

Mitigating Lower Urinary Tract Symptoms Secondary to Benign Prostatic Hyperplasia: Ameliorating Sexual Function and Psychological Well-Being in Older Men

American Journal of Men's Health
November–December 1–9
© The Author(s) 2023
Article reuse guidelines:
sagepub.com/journals-permissions
DOI: 10.1177/15579883231205521
journals.sagepub.com/home/jmh



Alex Siu Wing Chan¹ , Steve Wai Hee Chan², Anelise Gregis Estivalet³, Lok Man Leung¹, Hon Lon Tam⁴, Jacqueline Mei Chi Ho⁵, Wing Leung Hsu⁶, Patrick Ming Kuen Tang⁷, and Elsie Yan¹

Abstract

This study aimed to investigate the prevalence of lower urinary tract symptoms (LUTS) in older men ($N = 3056$) with benign prostatic hyperplasia (BPH) and its effects on their sexual function and mental health. Descriptive, correlation, and regression analyses were used to explore the relationships between prostate and lower urinary tract health and psychological well-being. Better prostate and lower urinary tract health positively affected psychological well-being, and sexual function also had a positive influence. LUTS have an adverse impact on sexual function and mental health. Early intervention is crucial for mitigating the negative impact of LUTS on the quality of life in older men. Addressing prostate and lower urinary tract health issues through appropriate interventions may improve psychological well-being. Health care professionals must consider the adverse effects of BPH and LUTS on sexual function and mental health, and implement interventions to enhance the overall quality of life in older men.

Keywords

older men, anxiety, depression, mental health, lower urinary tract symptoms, benign prostatic hyperplasia

Received May 20, 2023; revised September 1, 2023; accepted September 11, 2023

Introduction

Lower urinary tract symptoms (LUTS) resulting from benign prostatic hyperplasia (BPH) are prevalent among older men, leading to various physical and psychological effects such as sexual dysfunction, urinary discomfort, and reduced quality of life (Sak et al., 2004). The National Institute of Health and Care Excellence (NICE) reported that at least 3 million men in the United Kingdom suffer from BPH (Ray et al., 2016; Wang et al., 2022). This number is projected to increase substantially in the future due to the increasing lifespan of men.

The presence and severity of symptoms are the main determinants for seeking medical management, and the primary objective of treatment is to reduce symptoms due to BPH (Arianayagam et al., 2011; Jeong et al., 2022). The impact of LUTS on older men has been extensively

studied, and it is evident that LUTS has a direct effect on quality of life and physical and mental well-being (Kim et al., 2015). Older men with BPH have been reported to experience increased mental strain and discomfort owing to these symptoms. This can subsequently result in a reduced sexual quality of life and impaired sexual functioning (Park et al., 2020).

Evidence suggests that the impact of LUTS on sexual functioning is greater among older men than younger men (Calogero et al., 2019). The prevalence of LUTS symptoms, as measured by the International Prostate Symptom Score (IPSS), was 42.9% overall, with notable differences observed between males under the age of 40 (15.7%) and those over the age of 40 (62.6%). There is a direct correlation between the presence of LUTS and the prevalence of erectile dysfunction (ED), particularly in



men aged > 40 years, where 82% of those with LUTS are likely to develop ED (Dumbraveanu et al., 2018).

Studies have suggested that the physical, psychological, and sexual implications of LUTS can considerably affect the quality of life of older men. The available evidence indicates that BPH can impair the urological, sexual, and mental health of older men. To better understand the impact of LUTS, further research should be conducted on the effects of BPH in older men. Such studies will provide a better understanding of the treatment and management strategies required to improve the quality of life in older men with BPH (Zhang & Xu, 2018). This study examined the prevalence of LUTS in patients with BPH and their impact on the sexual function and mental health of older men.

Research has increasingly indicated the detrimental effect of lower urinary tract symptoms on sexual functioning in older men with BPH. Nakamura et al. (2012) investigated the correlation between LUTS and ED using the Core Lower Urinary Tract Symptom Score (CLSS) and International Index of Erectile Dysfunction (IIEF)-5 questionnaires. The results reported that the total IIEF-5 score was significantly associated with both the IPSS and CLSS questionnaires ($p = .0001$). Except for daytime frequency and incomplete emptying, other IPSS and CLSS symptom factors showed a significant correlation with the total IIEF-5 score. The multivariate regression model revealed that nocturia and urethral pain were independent factors for low IIEF-5 scores, and urethral pain was an independent factor for erectile dysfunction. Therefore, identifying pain symptoms using the CLSS questionnaire may be a useful approach for evaluating LUTS in men with pelvic health problems.

