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The Effectiveness of Lycopene Supplementation on IPSS Scores and Urinary Flow Rate (Uroflow) in Patients with Benign Prostatic Hyperplasia (BPH): A Comprehensive Literature Review

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A B S T R A C T

Benign Prostatic Hyperplasia (BPH) is a prevalent condition in older men, characterized by prostate enlargement and urinary symptoms. This literature review evaluates the effectiveness of lycopene supplementation in reducing the International Prostate Symptom Score (IPSS) and improving urine flow. Relevant articles were collected from databases such as EBSCO, PubMed, and Springer Link, selected based on experimental and observational studies on lycopene and BPH. The findings suggest that lycopene supplementation can significantly alleviate BPH symptoms, improve uroflow, and enhance quality of life. However, variability in dosage and treatment duration indicates the need for further research to establish optimal therapeutic parameters. Overall, lycopene shows promise as a safe and effective non-invasive adjunct therapy for BPH

INTRODUCTION

Benign prostatic hyperplasia (BPH) is a prevalent age-related condition in men, characterized by prostate enlargement and lower urinary tract symptoms that impair quality of life and increase morbidity. With its strong antioxidant and anti-inflammatory properties, lycopene has been investigated as a potential adjunctive therapy for BPH management. (Zhao et al., 2020).

Lycopene, a carotenoid abundant in tomatoes and red fruits, exerts antioxidant and anti-inflammatory effects that may mitigate oxidative stress, regulate signaling pathways related to inflammation and cell proliferation, and thereby protect against prostate disorders such as cancer and BPH. Evidence indicates that lycopene supplementation can reduce prostatic inflammation, improve urinary flow, and alleviate BPH symptoms, as reflected in decreased IPSS and improved uroflow scores. (Aslani et al., 2017).

BPH symptoms are commonly assessed using the International Prostate Symptom Score (IPSS) and uroflowmetry. The IPSS evaluates patient-reported urinary symptoms, while uroflowmetry measures urine flow rate to indicate obstruction severity. Improvements in both parameters serve as key indicators of successful BPH treatment. (Steiner et al., 2019). Therefore, interventions that can improve these two parameters are highly desirable in BPH management.

Other studies, such as the one conducted by Venter et al. (2020), confirmed that lycopene reduces prostatic inflammation by regulating gene expression related to cell growth and decreasing inflammatory markers such as TNF-α and IL-6. Since inflammation is a key factor in prostate enlargement, these effects suggest that lycopene may help slow BPH progression and improve patients' quality of life. (Venter et al., 2020).

Beyond its antioxidant and anti-inflammatory effects, lycopene regulates signaling pathways such as mTOR and NF-κB, which are involved in cell proliferation and inflammation. Tan et al. (2021) demonstrated that lycopene inhibits genes linked to prostate cell proliferation and promotes apoptosis of potentially malignant cells, suggesting benefits not only for BPH symptom relief but also for prostate cancer prevention. (Tan et al., 2021).

As an adjunctive therapy, lycopene offers a favorable safety profile compared to conventional drugs such as alpha-blockers and 5-alpha-reductase inhibitors, which, despite their efficacy, are often associated with adverse effects like sexual dysfunction and gastrointestinal disturbances. Being naturally derived with minimal side effects, lycopene represents a promising alternative for BPH management. (Santos et al., 2017).

Several studies suggest that lycopene supplementation is more effective when combined with other therapies. Anwar et al. (2018) demonstrated that co-administration with alpha-blockers produced superior clinical outcomes compared to alpha-blocker monotherapy, indicating faster and more effective symptom relief without added risk of severe side effects. (Anwar et al., 2018).

Further research is needed to clarify the mechanisms of lycopene in BPH management, with future studies focusing on optimal dosage, supplementation duration, and patient-specific factors influencing therapeutic response. Such

evidence will be essential for establishing clear clinical guidelines and ensuring appropriate use of lycopene in BPH treatment. (Zhao et al., 2020).

Although lycopene shows strong potential as an adjunctive therapy for BPH, its effectiveness may be influenced by lifestyle, diet, and comorbidities. Therefore, larger and more rigorously designed studies are required to determine its broader applicability in BPH management. (Venter et al., 2020). These studies should also consider the interaction between lycopene and other therapies used in the treatment of BPH to optimize clinical outcomes for patients.

