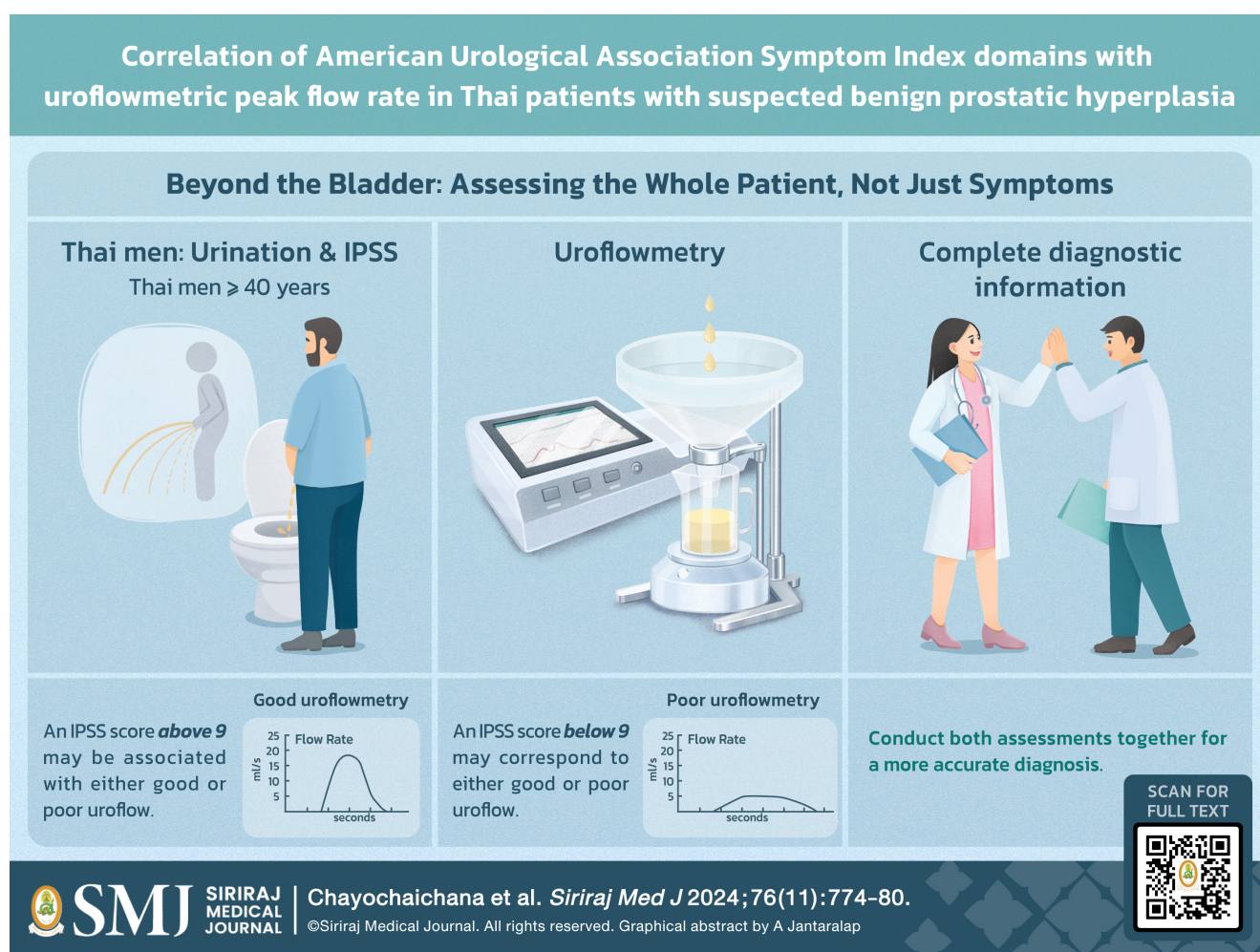# Correlation of American Urological Association Symptom Index Domains with Uroflowmetric Peak Flow in Thai Patients with Suspected Benign Prostatic Hyperplasia

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Correlation of American Urological Association Symptom Index domains with uroflowmetric peak flow rate in Thai patients with suspected benign prostatic hyperplasia

Beyond the Bladder: Assessing the Whole Patient, Not Just Symptoms

Thai men: Urination & IPSS — Thai men ≥ 40 years

Uroflowmetry

Complete diagnostic information

Good uroflowmetry — An IPSS score *above 9* may be associated with either good or poor uroflow.

