

MINI-REVIEW

The impact of the treatment of benign prostatic hyperplasia with lower urinary tract symptoms on quality of life, a scoping literature review aided by AI

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Abstract

Benign prostatic hyperplasia (BPH) refers to a non-cancerous condition characterized by hyperplastic changes in stromal and epithelial cells. BPH can cause lower urinary tract symptoms (LUTS) that decrease quality of life (QoL). The International Prostate Symptom Score (IPSS) is a validated tool used to assess and guide the management of LUTS. This scoping review evaluated the difference in IPSS and QoL in patients with BPH and LUTS before and after medical or interventional treatment. A PubMed search was conducted using: (Benign prostatic hyperplasia OR lower urinary tract symptoms) AND (erectile dysfunction OR depression OR disability-adjusted life year OR quality of life), which yielded 7143 results over 10 years. With the use of artificial intelligence (AI), 31 articles were included in the study. Randomized control trials, prospective clinical trials, prospective and retrospective cohort studies, and meta-analyses were included. IPSS and IPSS-QoL measurements before and after intervention were required. Data was assessed in three categories “overall”, “medical” and “interventional”. Mean age, IPSS and QoL scores before and after intervention were calculated, as well as the Pearson correlation between baseline IPSS and QoL. Thirteen articles were categorized as medical while 18 were categorized as interventional. Pearson correlation between IPSS and QoL for overall, medical and interventional articles were $r = 0.72$, 0.79 and 0.36 , respectively. There was an improvement in the QoL score by 1.28 points, 1.40 points, 2.49 points for overall, medical, and interventional groups, respectively. This study quantified the improvement in QoL after medical and interventional treatment of BPH. There is a strong correlation between the severity of BPH symptoms and the reduction of QoL. Improvement of BPH symptoms with medical and surgical treatments is associated with significant improvement in QoL.

Keywords

Benign prostatic hyperplasia; Lower urinary tract symptoms; Quality of life; Intervention

1. Introduction

Benign prostatic hyperplasia (BPH) is a non-cancerous, multifocal condition characterized by gradual and hyperplastic changes in stromal and epithelial cells. Prostate histopathology studies have suggested diagnosis of BPH increases each year, and 50% of men between the ages of 51 and 60 had pathological features [1]. In 2019, the worldwide prevalence of BPH/LUTS among men aged 40 years and older was estimated at 94.0 million, corresponding to an age-standardized prevalence of 2480 per 100,000 men [2].

The clinical definition of BPH refers to prostate adenoma, causing bladder outlet obstruction (BOO) resulting in varying lower urinary tract symptoms (LUTS) [3]. LUTS include urinary incontinence, overactive bladder symptoms, micturition difficulties, and voiding issues which include nocturia [4].

While each patient has a different symptom tolerance, LUTS can affect health beyond the urinary tract. Heightened urinary symptom severity is correlated with an increased prevalence of mobility issues, self-care difficulties, limitations in usual activities, pain/discomfort, and anxiety/depression among men, underscoring the broader impact on both mental and physical well-being [5].

Several questionnaires are utilized to assess the severity of LUTS as it relates to BPH and the impact the symptoms have on patients' quality of life (QoL). The International Prostate Symptom Score (IPSS) is a standardized and validated tool used to quickly assess and guide the management of LUTS [5]. IPSS and QoL are related to one another, for example, patients who experience nocturia, with greater than 2 voids per night have been shown to have worse mental and physical health status [2].

The management of BPH/LUTS includes both medications and procedures such as surgery or laser therapy. Both treatment modalities have been shown to improve QoL [6]. This scoping review aimed to evaluate the impact of BPH/LUTS on QoL through the difference in IPSS and QoL in patients with BPH/LUTS before and after medical or interventional treatment.

