International Journal of Research in Medical Sciences
Kenneth A et al. Int J Res Med Sci. 2016 Sep;4(9):3905-3911
www.msjonline.org
pISSN 2320-6071 | eISSN 2320-6012

DOI: http://dx.doi.org/10.18203/2320-6012.ijrms20162906

Research Article

Lower urinary tract symptoms suggestive of benign prostatic hyperplasia among Ghanaian men: a hospital-based cross-sectional prospective study

Aboah Kenneth[1], Agyemang-Yeboah Francis[2], Gyase-Sarpong Kofi Christian[1], Laing Edwin Ferguson[2], Acheampong Emmanuel[2]*, Twumasi Frimpong Benjamin[1], Amoah George[1], Batu Nsenbah Emmanuella[2], Adutwumwaah Asamoah Portia[1]

[1]Department of Surgery (Urology Unit), School of Medical Sciences/Komfo Anokye Teaching Hospital, Kumasi, Ghana
[2]Department of Molecular Medicine, School of Medical Sciences, Kwame Nkrumah University of Science and Technology (KNUST), Kumasi, Ghana

Received: 18 July 2016
Accepted: 12 August 2016

***Correspondence:**
Emmanuel Acheampong,
E-mail: emma_acheampong@knust.edu.gh

ABSTRACT

Background: Lower urinary tract symptoms (LUTS) of benign prostatic hyperplasia (BPH) are common in the elderly. This study sought to determine the prevalence of LUTS among patients visiting the urology clinic at Komfo Anokye Teaching Hospital, Kumasi, Ghana and to explore its presentation patterns.
Methods: Simple randomized sampling technique was used to recruit 225 subjects with a mean age of 67.96±14.57 (range=40-100years) in a prospective cross-sectional study. LUTS related characteristics and international prostate symptom score (IPSS) questionnaire were employed to obtain relevant data.
Results: The average IPSS of the studied participants was 17.52±7.83. Based on the IPSS, the prevalence of LUTS suggestive of BPH was 88.89%. Bladder storage symptoms were also recorded at 88.59% whilst prostate enlargement based on digital rectal examination (DRE) was 60.4% among the studied subjects. PSA levels ≥4.0ng/ml gave a prevalence of 81.5%. The prevalence of prostate enlargement defined as PSA ≥1.5ng/ml was 85.23% among the studied subjects whilst 63.11% of the subjects examined had troublesome LUTS. Urgency was the most predominantly reported LUTS (93.3%) among the subjects studied.
Conclusions: This study has clearly shown that, the most prevalent urinary tract symptoms (LUTS) associated with benign prostatic hyperplasia were bladder storage symptoms and urgency. These symptoms when present clinically therefore, suggest benign prostatic hyperplasia and that the prevalence estimates of LUTS in older men are relatively higher at diagnosis.

Keywords: International prostate symptom score, Prevalence, Lower urinary tract symptoms, Digital rectal examination

INTRODUCTION

Lower urinary tract symptoms (LUTS) of benign prostatic hyperplasia (BPH) are common clinical presentation in elderly men. It affects 15-60% of patients greater than 40 years which poses public health burden.[1,2] LUTS are used to define the complex of those symptoms which includes bladder storage, sensation or voiding symptoms. These symptoms are often associated with prostate enlargement which is a common aetiology of

male LUTS.[3-5] However, LUTS are not specific to only one disease, they may also be present in many other diseases such as heart failures, urinary tract infections, diabetes, bladder neck cancer, and neurological diseases including Parkinson disease, multiple sclerosis, stroke and cauda equina syndrome.[6-8]

Other factors, unrelated to prostatitis conditions including diet or fluid intake, alcohol intake and anticholinergic effects of commonly used medication (available without prescription) could affect the quality of life of the individual.[8,9] Clinical BPH is a term synonymous with LUTS in the presence of prostate enlargement detected on digital rectal examination (DRE).[10,11] The prevalence of LUTS differ with the demographics of a subject with BPH. It rises with age and the study orientation which is either population-based or facility-based.[12]