Poor uroflowmetry — An IPSS score *below 9* may correspond to either good or poor uroflow.

Conduct both assessments together for a more accurate diagnosis.

SCAN FOR FULL TEXT

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ABSTRACT

Objective: This study aimed to investigate the correlations between the obstructive and irritative domain scores of the total AUA-SI and the uroflowmetric peak flow rate (Qmax) in Thai patients suspected of having benign prostatic hyperplasia (BPH).

Methods: A retrospective observational study was conducted on 510 patients who presented with lower urinary tract symptoms (LUTSs) and were suspected of having BPH at the Urology Outpatient Department of King Chulalongkorn Memorial Hospital, Thailand. A self-administered AUA-SI score was used to determine the severity of symptoms, and uroflowmetry was conducted to determine parameters, including flow rate variable.

Results: A significant correlation was observed between the AUA-SI score and uroflowmetric peak flow (Qmax). The AUA-SI and its obstructive domain had weak negative Pearson correlations with uroflowmetric peak flow (r = −0.164 and −0.185, respectively; P < 0.01). The irritative domain was inversely associated with Qmax (r = 0.097, P = 0.028). However, when patients in each subgroup with mild (AUA-SI = 0 - 7), moderate (AUA-SI = 8–19), and severe symptoms (AUA-SI = 20–35) were considered, the relationship was found to be not significant.

Conclusion: The study revealed a significant weak negative correlation between the AUA-SI score and Qmax, but no significant correlations were found between the obstructive and irritative domains and Qmax in the subgroup analysis.

Keywords: BPH; Benign Prostatic Hyperplasia; AUA-SI; Uroflowmetry (Siriraj Med J 2024; 76: 774-780)

INTRODUCTION

Benign prostatic hyperplasia (BPH) is a prevalent condition that significantly impacts the quality of life of aging men.[1] It is the primary cause of lower urinary tract symptoms (LUTSs), which are often the main reason for seeking medical attention and may require surgical intervention. Half of men over 50 years of age exhibit evidence of BPH.[2] LUTSs can impose a substantial economic burden, and they are a significant concern for patients' overall health and wellbeing.[3,4] Taking a comprehensive medical history, including symptoms, previous procedures, sexual history, medication use, and overall fitness and health, is essential when evaluating patients with LUTSs.

The International Prostate Symptom Score (IPSS) or the American Urological Association (AUA) Symptom Index (AUA-SI) is a validated self-administered questionnaire that provides valuable information about the symptom burden experienced by patients. Although newer questionnaires have been developed, they have not gained worldwide popularity.[5-7]

The questionnaire consists of seven questions, each with five levels of severity. Questions 1, 3, 5, and 6 pertain to the obstructive domain, and questions 2, 4, and 7 are related to the irritative domain. IPSS has been translated and validated in Thai.[6] It includes the AUA-SI score and one question on the quality-of-life score.

Although IPSS, digital rectal examination (DRE), serum prostate-specific antigen (PSA), and uroflowmetry are important predictors of disease progression and acute urinary retention, the AUA 2020 guidelines recommend considering IPSS, DRE, and serum PSA in all patients. They also recommend performing uroflowmetry before intervening for LUTSs, particularly in patients with moderate-to-severe symptoms.