2. Materials and methods

A PubMed search was conducted using: (Benign prostatic hyperplasia OR lower urinary tract symptoms) AND (erectile dysfunction OR depression OR disability-adjusted life year OR quality of life), which yielded 7143 results over the last 10 years. The results were uploaded to [Rayyan.ai](#) (an AI website software that can extract key information from studies that allow for efficient filtering of articles). [Rayyan.ai](#) is able to “read” thousands of articles, with the ability to identify keywords, duplicate studies, and types of research studies (*i.e.*, systematic reviews, cohort studies, *etc.*) in a given list of articles. From this identification process, investigators can choose to include and exclude articles based on keywords and study types. Investigators can also manually include and exclude articles in the software. In Rayyan, articles containing the keywords “BPH” and “QoL” were included. Rayyan excluded 6099 articles based on the missing keywords. The remaining articles were independently reviewed in Rayyan by four co-authors for relevance.

Symptom severity was measured with the IPSS, with a higher score indicating worse symptoms. QoL was measured by the Bother score, the 8th question in the IPSS, with a higher score indicating worse QoL. For articles to be included, IPSS and IPSS-QoL measurements were required before and after an intervention. Randomized controlled trials, prospective clinical trials, prospective and retrospective cohort studies, and meta-analyses were included. Systematic reviews and abstract-only articles were excluded. Articles that did not have IPSS and QoL measures before and after an intervention were also excluded. Analysis of the articles was conducted by calculating mean age, IPSS and QoL scores before and after intervention. The articles were further categorized into subsets (overall, medical and interventional) and respective means were calculated. Comparisons between IPSS and QoL were analyzed with Pearson correlation.

3. Results

A total of 7143 articles were identified, 31 of which were full-text reviewed and satisfied inclusion criteria [7–37]. The screening process is shown in Fig. 1. Follow-up of the studies ranged from three months to five years and the sample size ranged from 30 to 1713.

Data was assessed in three categories “overall”, “medical” and “interventional”; based on article content. Mean IPSS and QoL at baseline and post-intervention were calculated and shown in Table 1. Thirteen articles were categorized as medical while 18 were categorized as interventional. Interventions included prostatectomy (laser and open), transurethral prostate split, photo-selective vaporization, holmium-laser enucleation,

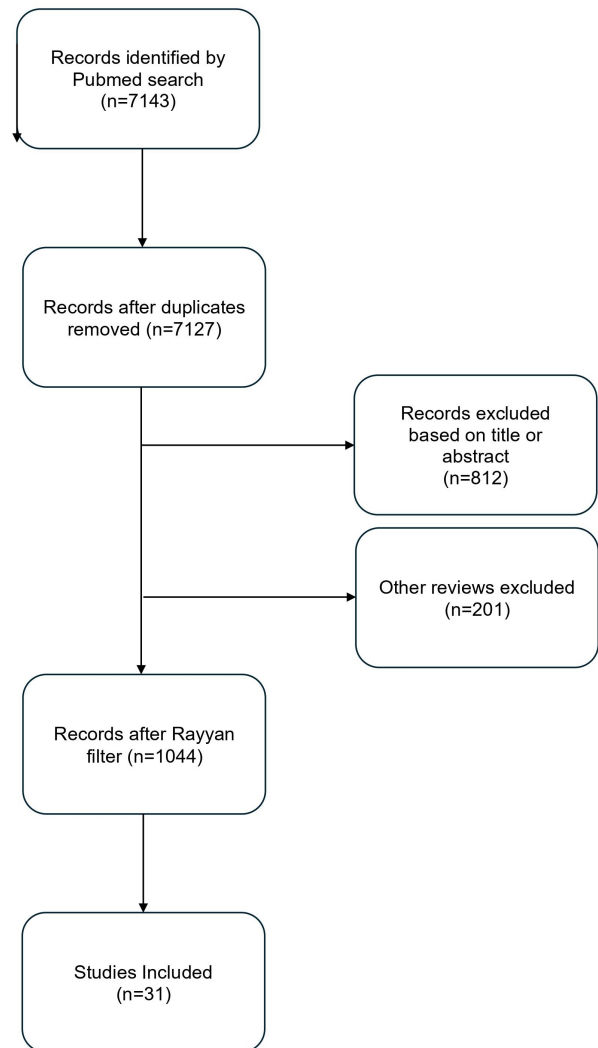


FIGURE 1. Flow diagram of bibliographic retrievals and results.

water vapor thermal therapy, prostatic artery embolization, and prostatic urethral lift. The overall mean age was 65.37 ± 4.82 . The mean age in the medical and interventional articles was 62.23 ± 3.91 and 67.81 ± 4.02 , respectively.