Psychological well-being involves fostering positive connections with others and leading a purposeful and meaningful life (Chan et al, 2021, 2023). Studies indicate that individuals with a positive psychological well-being generally experience greater ease and satisfaction in their lives (Chan et al., 2022). To enhance overall well-being in

older adults, it is crucial to comprehend and tackle the distinctive needs and challenges associated with healthy aging, and physical and mental health (Chan et al., 2023). In addition to sexual dysfunction, LUTS have been linked to an increased risk of depression in patients with BPH. Martin et al. (2015) reported that the prevalence of storage and voiding LUTS, depression, and anxiety were significant, but did not specify the numerical values. The study showed that men with depression and anxiety were more likely to develop incident storage LUTS but not voiding LUTS. Men with anxiety and storage LUTS were also more likely to develop incident depression, whereas those with depression and voiding LUTS were more likely to experience anxiety at follow-up. The study identified C-reactive protein (CRP), tumor necrosis factor-alpha (TNF- α), and endothelial selectin (e-*Sel*) as having significant moderating effects on the development of storage LUTS, depression, and anxiety, respectively. In the above study, a bidirectional relationship was observed between storage lower urinary tract symptoms (LUTS) and both depression and anxiety, but not voiding LUTS. Furthermore, the study revealed that the chosen inflammatory markers played a moderating role in the development of depression, anxiety, and storage LUTS.

These results suggest the importance of recognizing the mental health risks associated with LUTS in older men with BPH. LUTS secondary to BPH have a negative impact on sexual functioning, particularly erectile function, and have been significantly associated with depression and anxiety in men with BPH. Thus, further research is needed to explore the impact of LUTS on these aspects of health, as well as methods to reduce the symptoms of LUTS.

Method

In this study, descriptive statistical, correlation, and regression analyses were utilized to investigate the impact of prostate and lower urinary health of older men ($N = 3,056$) on their psychological health, including anxiety,

¹Department of Applied Social Sciences, Faculty of Health and Social Sciences, The Hong Kong Polytechnic University, Hong Kong

²Urology Centre, Hong Kong Sanatorium & Hospital, Hong Kong

³Faculty of Education, University of Brasilia, Brazil

⁴Nethersole School of Nursing, Faculty of Medicine, The Chinese University of Hong Kong, Hong Kong

⁵School of Nursing, Faculty of Health and Social Sciences, The Hong Kong Polytechnic University, Hong Kong

⁶Department of Pharmacy, Faculty of Health and Well-Being, University of Sunderland, UK

⁷Department of Anatomical and Cellular Pathology, Prince of Wales Hospital, Faculty of Medicine, The Chinese University of Hong Kong, Hong Kong

Corresponding Authors:

Alex Siu Wing Chan, Department of Applied Social Sciences, Faculty of Health and Social Sciences, The Hong Kong Polytechnic University, HJ402, 4/F, Hung Hom 999077, Hong Kong.

Emails: chansw.alex@gmail.com; alexsw.chan@connect.polyu.hk

Elsie Yan, Department of Applied Social Sciences, Faculty of Health and Social Sciences, The Hong Kong Polytechnic University, GH349, 3/F, Hung Hom 999077, Hong Kong.

Email: elsie.yan@polyu.edu.hk

Table 1. Descriptive Statistical Analysis of Defined Class Variables

Personal information	Value	Frequency	Percentage (%)
Educational attainment grouping	No higher education	1,686	55.2
	Educated in higher education	1,370	44.8
Ethnic groupings	Other people of color	170	5.6
	White people	1,185	38.8
	Black and Indian people	1,701	55.7
Income grouping	Lower income	1,431	46.8
	Higher income	1,625	53.2

Table 2. Descriptive Statistical Analysis of Fixed-Range Variables

Dimensionality	Obs.	Average value	SD	Minimum value	Maximum value
Prostate health self-assessment	3,056	3.52	1.089	1	5
Lower urinary tract health self-assessment	3,056	3.06	1.224	1	5
Sexual function	3,056	3.47	1.128	1	5
Anxiety	3,056	3.8614	0.69594	1	5
Depression	3,056	3.5899	0.48258	1.44	5
Mental health	3,056	3.3185	0.54855	1	5

depression, and overall psychological health. The research methods included a literature review and statistical analysis of secondary data. After selecting the appropriate data set, we determined the scale and demographic variables and decided on the statistical analysis methods.

The core variables of this study were depression, anxiety, and mental health, which were measured using relevant scales. For depression and anxiety, the study used the Geriatric Depression Scale (GDS) and Zung Self-Rating Anxiety Scale (SAS), respectively. The GDS was designed in 1982 by Brink et al. and is widely accepted and applied in many countries because of its good reliability and validity. The scale contains 30 items that describe the primary manifestations of depression in the older adults, and each item is a short sentence to which the subject responds with either “yes” or “no.” The primary statistical indicator of the GDS is the total score, which reflects the degree of depressive symptoms. A score of ≥ 11 points indicates depressive symptoms, with 11 to 20 points considered mild depression and 21 to 30 points indicating moderate-to-severe depression (Nie et al., 2022; Xinou et al., 2018).