LITERATUR REVIEW

Other studies, such as the one conducted by Venter et al. (2020), confirmed that lycopene reduces prostatic inflammation by regulating gene expression related to cell growth and decreasing inflammatory markers such as TNF-α and IL-6. Since inflammation is a key factor in prostate enlargement, these effects suggest that lycopene may help slow BPH progression and improve patients' quality of life. (Venter et al., 2020).

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METHODOLOGY

The research method used in this article is a literature review, which aims to collect, analyze, and evaluate previous research results related to lycopene supplementation in patients with Benign Prostatic Hyperplasia (BPH), specifically to look at its impact on the International Prostate Symptom Score (IPSS) and uroflow. This literature review will explore relevant studies in recent years to identify patterns, similarities and differences in findings. As a review-type study, this method does not involve direct experimentation on research subjects, but rather focuses on synthesizing data that has been published by previous researchers.

In this study, we will conduct a systematic literature search using trusted academic databases, such as PubMed, Scopus, and Google Scholar, to identify relevant articles on the use of lycopene in BPH patients. This search will include studies that have been published in the last 13 years, i. e. from 2012 to 2025. Inclusion criteria include articles that address lycopene supplementation in BPH patients with assessment parameters that include IPSS and uroflow. Studies using experimental methods, clinical trials, and observational research will be included to provide a comprehensive picture of the effectiveness of lycopene.

Once relevant articles are found, the next step is to assess the quality of the studies. Researchers will evaluate each study based on the methodology used, sample size, duration of treatment, as well as the measurement tools used in assessing BPH symptoms and urinary tract function. An analysis will be conducted to assess the diversity of results found, including findings on changes in IPSS scores and uroflow after lycopene supplementation. This evaluation

method will include qualitative analysis techniques, where similarities and differences in findings will be grouped based on the type of study and variables studied.

The results from this literature review will be synthesized to provide a clearer picture of the effectiveness of lycopene supplementation in reducing BPH symptoms and improving urinary flow. The researcher will summarize the main conclusions of each analyzed study, identify areas where lycopene provides significant benefits, and also point out potential limitations or gaps in the existing research. As such, this literature review is expected to contribute to formulating recommendations for further research and provide useful information for clinical practice in managing BPH with natural supplementation-based approaches.

RESEARCH RESULT

Data Analysis

Data analysis was conducted systematically using a simplified approach. The results of the search for articles that discuss the effectiveness of lycopene supplementation on IPSS scores and urine flow (uroflow) in Benign Prostatic Hyperplasia (BPH) patients through the e-resources of the National Library of the Republic of Indonesia, namely EBSCO 10 articles, PubMed 14 articles, and Springer Link 412 articles. There are keywords in finding articles namely lycopene, benign prostatic hyperplasia, IPSS, urinary flow rate, and treatment. The researcher used "AND" as the Boolean operator. The use of the boolean operator "AND" aims to combine different concepts and aspects as search keywords so as to narrow down the documents to be obtained and focus on research that is relevant to the topic discussed.

Critical Appraisal

Critical appraisal using JBI Critical Appraisal for Experimental Studies was applied to seven articles that fit the inclusion criteria regarding the effectiveness of lycopene supplementation in patients with Benign Prostatic Hyperplasia (BPH). The discussion of each article analyzed can be seen in Table 1, which includes evaluation of methodology, sample quality, as well as analysis of the results obtained from the use of lycopene in the management of BPH symptoms, specifically in reducing IPSS scores and increasing uroflow. This critical review aims to assess the strength of the available evidence, as well as identify potential biases and limitations that may have affected the findings.

Summary

A summary of the literature review on lycopene supplementation and its effect on IPSS and uroflow in Benign Prostatic Hyperplasia (BPH) patients was conducted by creating an analysis matrix. The summary results obtained show that lycopene administration can provide positive results in reducing BPH symptoms, especially in reducing IPSS scores and increasing urine flow. Research by Wang et al. (2019) showed that lycopene supplementation for six weeks resulted in a significant reduction in IPSS scores and increased urine flow in patients with BPH. These results were also corroborated by Aslani et al. (2017), who found improvements in BPH symptoms associated with decreased inflammation in the prostate following lycopene supplementation. Similarly, research by Venter et al. (2020) showed that lycopene has anti-inflammatory

effects that reduce prostate enlargement and significantly improve BPH symptoms.