Globally, various studies have reported racial difference in LUTS prevalence.[12,13] Prevalence of 41.0% of moderate-severe LUTS among African-American men in Michigan was significantly higher than that of Caucasian-American men in Minnesota (34.0%).[14] A hospital-based study among Nigerians reported a prevalence of 88% which was similar to a hospital-based study in Ethiopia which reported a prevalence of 84.4%. However a lower prevalence of 40% was in India.[15-17] Recent data from a population-based study in Ghana reported a prevalence of 19.9%, 62.3% and 13.3% respectively for international prostate symptom score (IPSS), PSA and an enlarged prostate on DRE.[18]

However, no hospital-based study has been done so far to elucidate both LUTS and BPH. Furthermore, there is scanty of data on LUTS that clinically suggest BPH and prevalence data are not well documented in poor-setting countries where such information may be clinically useful. It is against this background that this study sought to explore the presentation patterns of LUTS and to determine its prevalence to ascertain it clinical usefulness in diagnosing BPH among patients visiting the urology clinic at Komfo Anokye Teaching Hospital.

METHODS

A hospital-based cross-sectional prospective study was used to determine the occurrence of LUTS among 225 Ghanaian men visiting the urology clinic at Komfo Anokye Teaching Hospital (KATH), Ghana within a one year period. Komfo Anokye Teaching Hospital is a tertiary referral teaching hospital located in Kumasi, Ghana with a total projected population of 4,780,380. It is the second largest Hospital in Ghana.

Simple random sampling technique was used to recruited informed and consented subjects for the study. Recruited patients were male patients aged 40 years and above who presented to the urology clinic. Male patients who were below 40 years of age who presented with LUTS were excluded and male patients who were 40 years and above who presented without LUTS to the urology clinic were recruited. Data were obtained during clinical consultations with subjects. Information was obtained on their socio-demographic, medical history and detailed symptoms of the urogenital system.

Trained interviewers were employed to determine the extent to which patients are troubled by their symptoms using the International prostate symptoms score (IPSS). This established clinical score system also allowed the quality of life of the subjects to be assessed. The score tool contains eight questions. Seven fall under the LUTS categories and one pertains to quality of life.[19,20] It has sound internal consistency, as measured by a Cronbach's alpha coefficient of 0.89.

The seven questions of the IPSS comprise a question on post-micturition symptoms, on voiding symptoms and bladder storage symptoms. The overall score of the IPSS was obtained by a computer summation. This symptom category thus allows the physician to understand the degree of inconvenience that patients perceive their symptoms to have caused. Significant LUTS is usually defined as a total IPSS of at least 8 (moderate or severe).[19]

Physical examination of the patients was carried out by an experienced Urologist who performed a DRE to evaluate prostate size, consistency, induration, nodularity, asymmetry, or the presence of a rectal mass. An enlarged, firm, mobile rectal mucosa, smooth surface, well defined margins and symmetrical prostate was suggestive of LUTS.

Estimation of PSA and tran's rectal ultrasonography

Prior to ultrasonography, five millilitres (5ml) of blood was collected into a serum separator vacutainer(R) tube, and centrifuged to obtain the serum used for total PSA assay. The assay was performed using the electro-chemiluminiscence method (Cobas e411 Analyzer, Roche Diagnostics, Germany). Trans-rectal ultrasonography was performed using an endocavitary convex probe with a 6.5MHz transducer. Measures of the triaxial distances of the prostate were taken in its larger diameter and total volume was calculated using the formula; volume 0.52 x transverse diameter x anterior posterior diameter x longitudinal diameter.