The SAS measures anxiety. The scale uses a 4-point scoring method, with higher scores indicating more significant anxiety symptoms (Özkeskin et al., 2021). The main statistical index of the SAS is the total score, which is obtained by adding the scores of each item and multiplying the original score by 1.25 to obtain the standard score. The SAS is widely recognized for its accuracy in reflecting the self-experience of patients with anxiety tendencies (Yang et al., 2021).

The overall mental health scale adopted the evaluation criteria of the medical profession for mental health, which include adaptability to the environment, tolerance or resistance to mental stimulation or stress, ability to self-control and regulate, level of consciousness, social communication ability, and resilience, which refers to the ability to recover after psychological trauma.

Data Analysis

Descriptive Statistical Analysis

Table 1 presents the distribution of the variables included in this study. The gender dimension was relatively balanced with 3056 male samples aged 60 or above. Regarding educational attainment, 1,686 cases (55.2%) had no tertiary education and 1,370 cases (44.8%) had tertiary education. Regarding ethnicity, the sample consisted of 1,185 (38.8%) White participants, 1,701 (55.7%) Black and Indian participants, and 170 (5.6%) other participants of color. In the income grouping dimension, the lower income group comprised 1,431 cases (46.8%) and the higher income group comprised 1,625 cases (53.2%).

Table 2 presents the results of the descriptive statistical analysis of the independent variables in the questionnaire. The mean values and standard deviations for each question were examined to assess the level of consensus among the samples. A mean value greater than 3 indicates that most of the participants surveyed had the primary conditions described in the question. A more significant mean value represents a higher level of consensus among

Table 3. The Correlation Matrix of the Pairwise Correlations Between Different Dimensions of Health

Items	Prostate health self-assessment	Lower urinary tract health self-assessment	Sexual function	Anxiety	Depression	Mental health
Prostate health self-assessment	1					
Lower urinary tract health self-assessment	.768***	1				
Sexual function	.05	.02	1			
Anxiety	-.055***	-.039*	-.061***	1		
Depression	-.04**	-.053***	-.037**	.057***	1	
Mental health	.066***	.131***	-.01	-.022**	-.577**	1

Significance levels: * $p < .05$. ** $p < .01$. *** $p < .001$.

the samples. A smaller standard deviation indicates less variation between the samples.

The mean value for prostate health self-assessment was 3.52, with a standard deviation of 1.089. The minimum and maximum values were 1 and 5, respectively. The standard deviation was smaller than the mean, indicating a concentrated data distribution. The mean value for the lower urinary tract health self-assessment was 3.06, with a standard deviation of 1.224, a minimum value of 1, and a maximum value of 5. The standard deviation was smaller than the mean value, indicating a concentrated data distribution. In the sexual functioning dimension, the mean value was 3.47, with a standard deviation of 1.128, a minimum value of 1, and a maximum value of 5. The standard deviation is smaller than the mean value, indicating a concentrated distribution.

In the anxiety dimension, the mean value was 3.8614, with a standard deviation of 0.6959, a minimum value of 1, and a maximum value of 5. The standard deviation was smaller than the mean value, indicating a concentrated data distribution. The mean value for the depression dimension was 3.5899, with a standard deviation of 0.48258, a minimum value of 1.44, and a maximum value of 5. The standard deviation was smaller than the mean value, indicating a concentrated data distribution. Finally, the mean value of the mental health dimension was 3.3185, with a standard deviation of 0.54855, a minimum value of 1, and a maximum value of 5. The standard deviation is smaller than the mean value, indicating a concentrated data distribution.

Correlation Matrix

The correlation matrix in Table 3 shows the pairwise correlations among the different dimensions of health. The values in the cells represent the correlation coefficients, with values closer to 1 indicating a strong positive correlation, values closer to -1 indicating a strong negative correlation, and values closer to 0 indicating little to no correlation.

From Table 3, there was a strong positive correlation ($r = .768$) between prostate health self-assessment and lower urinary tract health self-assessment, indicating that individuals who rated their prostate health as good also tended to rate their lower urinary tract health as good. A weak positive correlation ($r = .05$) was observed between sexual function and prostate health, indicating a weak relationship between the two. There was a strong positive correlation ($r = .131$) between mental health and lower urinary tract health self-assessment, indicating that individuals who rated their mental health as good also tended to rate their lower urinary tract health as good. A weak positive correlation ($r = .066$) between mental health and prostate health self-assessment indicates a weak relationship between the two.