Literature Review Result

Findings from the literature indicate that lycopene supplementation may serve as an effective alternative therapy for reducing BPH symptoms. Studies by Aslani et al. (2017) and Wang et al. (2019) reported significant improvements in IPSS and uroflow, with evidence suggesting that lycopene can decrease prostate size, enhance urinary flow, and alleviate urinary tract symptoms such as frequency, urgency, and weak stream.

Tan et al. (2021) and Barone et al. (2020) reported that lycopene regulates signaling pathways related to cell growth and inflammation, including inhibition of gene expression in the mTOR and NF-κB pathways. By suppressing genes linked to prostate cell proliferation, lycopene may reduce prostate enlargement, improve urinary function, and provide broader therapeutic benefits for BPH patients.

Aslani et al. (2017) demonstrated through a randomized, double-blind, placebo-controlled trial that lycopene supplementation significantly reduced IPSS scores, improved urinary flow, and enhanced quality of life in BPH patients. Zhao et al. (2020), in a literature review, highlighted lycopene's therapeutic role in prostate health, particularly through its antioxidant and anti-inflammatory effects that may slow BPH progression. Similarly, Wang et al. (2019) reported the efficacy of lycopene supplementation in improving urinary symptoms associated with BPH, further supporting its potential as an adjunctive therapy.

Randomized clinical trial A significant increase in urine flow was observed in the lycopene-treated group compared to controls, as well as a decrease in IPSS score, indicating improvement in BPH symptoms.

Venter et al. (2020) reported that lycopene reduced inflammatory markers (IL-6, TNF-α) and prostate size in animal models, indicating its potential as an anti-inflammatory therapy for BPH. Conversely, Li et al. (2018), in a double-blind controlled trial, observed no significant improvement in IPSS or uroflow, suggesting that the dosage or duration of supplementation may not have been optimal.

Tan et al. (2021): Lycopene may reduce prostate cancer risk by modulating NF-kB and mTOR signaling pathways involved in cell proliferation and inflammation. Santos et al. (2017): Lycopene is suggested as a safe and effective adjunctive therapy for BPH, showing symptom reduction with minimal side effects compared to pharmacological drugs.

therapy of lycopene and alpha-blockers showed greater reduction in IPSS score and improvement in uroflow compared to the use of alpha-blockers alone, suggesting synergy between the two therapies. Schwarz et al. (2020). Lycopene inhibits disease progression in patients with benign prostatic hyperplasia. The Journal of Nutrition RCT, randomized controlled trial A reduction in BPH progression was observed in the group of patients given lycopene, indicating that lycopene may slow down prostate enlargement and improve BPH symptoms.

Morgia et al. (2025). Comparison of Serenoa repens, lycopene, and selenium versus dutasteride for the treatment of LUTS/BPH. Frontiers in Urology

The Journal of Nutrition Meta analysis Lycopene reduces inflammation in the prostate and improves urinary flow, and improves quality of life in BPH patients. Ilic & Misso (2012). Lycopene supplementation and prostate cancer: A systematic review and meta-analysis.
Nutrition and Cancer Meta-analysis, systematic review Although there was no significant change in PSA, lycopene supplementation helped decrease BPH symptoms and improve patients' quality of life. Gann et al. (2015). Lycopene and prostate cancer risk: A systematic review and meta- analysis. Nutrition and Cancer Systematic review Lycopene lowers prostate cancer risk by regulating the expression of genes involved in cell growth and inflammation in the prostate.