Sample size determination

The study was designed to detect a precision of 6% difference in the prevalence of LUTS, with α-error of 5%, acceptable β-error of 20%, and a statistical power of 80%. Based on an average prevalence 31.8% of (IPSS), PSA and an enlarged prostate on DRE in a previous study.[18] And using the formula for sample size determination for studying proportions in populations of more than 4,780380, the minimum required sample size was thus determined to be 225.[21]

Data analysis

Responses to questionnaires were coded and entered into a database using statistical package for social sciences® (SPSS, Chicago, Illinois, USA) Version 20 for analysis. Descriptive statistics such as frequencies, percentage and charts were used. Continuous variables are expressed as their mean±Standard deviation (SD), whereas categorical variables were expressed as figure and proportion.

Ethical consideration

Ethical Approval (CHRPE/AP/243/15) for the study was obtained from the Committee on Human Research, Publication and Ethics of the School of Medical Sciences (SMS), Kwame Nkrumah University of Science and Technology (KNUST) as well as ethical review board of the Komfo Anokye Teaching Hospital (KATH).

Participation was voluntary and verbal informed consent was obtained from each participant according to Helsinki declaration. Respondents were assured on the confidentiality of their responses. In addition, respondents were given the freedom to opt out any time they thought they couldn't continue with the study

RESULTS

During the study period, a total number of 4301 patients visited the department of surgery, KATH for the first time. Of these, 933 (21.69%) received a urological consultation. The mean age of the subjects was 67.96±14.57 (range=40-100). The average score obtained from the study participants using the IPSS scale was 17.52±7.83.

Most of the participants (88.00%) were married with an average marital period of 37.72±7.83 years. Majority of the participants (57.7%) were pensioners. Majority of the participants (58.67%) were at tertiary level in education. The majority of the participants (46.67%) were at least 75 years. Only 13.3% were younger than 50 years (Table 1).

Table 1: Socio-demographics characteristic of study participants.

Variables	Frequency (n)	Percentages (%)
Age (years) Mean±SD	67.96±14.57	
Age groups (years)		
40-44	30	13.33%
50-59	42	18.67%
60-69	48	21.33%
70 +	105	46.67%
Marital status		
Single	11	4.89%
Widower	10	4.44%
Divorced	6	2.67%
Married	198	88.00%
Marital period	37.52±10.32	
Religion		
Christian	211	93.78%
Islam	14	6.22%
Educational status		
No Education	8	3.56%
Basic	63	28.00%
Secondary	22	9.78%
Tertiary	136	58.67%
Occupational status		
Informal	80	35.56%
Pensioner	130	57.78%
Formal	7	3.11%
Unemployed **Score from IPSS (Mean±SD)**	8 (17.52±7.83)	3.56%

SD=Standard Deviation, IPSS = International prostate symptom score.

Table 2 shows the results of prostate related characteristics in studied subjects with LUTS. The result of the prostate volume shows that 21 (9.30%) had grade I, 23.56% had grade II, 23.11% had grade III and 44.00% had grade IV prostate size using results from ultrasonography. Forty-one (18.22%) of participants had PSA levels within the normal range of 0 – 4.0ng/ml whilst 81.70% had PSA levels above the normal limits.

Higher proportion (30.67%) had PSA levels within the range of 20.1-50.0ng/ml. Majority of the participants (60.44%) had an abnormal DRE (Table 2). Figure 1 shows the prevalence of LUTS. Higher proportion (45.3%) of participants had severe symptoms. Majority of participants had moderate to severe symptoms (88.9%).

Table 3 shows the distribution pattern of LUTS of the participants. One hundred and ninety-one of the participants (84.89%) experienced a sense of incomplete emptying which denotes individuals with post-micturition symptoms.

Participants with weak stream, intermittency and hesitancy represented 86.67%, 84.44% and 87.11% respectively with a mean of 86.00% having voiding symptoms. The proportion of participants who experienced frequency, nocturia and urgency were 80.89%, 91.56% and 93.33%. An average of 88.59% experienced bladder storage symptoms (Table 3).

