditions such as arthri-

tis, headache and flu [3]. The possible mechanism underlying the health effects of sauna bathing effects is not known but multiple different pathways have been proposed to be responsible for effects.

It has been suggested that heat stress in sauna induces changes in molecular mechanisms that protect the body from damage, similar to those provoked by exercise, which may forestall the effects of aging [9]. One molecular theory is that the positive effect of sauna bathing is caused by an increase in nitric oxide (NO) bioactivity.3 This is an interesting theory for our study, because for treatment for ED, a specific phosphodiesterase type 5 (PDE 5) inhibitor is used to enhance nitric oxide (NO) mediated vasodilation in the corpus cavernosum by inhibiting cyclic guanosine monophosphate breakdown [10].

Sauna bathing can have also negative effects. One study demonstrated impaired spermatogenesis associated with sauna bathing 15 minutes twice a week but the changes were normalized in six months after the exposure was stopped [11].

In our study, the prevalence of ED was comparable to other studies. Prevalence varied considerably from study to study as among around 70 years men prevalence vary between from 10 to 71 percent [1]. In our study cohort with a mean age of 63 years, 19 percent of men reported at least mild to moderate ED.

Sauna bathing frequency was not associated with the mean IIEF-5 score or prevalence of ED.

Seeking help for ED could have significant differences between different cultures. Therefore, significant differences could be found between studies concerning prevalence and treatment of ED. Main reasons for delayed help seeking has shown to be embarrassment and thinking of ED as a natural process of aging [12]. Total of 14.8 percent of men in our study cohort reported having received treatment for ED in the last five years. In UK, longitudinal study including 1162 men with mean age of 59 years were conducted and 37 percent of them receive treatment for ED at the baseline of the study, which was more than in our study [13]. More frequent sauna bathers were also more prone to use medication for ED, but there was no statistically significant difference between sauna bathing groups.

Treatment for ED was compared according to sauna bathing frequency and was similar between groups. Mainly oral medication was used as expected in a population-based study.

Sauna bathing frequency was not associated with subsequent ED, unlike age, diabetes, hypercholesteremia, elevated blood pressure, depression and a history of radical prostatectomy which are known risk factors for ED [14-16].

Education seemed to have preventive effect to ED in our study cohort, however it was slightly not statistically significant. The more educated men were, the less likely they had ED. A hypothesis could be made that less sauna bathers have less ED as they were more educated, but this was not the case. On the other hand, frequent sauna bathers smoked less and had less diabetes and depression, nevertheless the sauna bathing groups had the same erectile function. These factors could interpret that sauna bathing could also have a negative effect to erectile function.

Men sauna bathing frequently also reported more frequent sexual intercourse. This is likely explained by the fact that they were more often married of cohabiting than men with less sauna bathing, so they had probably more opportunities for intercourse.

As this was population-based postal questionnaire study, our results demonstrated findings from “normal” life. One shortcoming was that sauna bathing sessions was not standardized. To evaluate sauna bathing in a standardized fashion would require information on duration of each sauna session and ideally more detail about condition in sauna such as temperature and humidity. In 1994, the initial TAMUS questionnaire assessed the exact number of sauna bathing times per week [17]. The number of men sauna bathing more than twice per week was small and therefore in the 2019 questionnaire, sauna bathing frequency was divided into four categories (none, once a month or less, once a week and two times per week or more). In our opinion, this division was reasonable in this population-based setting. It could be interesting to collect data from men sauna bathing very frequent, like every day to evaluate if major exposure to sauna bath has any difference to results.

Conclusions

Sauna bathing frequency was not associated with ED in our population-based cohort study. There were no differences in IIEF-5 scores or use of medication for ED between the groups according to sauna bathing frequency. Yet, frequent sauna bathers reported sexual intercourses that are more frequent and had fewer risk factors for ED.

Author’s contribution

Antti Pöyhönen: No conflicts
Jonne Åkerla: No conflicts
Anssi Auvinen: Lecture fee Amgen/Janssen
Teuvo LJ Tammela: paid consultant to the company Astellas, Amgen and Janssen-Cilag.