However, past studies by Setthawong et al. (2018) in Thailand found that the level of education, especially among the elderly, affects the implementation of IPSS. This finding serves as the rationale for the present study. Considering that the level of education impacts IPSS scores, the relationship between IPSS and uroflowmetry may not align with the guidelines. Previous studies in Thai population identified a weak correlation, but the results were not statistically significant because the primary outcomes of these studies were not specifically designed to address this particular question.[7]

In many countries, studies found that the relationship between AUA-SI and uroflowmetry (Qmax) varies. Some studies showed a strong correlation, whereas others demonstrated a weak correlation. As a result, the use of uroflowmetry should be adapted on the basis of each country's study outcomes. Furthermore, studies that have been used as references in guidelines showed a clear relationship between increasing AUA scores and decreasing maximum flow rate in the overall population. However, an independent relationship was observed in subgroup studies. This independence is evident when assessing patients with AUA score > 7 points (moderate

to severe symptoms) and Qmax between 5 and 15 mL/s only.[3] This outcome suggests that only a subset of symptom scores had a weak correlation with Qmax in their study. Whether the relationship between AUA score and peak flow rate in Thai patients aligns with that in previous research is unclear, thereby raising questions about the consistency of this relationship in Thai patients compared with previous studies. The present study aimed to determine the correlation between symptom severity index scores, subgroup the obstructive and irritative domains, and examine the uroflowmetric parameter (Qmax).

MATERIALS AND METHODS

Study design and participants

A historical cohort study that involved newly diagnosed adult male patients with LUTS secondary to BPH at King Chulalongkorn Memorial Hospital from 2017 to 2021 was conducted. Eligible participants for the study were men over 45 years old with untreated lower urinary tract symptoms (LUTS) who had not previously received treatment with alpha blockers, 5 alpha reductase inhibitors, or PDE5 inhibitors. Additionally, they were required to have a negative digital rectal examination and a PSA level below 4 ng/dL. All patients completed the AUA-SI questionnaire and underwent uroflowmetry testing. The exclusion criteria were as follows: patients with voided volume < 150 mL, patients with indwelling catheters, patients with evidence of neurogenic bladder/ urethral stricture/urinary tract infection, and patients with neurological disorders. This study was conducted in accordance with the Good Clinical Practice guidelines and the Belmont Report. It was approved by the Institutional Review Board of the Faculty of Medicine, Chulalongkorn University.

Procedures

Demographic and other relevant data were recorded. The severity of the patients' symptoms was assessed using a Thai self-administered AUA-SI questionnaire that included a quality-of-life score in Thai language. Uroflowmetry was conducted using Andromeda Helix, a commercialized urodynamics instrument (Taufkirchen, Germany). Parameters, including the Qmax, the voided volume, and the average flow rate (Qave), were recorded. Flowmetry was conducted in an outpatient clinic with adequate privacy. Patients were asked to void when they felt a normal desire for normal urination, without performing any invasive procedure. The uroflowmetry that can be used must have a urine volume of more than 150 mL. The obstructive voiding patterns were classified on the basis of Qmax < 10 mL/s.

Study outcomes

The primary objective was to determine the correlation among the AUA-SI score, the scores for the obstructive and irritative domains, and the Qmax in patients suspected of having BPH. The secondary objective was to determine the dependent and independent relationships between the subgroups for the severity of symptoms and Qmax.

Statistical analysis

The sample size estimation for the correlation was calculated using a bivariate Pearson correlation with the expected correlation (r) = 0.4. The initial sample size target was 474 patients, including a 10.0% dropout allowance. All the statistical analyses were performed using IBM SPSS Statistics for Windows (version 22; IBM Corp, Armonk, NY). Pearson correlation and linear regression were used to assess correlations and relationships between variables. The level of significance was set at $P < 0.05$.

RESULTS

A total of 605 patients with LUTSs with suspected BPH admitted to the Urology Outpatient Department completed the AUA-SI and underwent uroflowmetry. After the exclusion criteria were applied, data from 510 patients were ultimately analyzed.

The mean age of the patients was 64.4 years (range of 45–88 years). The distribution of symptom severity among the patients was as follows: 192 had mild symptoms (IPSS = 0–7), 241 experienced moderate symptoms (IPSS = 8–19), and 77 reported severe symptoms (IPSS = 20–35) according to the IPSS categorization. Most of the patients had moderate symptoms, as shown in Table 1.

The mean maximal flow rate was within the no obstruction range, but the majority of the patients fell into the obstruction category, as shown in Table 1. The study revealed an intriguing relationship between the total AUA-SI scores and Qmax ($P < 0.001$), thus addressing the primary endpoint, as illustrated in Fig 1A.