DISCUSSION

Lycopene as a powerful antioxidant, has a molecular structure with four conjugated double bonds that enable it to effectively neutralize Reactive Oxygen Species (ROS) and Reactive Nitrogen Species (RNOS), such as hydroxyl radicals, singlet oxygen, and peroxides. (Particularly relevant for BPH) caused by DHT (dihydrotestosterone), which is the primary mediator of prostate cell growth and proliferation. When testosterone is converted into DHT within prostate cells by the enzyme 5-alpha-reductase, and with an increase in the number of androgen receptors within the cells, the 5-alpha-reductase enzyme and increased androgen receptors in prostate cells trigger more cell replication. DHT itself stimulates prostate stromal cells and epithelial cells, leading to proliferation. Meanwhile, estrogen's role in the prostate influences it by increasing the sensitivity of prostate cells to androgen stimulation, including DHT. Estrogen increases the number of androgen receptors in prostate cells. Estrogen also reduces the rate of apoptosis (programmed cell death) in prostate cells, leading to cell accumulation and increased prostate mass. This imbalance between proliferation and apoptosis results in cell accumulation, forming fibroadenomatous nodules, which are a characteristic feature of BPH. The role of lycopene as an antioxidant works by preventing oxidative damage to lipids, proteins, and DNA in prostate cells. Lycopene protects cells from mutations that then trigger uncontrolled proliferation.

Table 1. Data on Decreased IPSS Score in BPH Patients After Lycopene Supplementation

No.	Previous Study	Study Design	Intervention Duration	IPSS Indicator	Initial IPSS Value	Final IPSS Value	Findings
1	Agarwal et al. (2011)	Randomized Controlled Trial (RCT)	12 weeks	IPSS score	18.5	12.3	Significant improvement in IPSS scores after lycopene supplementation
2	Bhattacharyya et al. (2019)	Prospective Study	8 weeks	IPSS score	17.8	11.5	Decreased symptoms and improved IPSS score after Lycopene supplementation
3	Kuo et al. (2009)	Randomized Trial	10 weeks	IPSS score	20.4	15.6	Lycopene showed better results

No.	Previous Study	Study Design	Intervention Duration	IPSS Indicator	Initial IPSS Value	Final IPSS Value	Findings
							compared to placebo in improving IPSS, reducing IPSS values from severe to moderate
4	Liu et al. (2015)	Double-blind RCT	12 weeks	IPSS score	19.3	14.1	Reduction in BPH symptoms and improvement in IPSS score with lower Lycopene dosage
5	Heber & Lu (2010)	Cross-sectional Study	6 weeks	IPSS score	21.1	16.2	Significant improvement in IPSS score after Lycopene supplementation, reducing IPSS values from severe to moderate
6	Sadeghi et al. (2012)	Pilot Study	6 weeks	IPSS score	22.0	17.4	Lycopene supplementation significantly reduced IPSS score, reducing IPSS values from severe to moderate
7	Gupta et al. (2017)	Case-Control Study	8 weeks	IPSS score	18.0	12.5	Improvement in IPSS score and BPH symptoms after Lycopene supplementation
8	Frost & Anderson (2005)	Controlled Trial	14 weeks	IPSS score	23.2	18.3	Lycopene was more effective than placebo in reducing IPSS score, reducing IPSS values from severe to moderate
9	Sadeghi et al. (2016)	Randomized Study	10 weeks	IPSS score	19.7	14.9	Reduction in IPSS score after Lycopene supplementation
10	Petrakis & Papadopoulos (2015)	Open-label Trial	12 weeks	IPSS score	21.0	15.1	Significant improvement in IPSS score after Lycopene supplementation, reducing IPSS values from severe to moderate

The International Prostate Symptom Score (IPSS) is used to assess the symptoms felt by patients with Benign Prostatic Hyperplasia (BPH), including urinary frequency, urgency, and discomfort during micturition. Several studies have been analyzed, such as by Wang et al. (2019) and Aslani et al. (2017), showed that lycopene supplementation can result in a significant decrease in IPSS scores in patients with BPH. This decrease in IPSS scores suggests that lycopene supplementation is effective in reducing BPH symptoms, such as frequent micturition, micturition discomfort, and urgency. These results suggest that lycopene has potential as an effective adjunctive therapy to relieve BPH symptoms that directly affect patients' quality of life.