References

1. Prins, J., Blanker, M. H., Bohnen, A. M., Thomas, S., & Bosch, J. L. H. R. (2002). Prevalence of erectile dysfunction: a systematic review of population-based studies. International journal of impotence research, 14(6), 422-432.
2. Hannuksela, M. L., & Ellahham, S. (2001). Benefits and risks of sauna bathing. The American journal of medicine, 110(2), 118-126.
3. Laukkanen, J. A., Laukkanen, T., & Kunutsor, S. K. (2018,

August). Cardiovascular and other health benefits of sauna bathing: a review of the evidence. In Mayo clinic proceedings (Vol. 93, No. 8, pp. 1111-1121). Elsevier.
4. Rajfer, J. (2008). Discovery of NO in the penis. International journal of impotence research, 20(5), 431-436.
5. Shiri, R., Koskimäki, J., Häkkinen, J., Tammela, T. L., Huhtala, H., Hakama, M., & Auvinen, A. (2004). Effects of age, comorbidity and lifestyle factors on erectile function: Tampere Ageing Male Urological Study (TAMUS). European Urology, 45(5), 628-633.
6. Pöyhönen, A., Häkkinen, J. T., Koskimäki, J., Tammela, T. L., & Auvinen, A. (2014). Natural course of lower urinary tract symptoms in men not requiring treatment–a 5-year longitudinal population-based study. Urology, 83(2), 411-415.
7. Rosen, R. C., Cappelleri, J. C., Smith, M. D., Lipsky, J., & Pena, B. M. (1999). Development and evaluation of an abridged, 5-item version of the International Index of Erectile Function (IIEF-5) as a diagnostic tool for erectile dysfunction. International journal of impotence research, 11(6), 319-326.
8. Hussain, J., & Cohen, M. (2018). Clinical effects of regular dry sauna bathing: a systematic review. Evidence-Based Complementary and Alternative Medicine, 2018:1-30.
9. Patrick, R. P., & Johnson, T. L. (2021). Sauna use as a lifestyle practice to extend healthspan. Experimental Gerontology, 154, 111509.
10. Dishy, V., Sofowora, G., Harris, P. A., Kandcer, M., Zhan, F., Wood, A. J., & Stein, C. M. (2001). The effect of sildenafil on nitric oxide–mediated vasodilation in healthy men. Clinical Pharmacology & Therapeutics, 70(3), 270-279.
11. Garolla, A., Torino, M., Sartini, B., Cosci, I., Patassini, C., Carraro, U., & Foresta, C. (2013). Seminal and molecular evidence that sauna exposure affects human spermatogenesis. Human Reproduction, 28(4), 877-885.
12. Gülpinar, Ö., Haliloğlu, A. H., Abdulmajed, M. I., Bogğa, M. S., & Yaman, Ö. (2012). Help-seeking interval in erectile dysfunction: analysis of attitudes, beliefs, and factors affecting treatment-seeking interval in Turkish men with previously untreated erectile dysfunction. Journal of andrology, 33(4), 624-628.
13. Lee, L. J., Maguire, T. A., Maculaitis, M. C., Emir, B., Li, V. W., Jeffress, M., ... & Taylor, D. (2021). Increasing access to erectile dysfunction treatment via pharmacies to improve healthcare provider visits and quality of life: Results from a prospective real-world observational study in the United Kingdom. International Journal of Clinical Practice, 75(4), e13849.
14. Nackeeran, S., Havanur, A., Ory, J., Althof, S., & Ramasamy, R. (2021). Erectile Dysfunction is a Modifiable Risk Factor for Major Depressive Disorder: Analysis of a Federated Research Network. The Journal of Sexual Medicine, 18(12), 2005-2011.
15. Gupta, B. P., Murad, M. H., Clifton, M. M., Prokop, L., Nehra, A., & Kopecky, S. L. (2011). The effect of lifestyle modification and cardiovascular risk factor reduction on erectile dysfunction: a systematic review and meta-analysis. Archives of internal medicine, 171(20), 1797-1803.
16. Besiroglu, H., Otunctemur, A., & Ozbek, E. (2015). The relationship between metabolic syndrome, its components, and erectile dysfunction: a systematic review and a meta-analysis of observational studies. The Journal of Sexual Medicine, 12(6), 1309-1318.
17. Pöyhönen, A., Åkerla, J., Koskimäki, J., Tammela, T. L., & Auvinen, A. (2022). Sauna habits/bathing and changes in lower urinary tract symptoms–Tampere ageing male urologic study (TAMUS). Scandinavian Journal of Urology, 56(1), 77-82.