Additionally, the correlations among the obstructive domain scores, irritative domain scores, quality-of-life scores, and Qmax exhibited a significantly weak negative relationship, as shown in Table 2. Similar results were found with respect to Qave (average flow rate). The AUA-SI scores and the obstructive and irritative domains had weak, negative correlations with Qave.

However, when patients were categorized into mild, moderate, and severe symptom groups on the basis of their IPSS scores, the correlation between AUA-SI and Qmax within each symptom severity group was weak and non-significant, as demonstrated in Table 3 and Figs 1B–1D.

TABLE 1. AUA-SI score, categorized by severity and results of uroflowmetry parameters, categorized by maximal flow rate.

|	Total (510)	Mild (n = 192)	Moderate (n = 241)	Severe (n=77)
Age	64.4 (45-88)	63.8 (48-84)	64.7 (45-88)	64.9 (46-80)
PSA (ng/mL)	1.32 (0.1-3.9)	1.29 (0.1-3.9)	1.31 (0.1–2.9)	1.43 (0.3-3.79)
AUA-SI score				
Obstructive	5.9 ± 4.7	1.7 ± 1.4	6.75 ± 2.8	13.8 ± 2.9
Irritative	5.1 ± 3.0	2.55 ± 1.3	5.8 ± 2.0	9.7 ± 2.2
Quality of life	2.4 ± 1.5	1.5 ± 1.0	2.7 ± 1.3	4.2 ± 1.2
Uroflow parameters				
Maximal flow rate (mL/sec)	17.4 (4.5–51.8)	19.3 (5.8-45)	16.2 (4.5-51.8)	16.1 (4.5-31.2)
Average flow rate (mL/sec)	9.3 (1.8-79)	10.7 (2.8-79)	8.7 (1.8-56)	7.8 (2.1-19.9)
Voided volume (mL)	335 (150-1222)	362.4 (154-1222)	321 (150-741)	310.3 (154-677)
Post-voided residual (mL)	57.6 (0-584)	53.9 (0-307)	60.1 (0-584)	57.6 (0-273)
Nonobstructive (Qmax > 15)	283 (55.5%)	128 (66.67%)	116 (48.13%)	39 (50.65%)
Equivocal (Qmax = 10–15)	153 (30%)	50 (26.04%)	79 (32.78%)	24 (31.17%)
Obstructive (Qmax < 10)	74 (14.5%)	14 (7.29%)	46 (19.09%)	14 (18.18%)

AUA-SI, AUA-Symptom Index

TABLE 2. Correlation coefficient among AUA-SI score + quality of life, and Qmax.

AUA-SI + Qulity-of-life	Correlation coefficient (R)	*P*
Total scores (Q1–7)	−0.164	< 0.001*
Obstructive domain scores (Q1, Q3, Q5, and Q6)	−0.164	< 0.001*
Irritative domain scores (Q2, Q4, and Q7)	−0.097	0.028*
Quality-of-life	−0.165	< 0.001*