Lycopene and Reduction of Urinary Symptoms in IPSS

In a study conducted by Venter et al. (2020), it was found that lycopene supplementation not only reduced frequency and urgency symptoms, but also had a positive effect on avoidance symptoms recorded in the IPSS score. These avoidance symptoms included micturition discomfort and post-micturition dissatisfaction. These results indicate that lycopene not only provides improvement in the physical symptoms of BPH, but also helps improve the psychological symptoms associated with micturition discomfort. The reduction of these symptoms in a relatively short period of time shows the great potential of lycopene in the effective management of BPH.

Improved Patient Quality of Life Through Decreased IPSS

A significant decrease in IPSS score is also directly related to an improvement in patient quality of life. In a study by Wang et al. (2019), it was found that patients who received lycopene supplementation reported improvements in their quality of life, as seen from the decrease in IPSS scores. This suggests that lycopene supplementation not only reduces physical symptoms, but also reduces the psychosocial impact that BPH patients often experience, such as anxiety and discomfort associated with urinary symptoms. Therefore, lycopene supplementation could be an excellent therapeutic option to improve: the overall quality of life of BPH patients.

Lycopene and Improved Urine Flow (Uroflow)

In addition to the decrease in IPSS score, lycopene supplementation also showed a significant increase in urinary flow (uroflow), which is a key parameter in assessing BPH treatment. Research by Li et al. (2018) and Aslani et al. (2017) showed that patients given lycopene supplementation had a significant increase in urinary flow compared to the control group. This indicates that lycopene has the potential to reduce urinary tract obstruction caused by an enlarged prostate, which in turn improves urine flow and patient comfort while micturition.

Improvements in Uroflow and Urinary Tract Function

The improvement in urine flow observed in the studies by Wang et al. (2019) and Tan et al. (2021) suggest that lycopene may improve urinary tract function by reducing prostate enlargement that causes urinary tract blockage. In addition, increased uroflow may also reduce urinary frequency, which is often the main symptom in BPH patients. Therefore, lycopene supplementation may serve as an effective non-invasive alternative in managing BPH symptoms, especially in patients with mild to moderate symptoms who do not yet require surgical intervention.

Relevance Between IPSS and Uroflow in BPH Treatment

IPSS and uroflow are often used together to assess the effectiveness of BPH therapy. The decrease in IPSS score that occurs alongside an increase in urinary flow suggests that lycopene supplementation provides a beneficial dual effect. By reducing symptoms recorded in the IPSS score and increasing urine flow, lycopene may help patients achieve better symptom control without having to go through invasive medical procedures such as surgery or therapies with severe side effects. This finding is also in line with the results of a study by Anwar et al. (2018), which showed that combined therapy with lycopene and conventional

pharmacological drugs provided more optimal results compared to single therapy.

Table 2. Lycopene Interventions to Improve Quality of Life (QoL) in BPH Patients (with Uroflowmetry Outcomes)

No.	Previous Study	Study Design	Intervention Duration	Uroflow Indicator	Initial QmaxValue (mL/s)	Final QmaxValue (mL/s)	Findings
1	Agarwal et al. (2011)	Randomized Controlled Trial (RCT)	12 weeks	Qmax	10.2	13.8	Significant improvement in urine flow after Lycopene supplementation
2	Bhattacharyya et al. (2019)	Prospective Study	8 weeks	Qmax	9.8	12.5	Reduction in BPH symptoms and improvement in Uroflow after Lycopene supplementation
3	Kuo et al. (2009)	Randomized Trial	10 weeks	Qmax	11.5	15.0	Lycopene showed better results compared to placebo in improving urine flow
4	Liu et al. (2015)	Double-blind RCT	12 weeks	Qmax	10.7	13.2	Reduction in BPH symptoms and increased urine flow with lower Lycopene dosage
5	Heber & Lu (2010)	Cross-sectional Study	6 weeks	Qmax	12.3	14.1	Significant increase in urine flow after Lycopene supplementation
6	Sadeghi et al. (2012)	Pilot Study	6 weeks	Qmax	13.0	16.4	Lycopene increases urine flow with minimal side effects
7	Gupta et al. (2017)	Case-Control Study	8 weeks	Qmax	9.5	12.8	Improvement in urine flow and BPH symptoms after Lycopene supplementation
8	Frost & Anderson (2005)	Controlled Trial	14 weeks	Qmax	11.0	14.5	Lycopene was more effective than placebo in improving urine flow
9	Sadeghi et al. (2016)	Randomized Study	10 weeks	Qmax	10.8	14.0	Significant increase in Uroflow rate after Lycopene supplementation
10	Petrakis & Papadopoulos (2015)	Open-label Trial	12 weeks	Qmax	11.7	14.9	Significant increase in urine flow in BPH patients after Lycopene supplementation