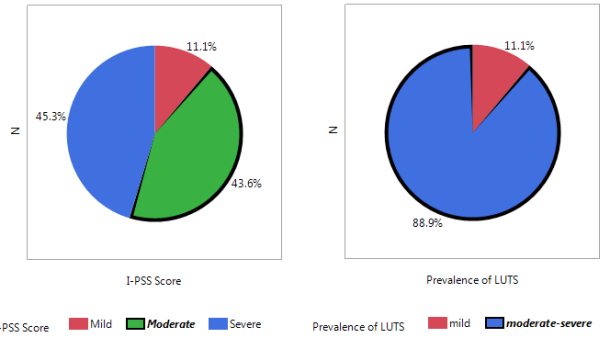

Figure 1: Prevalence of LUTS.

Table 2: Results of prostate related characteristics in subjects with lower urinary tract symptoms.

Variable	Frequency (n)	Percentage (%)
Prostate Volume (Median, IQR)	68.90 (39.65 -122.3)	
Prostate volume (ml) grading		
Grade I	21	9.30%
Grade II	53	23.56%
Grade III	52	23.11%
Grade IV	99	44.00%
PSA levels (ng/ml) (Median, IQR)	19.9 (6.25-0.00)	
PSA levels categories(ng/ml)		
0 – 4	41	18.22%
4.10 – 10	37	16.44%
10.1 – 20	31	13.78%
20.1 – 50	69	30.67%
>50	37	16.44%
DRE		
Normal	89	39.56%
Enlarged	136	60.44%

IQR = Inter quartile range

Table 3 Distribution of the pattern of the lower urinary tract symptoms suggestive of BPH.

Symptoms score Frequency (%)	0	1	2	3	4	5	Total
Incomplete Emptying	34 (15.11%)	16 (7.11%)	24 (10.67%)	50 (22.22%)	77 (34.22%)	25 (11.11%)	191 (84.89%)
Frequency	43 (19.11%)	2 (0.89%)	39 (17.33%)	62 (27.56%)	50 (22.22%)	29 (12.89%)	182 (80.89%)
Intermittency	29 (12.89%)	16 (7.11%)	53 (23.56%)	54 (24.89%)	53 (23.56%)	20 (8.89%)	196 (87.11%)
Urgency	15 (6.67%)	13 (5.78%)	35 (15.56%)	68 (30.22%)	60 (26.67%)	34 (15.11%)	210 (93.33%)
Weak stream	39 (17.33%)	7 (3.11%)	45 (20.00%)	58 (25.78%)	54 (24.00%)	22 (9.78%)	186 (86.67%)
Hesitancy	30 (13.33%)	10 (4.44%)	42 (18.67%)	60 (26.67%)	57 (25.33%)	26 (11.55%)	190 (84.44%)
Nocturia	19 (8.44%)	16 (7.11%)	32 (14.22%)	23 (10.22%)	80 (35.56%)	55 (24.44%)	206(91.56%)

Table 4: Prevalence of moderate to severe LUTS, PSA and enlarged prostate age.

Variables	Age (years)				
Estimated Prevalence	**40 -49**	**50-59**	**60-69**	**70+**	**Total (%)**
IPSS> 7	17 (8.5%)	32 (16.0%)	48 (24.0%)	103 (51.5%)	200 (88.89%)
DRE enlarged +IPSS>7	4 (2.9%)	23 (16.9%)	36 (26.5%)	73 (53.7%)	136 (60.44%)
PSA >4.0ng/ml + IPSS>7	10 (6.5%)	23 (14.9%)	34 (22.0%)	87 (56.5%)	154 (68.44%)
PSA >4.0ng/ml + IPSS>7+DRE enlarged	6 (5.9%)	14 (13.7%)	23 (22.5%)	59 (57.8%)	102 (45.33%)

Table 4 shows prevalence of moderate to severe LUTS, PSA and enlarged DRE by Age. Overall, 88.89% of men had moderate-to-severe LUTS (IPSS >7), 60.4% had enlarged prostate based on enlarged DRE. Forty-five per cent had IPSS>7 and either an enlarged prostate or a PSA≥4.0ng/ml. 68% had an IPSS >7 and a PSA ≥4.0 ng/ml (Table 4).