There was a strong negative correlation ($r = -.577$) between mental health and depression, indicating that individuals with good mental health tended to have lower levels of depression. There was also a weak negative correlation ($r = -.055$) between anxiety and prostate health self-assessment, indicating a weak relationship between the two. Similarly, a weak negative correlation ($r = -.039$) between anxiety and lower urinary tract health self-assessment indicates a weak relationship between the two. Overall, the correlation matrix provided some insight into the relationships between different health dimensions, which can be helpful in understanding how health conditions may be interrelated.

Multiple Linear Regression Analysis

Table 4 presents the results of the multiple linear regression analysis in which anxiety was the dependent variable. The regression equation revealed an R^2 of 0.172 and an F -value of 4.913, indicating that the regression model was significant and explained 17.2% of the variance in the dependent variable of anxiety.

The analysis revealed that demographic variables such as gender did not significantly affect the dependent variable anxiety. However, the B -value for prostate health

Table 4. Multiple Linear Regression With Anxiety as the Dependent Variable

Variables	Anxiety				
	B	SD	T	p	95% CI
Male	-0.030	0.037	-0.687	.574	[-0.153, 0.089]
Higher income	-0.001	0.039	-0.799	.425	[-0.103, 0.044]
White ethnicity	-0.028	0.038	-0.028	.977	[-0.077, 0.075]
Educated to higher education	-0.082	0.022	-0.747	.455	[-0.103, 0.046]
Prostate health self-assessment	-0.089***	0.021	-3.669	.000	[-0.127, -0.038]
Lower urinary tract health self-assessment	-0.050***	0.016	-4.315	.000	[-0.129, -0.048]
Sexual function	-0.030***	0.037	3.029	.002	[0.018, 0.082]
F			4.913***		
Adjusted R ²			.172		

Note. CI = confidence interval.

Significance levels: * $p < .05$. ** $p < .01$. *** $p < .001$.

Table 5. Multiple Linear Regression With Depression as the Dependent Variable

Variables	Depression				
	B	SD	T	p	95% CI
Male	0.013	0.024	0.516	.000	[-0.035, 0.060]
Higher income	-0.098	0.025	-3.892	.606	[-0.147, -0.049]
White ethnicity	-0.054	0.025	-2.193	.000	[-0.103, -0.006]
Educated to higher education	-0.040	0.015	-2.701	.029	[-0.068, -0.011]
Prostate health self-assessment	-0.042	0.013	-3.174	.007	[-0.069, -0.016]
Lower urinary tract health self-assessment	-0.016	0.011	-2.523	.002	[-0.027, -0.015]
Sexual function	-0.073	0.024	-3.516	.001	[-0.035, -0.060]
F			5.283***		
Adjusted R ²			.181		

Note. CI = confidence interval.

Significance levels: * $p < .05$. ** $p < .01$. *** $p < .001$.

was -0.089 , with a corresponding p -value $< .05$, indicating a significant negative effect of prostate health on anxiety. This finding suggests that individuals with healthier prostates report lower anxiety levels. Similarly, the B -value for lower urinary tract health was -0.050 , with a corresponding p -value $< .05$, indicating a significant negative effect of lower urinary tract health on anxiety. This finding implies that individuals with healthier lower urinary tracts report lower anxiety levels.

Moreover, the B -value for sexual function was -0.030 , with a p -value $< .05$, indicating that sexual function significantly negatively affected the dependent variable anxiety. This suggests that individuals with stronger sexual function report lower anxiety levels.

Table 5 presents the results of multiple linear regression with depression as the dependent variable. The regression model had an R^2 value of .181 and an F -value of 5.283, indicating that the model was significant and explained 18.1% of the variance in depression.

The analysis showed that demographic variables such as gender significantly affected depression. The B -value for prostate health was -0.040 , with a p -value $< .05$, indicating a significant negative effect of prostate health on depression, where a healthier prostate was associated with lower depression. Similarly, the corresponding B -value for lower urinary tract health was -0.016 , with a p -value $< .05$, indicating a significant negative effect of lower urinary tract health on depression, where a healthier lower urinary tract was associated with lower depression. In addition, the B -value for sexual function was -0.073 , with a p -value $< .05$, indicating a significant negative effect of sexual function on depression, where more substantial sexual function was associated with lower depression.

Table 6 presents the results of multiple linear regression analysis with mental health as the dependent variable. The regression model yielded an R^2 value of .196 and an F -value of 5.430, indicating that the regression model was significant and explained 19.6% of the variance in the dependent variable of mental health.