IPSS means are shown in Fig. 2. The overall mean baseline IPSS was 20 ± 3.48 . The mean baseline IPSS in the medical and interventional articles were 16.66 ± 3.20 and 22.17 ± 3.47 . The overall mean IPSS post-treatment was 11.47 ± 2.81 . The mean IPSS post-treatment in the medical and interventional articles were 12.40 ± 0.90 and 7.0 ± 4.21 , respectively.

Mean QoL scores are shown in Fig. 3. The overall mean baseline QoL score was 4.15 ± 0.90 . The mean baseline QoL score in the medical and interventional articles was 4.34 ± 1.24 and 4.46 ± 0.29 . The overall mean QoL post-treatment was 2.84 ± 0.66 . The mean QoL post-treatment in the medical and interventional articles were 2.94 ± 0.59 and 1.97 ± 0.67 , respectively. Pearson correlation between IPSS and QoL for overall, medical and interventional articles were $r = 0.72, 0.79$ and 0.36 respectively. Results are shown in Figs. 4,5,6.

TABLE 1. Assessment of included studies.

	Overall	Standard Deviation (SD)	Medical	SD	Interventional	SD
Total number of studies	31.00		13.00		18.00	
Mean age	65.37	4.82	62.23		67.81	4.02
Mean baseline IPSS	20.00	3.48	16.66	3.91	22.17	3.47
Mean baseline QoL	4.15	0.90	4.34	3.20	4.46	0.29
Mean post-treatment IPSS	11.47	2.81	12.40	0.90	7.00	4.21
Mean post-treatment QoL	2.84	0.66	2.94	0.59	1.97	0.67
IPSS-QoL correlation	r	0.72	r	0.79	r	0.36

IPSS: International Prostate Symptom Score; QoL: quality of life.

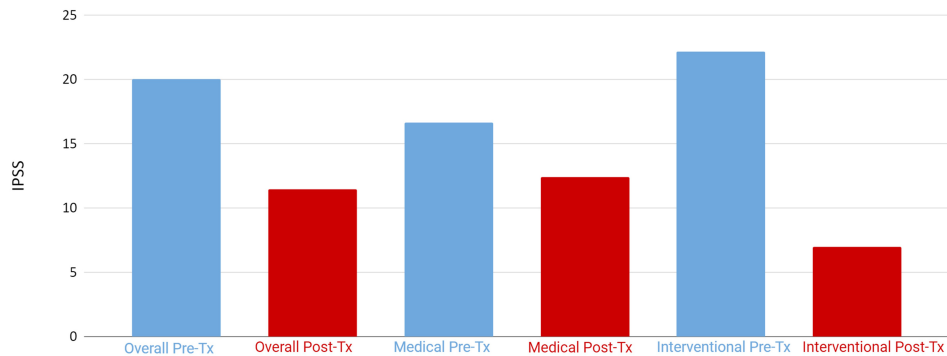


FIGURE 2. Baseline and post-intervention mean IPSS for overall, medical, and interventional studies. IPSS: International Prostate Symptom Score.

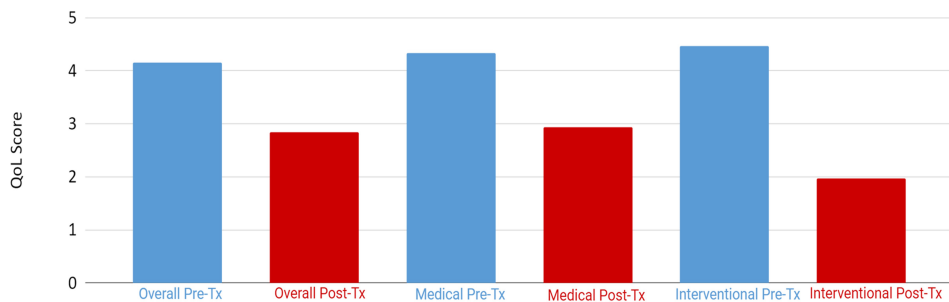


FIGURE 3. Baseline and post-intervention mean QoL scores for overall, medical, and interventional studies. QoL: quality of life.