Table 5: Distribution of lower urinary tract symptoms by bother score.

Variables	IPSS symptom grade			
	Mild (%)	Moderate (%)	Severe (%)	Total
Bother Score				
Pleased	36 (65.45%)	0 (0)	0 (0)	36 (16.00%)
Mostly Satisfied	11 (20.00%)	0 (0)	1 (0.96%)	12 (5.33%)
Mixed	4 (7.27%)	9 (13.64%)	4 (3.85%)	17 (7.56%)
Mostly Dissatisfied	2 (3.64%)	4 (6.06%)	11 (10.58%)	17 (7.56%)
Unhappy	1 (1.82%)	17 (25.76%)	20 (19.23%)	38 (16.89%)
Terrible	0 (0)	36 (54.54%)	68 (65.39%)	104 (46.22%)
Total	55 (24.44%)	66 (29.33%)	104 (46.22%)	225 (100%)

Table 5 shows the distribution of LUTS by bother score. None of the participants with severe LUTS were pleased with their symptoms while 1 (0.96%) with severe LUTS reported most satisfied with the symptoms. None of the participants with moderate LUTS was pleased or most satisfied with their symptoms. In addition, no participants felt severe pain with mild LUTS while 68 (65.39%) with severe LUTS felt deep pain in relation to their symptoms. One hundred and seventy-six (78.22%) reported mixed of most satisfied and dissatisfied, most dissatisfied, unhappy and terrible respectively which suggest that 78.2% had bothersome LUTS (Table 5).

DISCUSSION

Lower urinary tract symptoms are common symptomatic presentation in the elderly men. This novel study is the first to determine the prevalence of LUTS suggestive of BPH in hospital-based settings among Ghanaian men in the Kumasi metropolis. The study indicated that, the using of the IPSS score, prevalence of LUTS suggestive of BPH was 88.9%.

This was far higher than a population-based study that was carried out among Ghanaian men in the Greater Accra region in which a prevalence of 19.9% was reported.[18] Furthermore, the frequency of occurrence of LUTS in the present study was higher than the 12% reported in France and other white population from Netherland (10.3%), Germany (14%) and Canada (21%).[18,22-24] It should also be mentioned here that, our observed prevalence was also higher than results obtained elsewhere in which IPSS tool was employed.[14,19,25]

However, the prevalence in this present study was comparable to reports from hospital-based studies in south-western Nigeria (88.0%), Ethiopia (84.4%) and Port Harcourt, Nigeria (72.2%).[15,16,26] These observations tend to indicate that prevalence of LUTS suggestive of BPH in hospital-based studies is comparatively higher than that reported in population-based studies. As age advanced, it is expected that the prevalence of LUTS seen in men would increase. In this current study, it was found that the prevalence of LUTS increased with age with higher proportion (46.67%) of the subjects being older than 70 years of age. These findings are consistent with a population-based study among Swedish men and Austrian men.[27,28]

The presentation patterns of LUTS in this present study have shown that bladder storage symptoms were the most experienced symptoms (88.59%). This is similar to

observation in a hospital-based study in Port Harcourt among Nigerians and a study in India.[17,26] Urgency was the most predominantly reported LUTS (93.3% observed in this study consistent with a study in India.[24]

It is of interest to note that, perhaps exclusion of urgency score from the IPSS tool would significantly change the LUTS score and reduce the prevalence of LUTS. In contrast to the results for IPSS, the prevalence of prostate enlargement based on DRE among the subjects was 60.4% which is comparable to a population-based study among Ghanaian and a hospital-based study among Nigerians (60.0%), but substantially higher than that reported for predominantly caucasians in the United States.[18,26,29] However DRE assessment may vary depending on the experience of the health care provider preforming the evaluation.