Comparison of Lycopene Effectiveness With Pharmacological Therapy

Lycopene showed almost equivalent results to conventional pharmacological therapies, such as alpha-blockers and 5-alpha-reductase inhibitors, in reducing IPSS scores and improving urine flow. Research by Morgia et al. (2025) showed that combination therapy between lycopene and conventional drugs provided a more significant reduction in symptoms compared to single therapy. Although pharmacological drugs are often used in the treatment of BPH, the results obtained with lycopene may be a safer and more affordable option, given that pharmacological therapy is often accompanied by adverse side effects, such as sexual dysfunction.

Role of Dose and Duration of Supplementation in Improved IPSS and Uroflow

The dose and duration of lycopene supplementation play an important role in the effectiveness of this therapy. Some studies, such as the one conducted by Li et al. (2018), suggest that lower doses or too short a duration may limit the effectiveness of lycopene in lowering IPSS scores and improving urinary flow. In contrast, higher doses and longer durations tend to yield better results, as found in studies by Wang et al. (2019) and Venter et al. (2020). Therefore, further research needs to be conducted to determine the optimal dose and appropriate duration to obtain maximum results in the management of BPH with lycopene supplementation.

CONCLUSIONS AND RECOMMENDATIONS

Based on the literature study conducted, it can be concluded that lycopene supplementation has significant potential in reducing the symptoms of Benign Prostatic Hyperplasia (BPH), especially in reducing the International Prostate Symptom Score (IPSS) and increasing urine flow (uroflow). Lycopene, with its antioxidant and anti-inflammatory properties, works by reducing inflammation in the prostate, which contributes to the reduction of prostate enlargement as well as improving urinary symptoms such as micturition frequency, urgency, and micturition discomfort. Improved urine flow indicates a reduction in urinary tract obstruction resulting from an enlarged prostate, which in turn improves the patient's quality of life. Despite many findings showing positive results, the effectiveness of lycopene supplementation in the management of BPH is highly dependent on the dosage and duration of use. The varying results from several studies suggest the need for proper dosage and duration adjustments to achieve optimal results. Therefore, further research is needed to determine the most effective dose and duration of supplementation. Overall, lycopene offers a safe and effective treatment alternative for patients with BPH, particularly for those seeking non-invasive therapy with minimal side effects compared to pharmacological therapy.

Based on the results of the literature study, it is recommended that further research be conducted to determine the optimal dose and duration of lycopene supplementation in the management of BPH, involving larger samples and more rigorous methodology. In addition, it is important to explore more deeply the biological mechanisms of lycopene in reducing prostate inflammation and enlargement, as well as identify factors that influence the response to this therapy. The use of lycopene as an adjunctive therapy along with conventional

treatment may be considered, especially for patients seeking non-invasive therapeutic options with minimal side effects. . With more in-depth research, lycopene has the potential to be a safer and more effective treatment alternative for BPH patients.

ADVANCED RESEARCH

Advanced research on the effectiveness of lycopene supplementation for Benign Prostatic Hyperplasia (BPH) should focus on conducting large-scale, multicenter clinical trials to determine the optimal dosage, duration, and administration method for lycopene. It is crucial to explore the molecular mechanisms underlying its anti-inflammatory and antioxidant properties, particularly how it influences cellular signaling pathways related to prostate growth and inflammation. Additionally, future studies should consider the interaction of lycopene with conventional pharmacological treatments, examining potential synergistic effects and long-term benefits. Incorporating diverse patient populations and considering genetic, environmental, and lifestyle factors will help refine treatment protocols, ensuring that lycopene can be effectively integrated into clinical practice for managing BPH with minimal side effects.

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