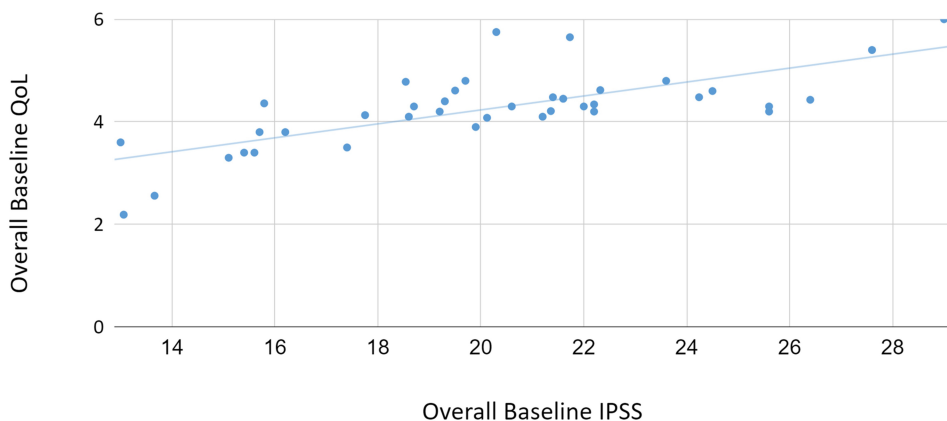


FIGURE 4. Correlation between overall baseline IPSS and QoL. IPSS: International Prostate Symptom Score; QoL: quality of life.

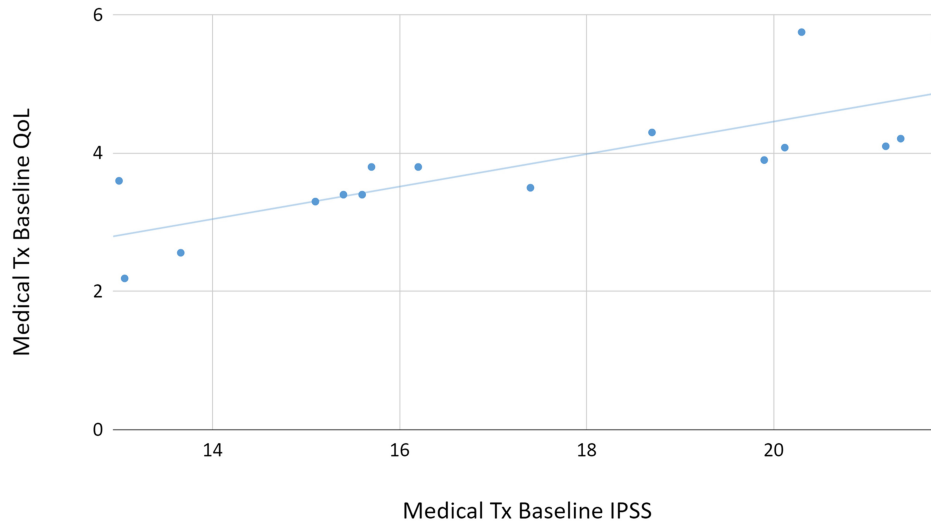


FIGURE 5. Correlation between baseline IPSS and QoL in medical studies. IPSS: International Prostate Symptom Score; QoL: quality of life.