PSA levels less than or equal to 4.0ng/ml is an optimal cut off acceptable for most populations. PSA elevated level gave a prevalence of 81.70% in this present study. Recent data have also shown that PSA ≥1.5ng/ml indicates a prostate volume of ≥30ml which is the volume range with the risk for BPH progression increases.[30,31] In our study, 210 subjects had PSA ≥1.5ng/ml and out of these, 85.23% had prostate volume ≥30ml.

This study also showed that 63.11% of the subjects had troublesome LUTS which is comparable to a hospital-based study among Nigerians but inconsistent with a hospital-based study among Indians.[17,26] The occurrence of bothersome LUTS in this study showed that LUTS suggestive of BPH impacted negatively on the lives of the subjects. It is therefore necessary for physicians to be well-informed of the management of the condition if the quality of life of patients and members of the society are to be improved.

The major limitation to the study was the fact that it was purely a hospital-based study and may thus not be a representative what occurs in the community. Therefore, extrapolations of findings in the study should be made with restraint.

CONCLUSION

This study has clearly shown that bladder storage symptoms are the most experienced LUTS in patients suspected of BPH and that is often associated with high troublesome symptoms. Furthermore, the prevalence estimates of LUTS in older men were relatively high. The study has confirmed that hospital-based studies have a higher prevalence of LUTS suggestive of BPH than that of population-based studies.

ACKNOWLEDGEMENTS

Gratitude goes to workers at urology unit and authorities at Department of Surgery, Komfo Anokye Teaching Hospital and Department of Molecular Medicine, KNUST, Kumasi-Ghana.

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: The study was approved by the Committee on Human Research, Publication and Ethics of the School of Medical Sciences (SMS)

REFERENCES

1. Parsons JK. Benign prostatic hyperplasia and male lower urinary tract symptoms: epidemiology and risk factors. Current bladder dysfunction reports. 2010;P5(4):212-8.
2. Skolarikos A, Thorpe A, Neal D. Lower urinary tract symptoms and benign prostatic hyperplasia. Minerva urologicae nefrologica. The Italian journal of urology and nephrology. 2004;56(2):109-22.
3. Pelman RS. Overview of overactive bladder, prostatitis, and lower urinary tract symptoms for the primary care physician. Reviews in urology. 2004,6(Suppl 1):S16.
4. Lee C, Kozlowski JM, Grayhack JT. Etiology of benign prostatic hyperplasia. The Urologic clinics of North America. 1995;22(2):237-46.
5. Grossfeld GD, Coakley FV: Benign prostatic hyperplasia: clinical overview and value of diagnostic imaging. Radiologic Clinics of North America. 2000;38(1):31-47.
6. Kuritzky L. Role of primary care clinicians in the diagnosis and treatment of LUTS and BPH. Reviews in urology. 2004;6(Suppl 9):S53.
7. Kuo H-C: Differential diagnosis of male lower urinary tract symptoms suggestive of benign prostatic hyperplasia and non-benign prostatic hyperplasia. Incont Pelvic Floor Dysfunct. 2007;1(Suppl 1):3-6.
8. Su L, Guess HA, Girman CJ, Jacobsen SJ, Oesterling JE, Panser LA, et al. Adverse effects of medications on urinary symptoms and flow rate: a community-based study. Journal of clinical epidemiology. 1996;49(4):483-7.
9. Homma Y, Araki I, Igawa Y, Ozono S, Gotoh M, Yamanishi T, et al. Clinical guideline for male lower urinary tract symptoms. International journal of urology. 2009;16(10):775-90.
10. Kok ET, Bohnen AM, Jonkheijm R, Gouweloos J, Groeneveld FP, Thomas S, et al. Simple case definition of clinical benign prostatic hyperplasia, based on International Prostate Symptom Score, predicts general practitioner consultation rates. Urology. 2006;68(4):784-9.
11. Girman C. Population-based studies of the epidemiology of benign prostatic hyperplasia. British journal of urology Supplement. 1998,82(1):34-43.
12. Engström G, Walker-Engström M-L, Lööf L, Leppert J. Prevalence of three lower urinary tract