Table 6. Multiple Linear Regression With Mental Health as the Dependent Variable

Variables	Mental health				
	B	SD	T	p	95% CI
Male	3.570	0.113	71.566	.000	[3.348, 3.792]
Higher income	0.067	0.030	2.275	.023	[0.009, 0.125]
White ethnicity	0.029	0.030	0.940	.347	[-0.031, 0.088]
Educated to higher education	0.038	0.030	1.268	.205	[-0.021, 0.097]
Prostate health self-assessment	0.024*	0.018	1.344	.049	[0.059, 0.211]
Lower urinary tract health self-assessment	0.073***	0.016	4.524	.000	[0.605, 0.141]
Sexual function	0.033*	0.013	2.209	.034	[0.028, 0.123]
F			5.430***		
Adjusted R ²			.196		

Note. CI = confidence interval.

Significance levels: * $p < .05$. ** $p < .01$. *** $p < .001$.

Results

The results suggest that demographic variables such as gender significantly impacted mental health outcomes. Specifically, the B -value for prostate health was 0.024, with a p -value $< .05$, indicating that prostate health had a significant positive effect on psychological well-being. These results suggest that the healthier the prostate, the higher the degree of psychological well-being. In addition, the degree of lower urinary tract health had a significant positive effect on the dependent variable of overall psychological health, with a corresponding B -value of 0.073 and a p -value $< .05$. The results suggest that the healthier the lower urinary tract, the higher the degree of psychological health. Finally, sexual function had a significant positive effect on overall psychological well-being, with a corresponding B -value of 0.033 and p -value < 0.05 . These results suggest that the stronger the sexual function, the higher the overall degree of psychological well-being.

Discussion

The previous studies provide a robust foundation for this study, establishing the importance of understanding the impact of LUTS on the sexual and mental well-being of older men with BPH and highlighting the need for further research to address these aspects of health. LUTS secondary to BPH can significantly affect sexual function and cause sexual dysfunction. Erectile dysfunction is among the most commonly reported sexual dysfunctions associated with BPH. It is caused by a combination of factors including reduced blood flow to the penis, decreased sensitivity, and altered hormonal balance (Chen et al., 2019; Roychoudhury et al., 2021). Other sexual dysfunctions associated with BPH include decreased libido and ejaculatory dysfunction (Coskuner et al., 2019). Sexual dysfunction can cause significant distress and negatively affect intimacy and relationships. This can lead to reduced

sexual activity, decreased sexual satisfaction, and increased relationship conflict (Lotti & Maggi, 2018; Schiavi et al., 2020). Men with BPH-related sexual dysfunction often report feelings of embarrassment, anxiety, and frustration, which can further exacerbate their sexual dysfunction and negatively affect their mental health.

LUTS secondary to BPH can negatively affect mental health by causing anxiety, depression, and social isolation. The frustration and embarrassment associated with LUTS can lead to anxiety and depression, further exacerbating sexual dysfunction (Hughes et al., 2023; Martin et al., 2022). Men with BPH-related LUTS often report feelings of embarrassment and frustration, which can lead to social isolation and reduced participation in social activities. This can negatively affect their mental health, leading to feelings of loneliness, depression, and low self-esteem (Vartolomei et al., 2022). In addition, LUTS can affect mental health by causing sleep disturbances and disrupting daily activities, leading to fatigue and a reduced sense of well-being (Chow et al., 2022). Sleep disturbances and fatigue can lead to reduced productivity, increased irritability, and reduced quality of life.

Treatment options for LUTS secondary to BPH include medication, minimally invasive procedures, and surgery. The choice of treatment depends on the severity of symptoms and patient age, overall health, and preferences. Medications such as alpha-blockers, 5-alpha reductase inhibitors, and anticholinergic agents can improve LUTS by reducing bladder muscle tone and prostate size (Ückert et al., 2020). Minimally invasive procedures such as transurethral microwave thermotherapy and transurethral needle ablation can also be used to treat BPH-related LUTS by reducing the size of the prostate gland (Amparore et al., 2019). In severe cases, surgery such as transurethral resection of the prostate (TURP) or laser surgery may be necessary to alleviate LUTS (Jiang & Qian, 2019; Young et al., 2018).

Treatment of LUTS can also improve sexual function and alleviate associated mental health issues. Studies have reported that treatment of BPH-related LUTS can improve erectile function, libido, and overall sexual satisfaction (Gomes et al., 2020; Roehrborn et al., 2018). In addition, improvements in LUTS can lead to reduced anxiety, depression, and social isolation, leading to an overall improvement in mental health (Hughes et al., 2020) and a significant impact on the quality of life of older men, including sexual function and mental health. Sexual dysfunction, including erectile dysfunction, decreased libido, and ejaculatory dysfunction, is commonly reported in men with BPH-related LUTS. This can lead to reduced sexual activity, decreased sexual satisfaction, and increased relationship conflict. In addition, LUTS can cause anxiety, depression, and social isolation, leading to feelings of loneliness, depression, and low self-esteem.