AUA-SI, AUA-Symptom Index
* Statistically significant.
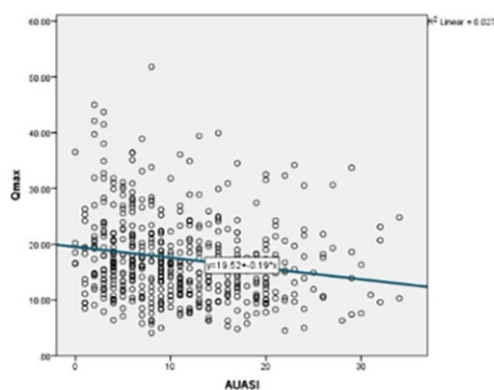
(A) r = -0.164, R², 0.027; *P* < 0.001*
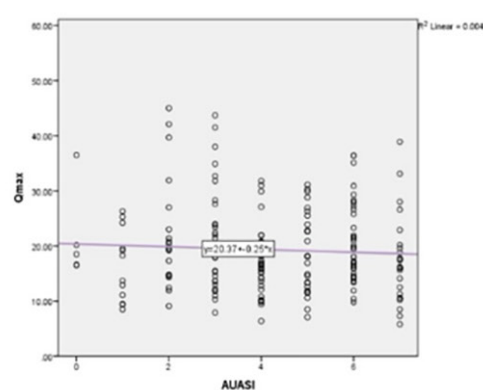
(B) r = -0.060; R2, 0.002; *P* = 0.411
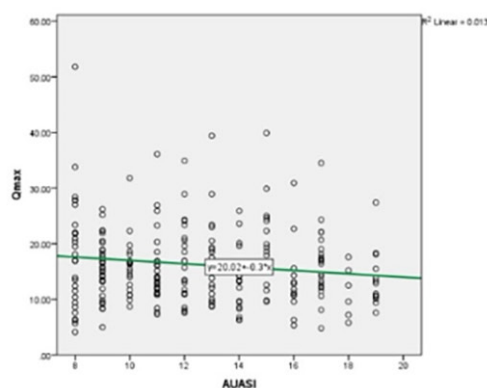
(C) r = -0.113; R2, 0.013; *P* = 0.079
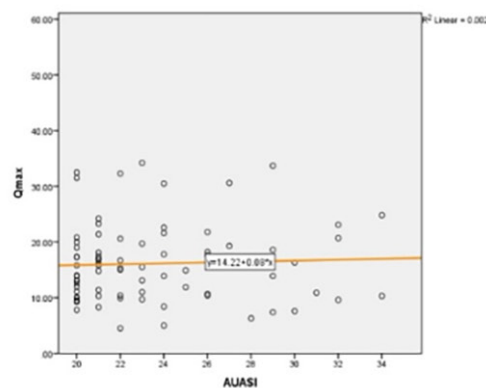
(D) r = 0.045, R2, 0.002; *P* = 0.699
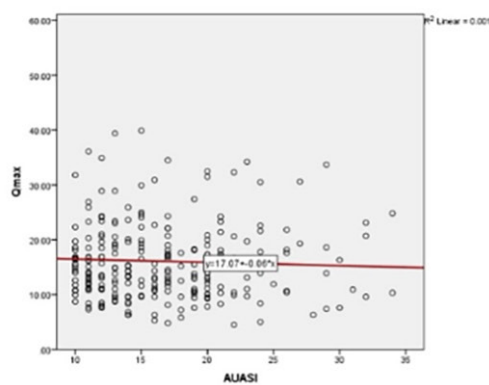
(E) R, -0.038; R2, 0.001; *P* = 0.544

Fig 1. Simple linear regression of Qmax on AUA-SI; **(A)** total number of patients; **(B)** patients with mild symptoms (AUA-SI ≤ 7); **(C)** patients with moderate symptoms (AUA-SI = 8–19); **(D)** patients with severe symptoms (AUA-SI ≥ 20); **(E)** patients with AUA-SI ≥ 10
R, correlation coefficient; R2, coefficient of determination,* statistically significant)

TABLE 3. Correlation coefficient between AUA-SI subscore and Qmax.

AUA-SI	Correlation coefficient (R)	*P*
Mild symptoms (0–7)	−0.060	0.411
Moderate symptoms (8–19)	−0.113	0.079
Severe symptoms (20–35)	0.045	0.699
Treatment-needed group	-0,051	0.544

AUA-SI, AUA-Symptom Index

When looking at the treatment-needed group (moderate-to-severe symptoms), the symptom scores were unable to determine the relationship with Qmax. Linear regression models were employed to show the relationship among the total AUA-SI score, the scores of the treatment-needed group, and Qmax, as demonstrated in Table 3 and Fig 1E.