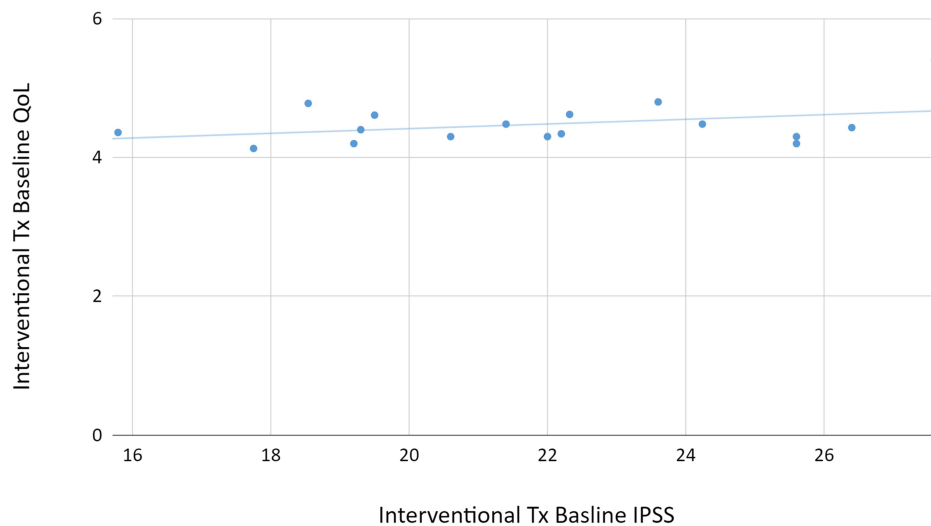


FIGURE 6. Correlation between baseline IPSS and QoL in interventional studies. IPSS: International Prostate Symptom Score; QoL: quality of life.

4. Discussion

BPH negatively affects QoL, with the most troubling symptoms reported by patients being urinary urgency, nocturia, and post micturition dribble [38]. Beyond the physical, patients also have an associated psychological component where patients report symptoms of anxiety and depression [39]. The cellular mechanism of action is not completely understood, however, there are links to hormonal induced growth to the prostate caused changes in hormones such as testosterone, estrogen, insulin, and insulin-like growth factor 1; these hormones mediate inflammation and hyperplasia [40].

In this scoping review, a comprehensive analysis was conducted, encompassing 31 studies, with 13 dedicated to medical treatment and 18 to interventional treatment modalities. The studies included patients with moderate to severe LUTS, as indicated by an IPSS of 8 or greater. Of particular significance was the observation of a robust Pearson correlation coefficient

of 0.70 between baseline BPH symptoms and baseline QoL. Both medical and interventional interventions yielded improvements in QoL.

Based on the Pearson correlation of 0.72 for all of the studies, there is a strong positive correlation between the severity of BPH symptoms and QoL. As illustrated in Fig. 4, the data delineate a discernible trend wherein greater symptom severity corresponds to poorer QoL outcomes. Notably, even within the most severe symptom category of the IPSS, ranging from 20 to 35, the nadir of QoL is represented by a score of 6. This observation underscores that maximal IPSS scores need not reach 35 to manifest the most compromised QoL.

As depicted in Fig. 3, enhancements in QoL were evident across the entire cohort, including both medical and interventional subgroups. Collectively, there was an aggregate improvement of 1.28 points in QoL scores. Specifically, the medical treatment group demonstrated a mean improvement of 1.40 points, whereas the interventional treatment group

exhibited a more substantial enhancement of 2.49 points.

The pivotal role of *Rayyan.ai* in facilitating this scoping review cannot be overstated. Serving as the primary repository and filtration platform for articles, *Rayyan.ai* streamlined the process by effectively filtering out 6099 articles that did not align with the search criteria by employing the keywords “BPH” and “QoL”. Leveraging *Rayyan.ai*’s functionalities, the research team curated articles, ensuring relevance to the study objectives.