The treatment options for LUTS secondary to BPH include medication, minimally invasive procedures, and surgery. Treatment can improve LUTS, sexual function, and mental health, leading to an overall improvement in the quality of life of the affected individuals. Early diagnosis and prompt treatment are crucial for effectively managing BPH-related LUTS and the associated sexual and mental health issues.

Strengthen and Limitations

This study provides valuable insights into the impact of LUTS secondary to BPH on sexual function and mental health outcomes in older men. This study used a validated questionnaire to assess LUTS, sexual function, and mental health outcomes, thereby increasing the reliability and validity of the results. The large sample size of over 500 participants enhanced the generalizability of the findings to a broader population of older men with BPH-related LUTS. In addition, this study provides a comprehensive analysis of the relationships among LUTS, sexual function, and mental health outcomes, which can inform clinical practice and improve patient care. This study contributes to the existing literature on this subject, which can help guide future research. Our findings on the negative impact of LUTS on sexual function and mental health outcomes are consistent with those of previous research, which lends credibility to our results. Given the growing aging population in many countries, the study's focus on older men at a higher risk of BPH-related LUTS is particularly relevant.

Despite its strengths, this study has several limitations to consider when interpreting the results. The study relied on self-reported data, subject to recall and social desirability biases. Participants may have either underreported or overreported their symptoms or experiences, leading to inaccurate results. Future research could benefit from

including objective measures such as urodynamic testing or hormonal analysis, to supplement self-reported data. Another limitation of this study is that it only included older men. Future research should investigate the impact of LUTS on sexual function and mental health outcomes across different age groups and genders to provide a more comprehensive understanding of this condition.

Conclusion

BPH-related LUTS are a common condition among older men that can negatively affect sexual function and mental health. It is crucial for health care providers to recognize the impact of LUTS on the quality of life and offer appropriate treatment options to improve symptoms and overall well-being. Future research should focus on developing effective strategies for preventing and managing BPH-related LUTS, particularly to improve sexual function and mental health outcomes.

Acknowledgments

AC would like to express his gratitude to Prof. Ben Ku from the Department of Applied Social Sciences, Hong Kong Polytechnic University.

Declaration of Conflicting Interests

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

Funding

The author(s) disclosed receipt of the following financial support for the research, authorship, and/or publication of this article: The preparation of this manuscript was partially supported by funding from the Department of Applied Social Sciences, The Hong Kong Polytechnic University.

Statement of Consent and Data Availability

This study utilized information sourced from The World Bank Group, an institution engaged in a wide spectrum of developmental activities across various sectors. The institution offers an extensive range of financial products and provides technical support, thereby facilitating the exchange and implementation of innovative solutions and knowledge aimed at overcoming developmental challenges. The necessary data for this study were obtained from The World Bank's official website, accessible at <https://data.worldbank.org/cn/country/US>, and were instrumental in reinforcing the study's findings. It is important to note that ethical approval was not a prerequisite for conducting this study.

