

A STUDY OF NORMATIVE FLOW-VOLUME RELATIONS IN HEALTHY INDIAN WOMEN IN SQUATTING VOIDING POSITION: REAPPRAISAL OF APPLICABILITY OF LIVERPOOL NOMOGRAMS IN THIS POPULATION

Hypothesis / aims of study

Voiding dysfunction is not uncommon among women. Due to differences in demographic profile and natural voiding position, urine-flow-volume nomograms developed for Caucasian women [e.g. Liverpool nomogram (1)] may not be applicable for Asian women. We undertook this study to establish normal references values for urine flow rates in Indian women in squatting position, the most common voiding position in them.

Study design, materials and methods

healthy women volunteers, including hospital staff, nursing students, visitors and relatives of patients, whose natural voiding position was squatting, underwent free uroflowmetry in squatting position using digital uroflowmeter (Solar Silver, Medical Measurement System, the Netherlands). Women with voiding symptoms, urinary tract infection within last 4 weeks, neurological / non-neurological diseases or medication affecting voiding function and abnormal uroflows were excluded. One micturition was obtained per participant to determine various uroflow variables. The results were compared to flow-volume nomograms developed in sitting voiding position in Caucasian women (1).

Results

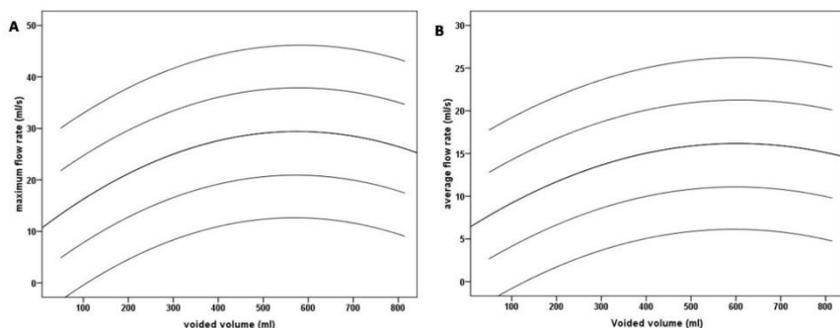
Of total 270 women enrolled in the study, data of 253 was available for final analysis. Their mean (\pm SD) age was 38.5 ± 11.9 y, body mass index (BMI) 24.1 ± 4.4 kg/m², voided volume (VV) 287 ± 158 ml, maximum flow-rate (Qmax) 23.5 ± 9.5 ml/sec and average flow-rate (Qave) 13.0 ± 5.5 ml/sec. Corrected Qmax (cQmax) and corrected Qave (cQave) were computed to be 1.49 ± 0.55 and 0.82 ± 0.30 , respectively ($cQ = Q/\sqrt{VV}$). These values were comparable to those of our previously published study on healthy Indian women in sitting voiding position (2). In multivariate analysis, flow rates had positive correlation with BMI & VV and negative with age. Confidence limit flow-volume nomograms were developed using this data (fig 1). Plotting our results on the Liverpool nomogram revealed that flow-volume relations of Indian women were at par till 250ml which fell below par progressively beyond it (fig 2). The normative flow-volume relations were tested using data of 22 women with voiding type lower urinary tract symptoms using Receiver-operating characteristics curves (fig 3); the area under curve was 0.909 for cQmax ($p=0.0001$) and 0.922 for cQave ($p=0.0001$).

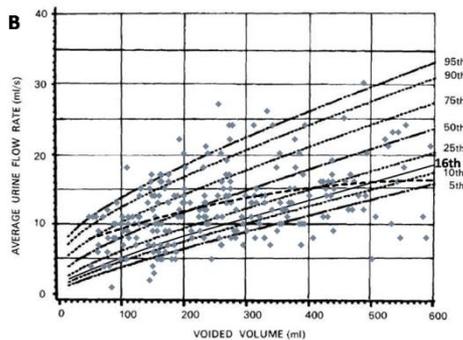
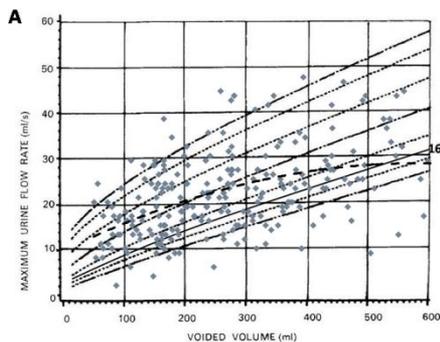
Interpretation of results

Normative flow-volume relations were obtained in the above population in their natural voiding position and are presented as flow-volume nomograms and volume-corrected flow rates.

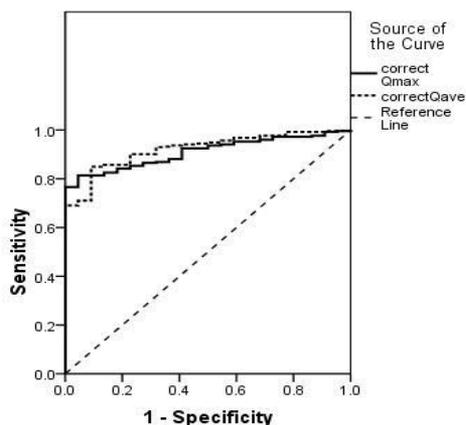
Concluding message

These nomograms would help clinicians evaluate flow rates over a wide range of voided volume as well as age. Utilizing Liverpool nomogram in Indian population may lead to false positive result, especially a VV > 250ml.





ROC Curve



Diagonal segments are produced by ties.

References

1. Haylen BT, Ashby D, Sutherst JR, et al. Maximum and average urine flow rates in normal male and female populations— The Liverpool nomograms. Br J Urol 1989;64:30–38.
2. Barapatre Y, Agarwal MM, Singh SK, Sharma SK, Mavuduru RM, Mete UK, et al. Uroflowmetry in healthy women: development and validation of flow – volume and corrected flow – age nomograms. Neurourol Urodynam 2009; 28(8): 1003-9.

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Is this a clinical trial?	No
What were the subjects in the study?	HUMAN
Was this study approved by an ethics committee?	Yes
Specify Name of Ethics Committee	institute ethics committee, postgraduate institute of medical education and research, chandigarh, india.
Was the Declaration of Helsinki followed?	Yes
Was informed consent obtained from the patients?	Yes