DISCUSSION

Studies showed that most patients with LUTSs sought treatment in the form of medicine or medical intervention, with a majority being over 40 years old and presenting with mild-to-severe symptoms. In the present study, the connection between LUTS caused by BPH, as quantified by the AUA-SI, and the objective noninvasive parameters of lower urinary tract dysfunction was assessed. The results indicated that the overall severity of symptoms had a weak correlation with uroflowmetry results only. This finding supported the hypothesis that symptom scores may be influenced by various factors such as educational level, language proficiency, and comprehension of the questionnaire. These observations demonstrated that for an individual patient, the lack of correlation between symptoms and flow rate results should not alter the diagnosis. Patients seeking initial treatment often presented with mild-to-moderate symptoms, with nearly 40% exhibiting mild conditions. Uroflowmetry stands out as a widely adopted diagnostic tool in the field of urology for evaluating LUTSs.[8] All uroflowmetry parameters, such as maximum flow rate, average flow rate, voided volume, and residual urine volume, in Thai patients did not differ from those in a previous study.[7]

In cases where medical treatment was unsuccessful, surgical intervention may have been necessary for patients suffering from LUTSs caused by BPH, especially in situations where symptoms were compromising kidney function or leading to recurrent complications like urinary retention or infections. The decision for surgery was often made in consultation between the patient and their healthcare provider, as demonstrated by the findings of the Medical Therapy of Prostatic Symptoms (MTOPS) study, a large-scale, long-term study that involved 3047 men with BPH and had a mean follow-up period of 4.5 years.[9,10] According to the PLESS study, a prostate volume > 40 mL and a serum PSA level > 1.5 ng/mL were predictors of acute urinary retention and/or surgery.[11] Uroflowmetry was used to predict acute urinary retention, with a Qmax of < 10 mL/s, indicating a higher risk. Evaluation of patients by using AUA-SI/IPSS showed that those with moderate or severe symptoms were more likely to experience disease progression and complications or require surgery. Ensuring a comprehensive assessment of disease progression, complications, and the necessity for surgery involved evaluating all four predictors: IPSS, PSA, prostate volume, and uroflowmetry (Qmax). Among them, uroflowmetry was particularly recommended for further assessment in patients with moderate-to-severe symptoms or those in need of surgical intervention. The subjective nature of IPSS highlighted the importance of considering the patient's understanding and educational level because they could vary greatly among individuals and regions.[7]

Several studies across various nations investigated the correlation between the IPSS and uroflowmetry parameters.[8,12-20]

The study on Thai patients revealed a weak correlation between AUA-SI and Qmax, particularly evident in those with mild-to-severe symptoms, suggesting a weak relationship between symptom score and Qmax (P < 0.001).

A significant negative correlation was found in the relationship between IPSS and Qmax in other countries, such as Thailand (r = −0.16), Brazil (r < −0.3)[13], India (r = −0.26)[14], the Netherlands (r = -0.2)[15], and China (r = −0.26).[16] Countries that demonstrated moderate-to-strong correlations included Nepal (r = −0.729)[18], Nigeria (r = −0.492)[19], and the United States (r = −0.4).[3] Contrary to common assumptions, Qmax could not be predicted on the basis of patient symptoms in the authors' center. Therefore, instead of subjectively evaluating patient complaints only, uroflowmetry should have been used to objectively measure all patients with LUTSs, even if there were mild symptoms. In countries that have their own guidelines and have not adopted those of other nations, it is recommended to perform uroflowmetry in the initial assessment of male LUTS, as seen in India. Therefore, for Thailand, which is currently developing its own guidelines, this information may be helpful in considering and determining these guidelines.[21] However, this study had the limitation of being a single-center, retrospective investigation.

CONCLUSION

The study revealed a significant negative correlation between the AUA-SI score and Qmax, but no significant correlations were found between the obstructive and irritative domains and Qmax in the subgroup analysis, indicating that uroflowmetry is a more objective method for evaluating LUTS in all patients.

DECLARATION

Grants and Funding Information

Conflict of Interest

The authors declare that they have no conflicts of interest.

Author Contributions

Conceptualization and methodology, S.C. and S.R. ; Historical cohort, S.C., J.O., A.S. and S.R. ; Formal analysis, S.C. and S.R. ; Investigation, S.C., J.O., A.S. and S.R. ; Resources, S.C., J.O., A.S. and S.R. ; Original draft, S.C. and S.R. ; Writing – review and editing, S.R. ; Funding acquisition, S.R. All authors have read and agreed to the final version of the manuscript.

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