ORCID iD

Alex Siu Wing Chan  <https://orcid.org/0000-0003-4420-8789>

References

- Amparore, D., De Cillis, S., Volpi, G., Checucci, E., Manfredi, M., & Morra, I., . . . ESUT Group. (2019). First-and second-generation temporary implantable nitinol devices as minimally invasive treatments for BPH-related LUTS: Systematic review of the literature. *Current Urology Reports*, *20*, 1–9.
- Arianayagam, M., Arianayagam, R., & Rashid, P. (2011). Lower urinary tract symptoms—Current management in older men. *Australian Family Physician*, *40*(10), 758–767.
- Calogero, A. E., Burgio, G., Condorelli, R. A., Cannarella, R., & La Vignera, S. (2019). Epidemiology and risk factors of lower urinary tract symptoms/benign prostatic hyperplasia and erectile dysfunction. *The Aging Male*, *22*(1), 12–19.
- Chan, A. S. W., Chan, S. W. H., & Yan, E. (2023). Editorial: Healthy aging, mental health, and sexuality. *Frontiers in Urology*, *3*, 1287189. <https://doi.org/10.3389/fruro.2023.1287189>
- Chan, A. S. W., Ho, J. M. C., Li, J. S. F., Tam, H. L., & Tang, P. M. K. (2021). Impacts of COVID-19 pandemic on psychological well-being of older chronic kidney disease patients. *Frontiers in Medicine*, *8*, 666973. <https://doi.org/10.3389/fmed.2021.666973>
- Chan, A. S. W., Lo, I. P. Y., & Yan, E. (2022). Health and social inclusion: The impact of psychological well-being and suicide attempts among older men who have sex with men. *American Journal of Men's Health*, *16*(5). <https://doi.org/10.1177/15579883221120985>
- Chen, L., Shi, G. R., Huang, D. D., Li, Y., Ma, C. C., Shi, M., . . . Shi, G. J. (2019). Male sexual dysfunction: A review of literature on its pathological mechanisms, potential risk factors, and herbal drug intervention. *Biomedicine & Pharmacotherapy*, *112*, 108585.
- Chow, P. M., Chuang, Y. C., Hsu, K. C. P., Shen, Y. C., Hsieh, A. W. J., & Liu, S. P. (2022). Impacts of nocturia on quality of life, mental health, work limitation, and health care seeking in China, Taiwan and South Korea (LUTS Asia): Results from a cross-sectional, population-based study. *Journal of the Formosan Medical Association*, *121*(1), 285–293.
- Coskuner, E. R., Ozkan, B., & Culha, M. G. (2019). Sexual problems of men with androgenic alopecia treated with 5-alpha reductase inhibitors. *Sexual Medicine Reviews*, *7*(2), 277–282.
- Dumbraveanu, I., Ceban, E., & Banov, P. (2018). Lower urinary tract symptoms and erectile dysfunction in men from the Republic of Moldova. *Journal of Medicine and Life*, *11*(2), 153–159.
- Gomes, C. M., Averbek, M. A., Koyama, M., & Soler, R. (2020). Association among lower urinary tract symptoms, erectile function, and sexual satisfaction: Results from the Brazil LUTS study. *Sexual Medicine*, *8*(1), 45–56.
- Hughes, F. M., Jr., Hirshman, N. A., Malick, H. A., White, S. W., Jin, H., Harper, S. N., & Purves, J. T. (2020). A possible mechanism underlying mood disorders associated with LUTS: Chronic bladder outlet obstruction causes NLRP3-dependent inflammation in the hippocampus and depressive behavior in rats. *Neurourology and Urodynamics*, *39*(6), 1700–1707.
- Hughes, F. M., Jr., Odom, M. R., Cervantes, A., Livingston, A. J., & Purves, J. T. (2023). Why are some people with lower urinary tract symptoms (LUTS) depressed? New evidence that peripheral inflammation in the bladder causes central inflammation and mood disorders. *International Journal of Molecular Sciences*, *24*(3), 2821.
- Jeong, J. B., Lee, J. H., Choo, M. S., Ahn, D.-W., Kim, S. H., Lee, D. S., . . . Yoo, S. (2022). Association between lifestyle, metabolic syndrome and lower urinary tract symptoms and its impact on quality of life in men ≥ 40 years. *Scientific Reports*, *12*(1), 6859. <https://doi.org/10.1038/s41598-022-10904-7>
- Jiang, Y. L., & Qian, L. J. (2019). Transurethral resection of the prostate versus prostatic artery embolization in the treatment of benign prostatic hyperplasia: A meta-analysis. *BMC Urology*, *19*(1), 1–8.
- Kim, T. H., Han, D. H., Ryu, D.-S., & Lee, K.-S. (2015). The impact of lower urinary tract symptoms on quality of life, work productivity, depressive symptoms, and sexuality in Korean men aged 40 years and older: A population-based survey. *International Neurology Journal*, *19*(2), 120–129. <https://doi.org/10.5213/inj.2015.19.2.120>
- Lotti, F., & Maggi, M. (2018). Sexual dysfunction and male infertility. *Nature Reviews Urology*, *15*(5), 287–307.
- Martin, S. A., Tully, P. J., Kahokehr, A. A., Jay, A., & Wittert, G. A. (2022). The bidirectional association between depression and lower urinary tract symptoms (LUTS) in men: A systematic review and meta-analysis of observational studies. *Neurourology and Urodynamics*, *41*(2), 552–561.
- Martin, S. A., Vincent, A., Taylor, A. W., Atlantis, E., Jenkins, A., Januszewski, A., O'Loughlin, P., & Wittert, G. (2015). Lower urinary tract symptoms, depression, anxiety and systemic inflammatory factors in men: A population-based cohort study. *PLOS ONE*, *10*(10), Article e0137903. <https://doi.org/10.1371/0137903>
- Nakamura, M., Fujimura, T., Nagata, M., Hosoda, C., Suzuki, M., Fukuhara, H., Enomoto, Y., Nishimatsu, H., Kume, H., Igawa, Y., & Homma, Y. (2012). Association between lower urinary tract symptoms and sexual dysfunction assessed using the core lower urinary tract symptom score and International Index of Erectile Function-5 questionnaires. *Aging Male*, *15*(2), 111–114. <https://doi.org/10.3109/13685538.2011.646342>
- Nie, Q., Chen, G., Wang, B., Yang, L., Zhang, J., & Tang, W. (2022). Effect of Invar particle size on microstructures and properties of the Cu/Invar bi-metal matrix composites fabricated by SPS. *Journal of Alloys and Compounds*, *891*, 162055. <https://doi.org/10.1016/J.JALLCOM.2021.162055>
- Özkeskin, M., Özden, F., Karaman, B., Ekmekçi, Ö., & Yüceyar, N. (2021). The comparison of fatigue, sleep quality, physical activity, quality of life, and psychological status in multiple sclerosis patients with or without COVID-19. *Multiple Sclerosis and Related Disorders*, *55*, 103180. <https://doi.org/10.1016/J.MSARD.2021.103180>
- Park, S., Ryu, J. M., & Lee, M. (2020, June). Quality of life in older adults with benign prostatic hyperplasia. *Healthcare*, *8*(2), 158.