It is imperative to acknowledge the limitations inherent in this investigation. Notably, the inclusion criteria encompassed studies utilizing solely the IPSS-QoL score for QoL assessment, potentially overlooking other pertinent QoL scales or surveys. Furthermore, urodynamic measures, while collected, were ultimately excluded from the analysis due to incomplete datasets. The grouping of medical and interventional treatments without explicit differentiation regarding their impact on QoL presents another limitation. Additionally, the age discrepancy between the medical (62.23 ± 3.91) and interventional (67.81 ± 4.02) groups, likely due to patients previously experiencing conservative medical treatment before intervention, may influence the results and conclusions of this review. The baseline IPSS was different between the medical and interventional treatment groups. Further subgroup analysis of baseline IPSS in medical and surgical treatments may be of high interest for future research.

Assessing the quality of life poses a considerable challenge due to its inherently subjective nature. Researchers often use standardized questionnaires and scales that individuals complete to self-report their well-being, while some may consider objective indicators like life expectancy, disability-adjusted life years (DALYs), and healthcare access. Qualitative methods, such as interviews and focus groups, allow for a deeper understanding of individuals’ subjective experiences and perceptions.

When studying the effect of a specific factor on QoL, in our study of LUTS, the question arises as to whether utilizing general inquiries, which capture a broader spectrum of experiences, or employing specific questions tailored to the aspects of LUTS, offers a more dependable assessment. In our study, QoL was measured by the Bother score, the 8th question in the IPSS. The IPSS was adopted in 1993 by the World Health Organization. The IPSS is derived from the seven original questions of the American Urological Association Symptom Index score (AUASI), with an additional 8th question; the Bother Score; “If you were to spend the rest of your life with your urinary condition the way it is now, how would you feel about that?”. According to the literature, validation data support the argument that the bother score is a statistically reliable measure of treatment outcome in patients with BPH who view their symptoms as bothersome [41].

5. Conclusions

The burden of BPH and its detrimental effect on QoL have been well defined and several studies have suggested advancements in treatment options by better understanding the mechanism of action of drugs and positive results of surgical intervention. With a deeper understanding of both medical and surgical

treatment options, we are able to improve QoL by targeting the prostate and thus limit LUTS. Several studies have suggested enhanced knowledge on medical management, minimally invasive procedures, and post-treatment outcomes that continue to improve patient outcomes [42–46].

This scoping review was able to quantify the improvement in QoL after medical and interventional treatment of BPH. There is a strong correlation between the severity of BPH symptoms and the reduction of QoL. Improvement of BPH symptoms with medical and surgical treatments is associated with significant improvement in QoL. This study upholds the use of IPSS in clinical practice in accordance with the AUA guidelines. Furthermore, this study may call for raising awareness about BPH/LUTS, especially among primary practice clinicians, in order to initiate discussions with patients and possibly facilitate early referrals and treatment. To better elucidate the association between IPSS and QoL, future studies may include qualitative methods to measure the QoL and compare the results to IPSS.

AVAILABILITY OF DATA AND MATERIALS

The data presented in this study are available on reasonable request from the corresponding author.

AUTHOR CONTRIBUTIONS

BF, JG and RS—designed the research study. BF, JG, SA, SM, EM and BC—performed the research. MD and RS—provided help and advice. JG—analyzed the data. BF, SA and SM—wrote the manuscript. All authors contributed to editorial changes in the manuscript. All authors read and approved the final manuscript.

ETHICS APPROVAL AND CONSENT TO PARTICIPATE

Not applicable.

ACKNOWLEDGMENT

We acknowledge and thank the SBH Health System for allowing us to use their facilities to conduct our research.

FUNDING

This research received no external funding.

CONFLICT OF INTEREST

The authors declare no conflict of interest. Ridwan Shabsigh is serving as one of the Editorial Board members of this journal. We declare that Ridwan Shabsigh had no involvement in the peer review of this article and has no access to information regarding its peer review. Full responsibility for the editorial process for this article was delegated to AT.

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How to cite this article: Bjarne Faraon, Juan Garces, Sulaiman Ahmad, Satanay Mahmoud, Marc Danzinger, Ridwan Shabsigh, *et al*. The impact of the treatment of benign prostatic hyperplasia with lower urinary tract symptoms on quality of life, a scoping literature review aided by AI. *Journal of Men’s Health*. 2024; 20(7): 8-14. doi: 10.22514/jomh.2024.104.