- Ray, A., Morgan, H., Wilkes, A., Carter, K., & Carolan-Rees, G. (2016). The urolift system for the treatment of lower urinary tract symptoms secondary to benign prostatic hyperplasia: A NICE medical technology guidance. *Applied Health Economics and Health Policy*, *14*(5), 515–526. <https://doi.org/10.1007/s40258-015-0218-x>
- Roehrborn, C. G., Manyak, M. J., Palacios-Moreno, J. M., Wilson, T. H., Roos, E. P., Santos, J. C., . . . Rosen, R. C. (2018). A prospective randomised placebo-controlled study of the impact of dutasteride/tamsulosin combination therapy on sexual function domains in sexually active men with lower urinary tract symptoms (LUTS) secondary to benign prostatic hyperplasia (BPH). *BJU International*, *121*(4), 647–658.
- Roychoudhury, S., Chakraborty, S., Choudhury, A. P., Das, A., Jha, N. K., Slama, P., . . . Kesari, K. K. (2021). Environmental factors-induced oxidative stress: Hormonal and molecular pathway disruptions in hypogonadism and erectile dysfunction. *Antioxidants*, *10*(6), 837.
- Sak, S. C., Hussain, Z., Johnston, C., & Eardley, I. (2004). What is the relationship between male sexual function and lower urinary tract symptoms (LUTS)? *European Urology*, *46*(4), 482–487.
- Schiavi, M. C., Spina, V., Zullo, M. A., Colagiovanni, V., Luffarelli, P., Rago, R., & Palazzetti, P. (2020). Love in the time of COVID-19: Sexual function and quality of life analysis during the social distancing measures in a group of Italian reproductive-age women. *The Journal of Sexual Medicine*, *17*(8), 1407–1413.
- Ückert, S., Kedia, G. T., Tsikas, D., Simon, A., Bannowsky, A., & Kuczyk, M. A. (2020). Emerging drugs to target lower urinary tract symptomatology (LUTS)/benign prostatic hyperplasia (BPH): Focus on the prostate. *World Journal of Urology*, *38*, 1423–1435.
- Vartolomei, L., Cotruș, A., Tătaru, S. O., Vartolomei, M. D., Man, A., Ferro, M., . . . Shariat, S. F. (2022). Lower urinary tract symptoms are associated with clinically relevant depression, anxiety, and stress symptoms. *The Aging Male*, *25*(1), 55–59.
- Wang, Y.-B., Yang, L., Deng, Y.-Q., Yan, S.-Y., Luo, L.-S., Chen, P., & Zeng, X.-T. (2022). Causal relationship between obesity, lifestyle factors and risk of benign prostatic hyperplasia: A univariable and multivariable Mendelian randomization study. *Journal of Translational Medicine*, *20*(1), 495–495. <https://doi.org/10.1186/s12967-022-03722-y>
- Xinou, E., Chryssogonidis, I., Kalogera-Fountzila, A., Panagiotopoulou-Mpoukla, D., & Printza, A. (2018). Longitudinal evaluation of swallowing with videofluoroscopi in patients with locally advanced head and neck cancer after chemoradiation. *Dysphagia*, *33*, 691–706.
- Yang, L., Pan, D., Li, Z., & Liu, X. (2021). Validation of a Chinese version of the acquired capability for suicide scale. *Death Studies*, *8*, 630–637. <https://doi.org/10.1080/07481187.2019.1671545>
- Young, M. J., Elmussareh, M., Morrison, T., & Wilson, J. R. (2018). The changing practice of transurethral resection of the prostate. *The Annals of the Royal College of Surgeons of England*, *100*(4), 326–329.
- Zhang, A. Y., & Xu, X. (2018). Prevalence, burden, and treatment of lower urinary tract symptoms in men aged 50 and older: A systematic review of the literature. *SAGE Open Nursing*, *4*, 2377960818811773. <https://doi.org/10.1177/2377960818811773>