symptoms in men-a population-based study. Family practice. 2003;20(1):7-10.
13. Cotran RS, Kumar V, Collins T, Robbins SL. Robbins pathologic basis of disease. 1999.
14. Sarma AV, Wei JT, Jacobson DJ, Dunn RL, Roberts RO, Girman CJ, et al. Comparison of lower urinary tract symptom severity and associated bother between community-dwelling black and white men: the Olmsted County Study of Urinary Symptoms and Health Status and the Flint Men's Health Study. Urology. 2003;61(6):1086-91.
15. Adegun P, Popoola A. A survey of benign prostatic hyperplasia (BPH) amongst patients with prostatic disorders in Ado-Ekiti, Nigeria. Nig Med Pract. 2011;60(3-6):38-42.
16. Berhanu N. The safety and efficacy of trans-vesical prostatectomy done at a primary general hospital setting in Ethiopia. 2008.
17. Rao CN, Singh MK, Shekhar T, Venugopal K, Prasad MR, Saleem KL, et al. Causes of lower urinary tract symptoms (LUTS) in adult Indian males. Indian Journal of Urology. 2004;20(2):95.
18. Chokkalingam A, Yeboah E, Demarzo A, Netto G, Yu K, Biritwum R, et al. Prevalence of BPH and lower urinary tract symptoms in West Africans. Prostate cancer and prostatic diseases. 2012;15(2):170-6.
19. Kupelian V, Wei JT, O'Leary MP, Kusek JW, Litman HJ, Link CL, et al. Prevalence of lower urinary tract symptoms and effect on quality of life in a racially and ethnically diverse random sample: the Boston Area Community Health (BACH) Survey. Archives of Internal Medicine. 2006;166(21):2381-7.
20. Cruz F, Desgrandchamps F. New concepts and pathophysiology of lower urinary tract symptoms in men. European Urology Supplements. 2010,9(4):472-6.
21. Naing L, Winn T, Rusli B. Practical issues in calculating the sample size for prevalence studies. Archives of orofacial Sciences. 2006;1(1):9-14.
22. Norman R, Nickel J, Fish D, Pickett S. 'Prostate-related symptoms' in Canadian men 50 years of age or older: prevalence and relationships among symptoms. British journal of urology. 1994;74(5):542-50.
23. Sagnier P, MacFarlane G, Richard F, Botto H, Teillac P, Boyle P. Results of an epidemiological survey using a modified American Urological Association symptom index for benign prostatic hyperplasia in France. The Journal of urology. 1994,151(5):1266-70.
24. Braun M, Sommer F, Haupt G, Mathers M, Reifenrath B, Engelmann U. Lower urinary tract symptoms and erectile dysfunction: co-morbidity or typical "Aging Male" symptoms? Results of the "Cologne Male Survey". European urology. 2003;44(5):588-94.
25. Markland AD, Thompson IM, Ankerst DP, Higgins B, Kraus SR. Lack of disparity in lower urinary tract symptom severity between community-dwelling non-Hispanic white, Mexican-American, and African-American men. Urology. 2007;69(4):697-702.
26. Bock-Oruma AA, Dienye PO, Oghu IS: Prevalence of lower urinary tract symptoms suggestive of benign prostatic hyperplasia in primary care, Port Harcourt, Nigeria. South African Family Practice. 2013;55(5):467-72.
27. Andersson SO, Rashidkhani B, Karlberg L, Wolk A, Johansson JE. Prevalence of lower urinary tract symptoms in men aged 45-79 years: a population-based study of 40 000 Swedish men. BJU international. 2004;94(3):327-31.
28. Haidinger G, Temml C, Schatzl G, Brössner C, Roehlich M, Schmidbauer CP, et al. Risk factors for lower urinary tract symptoms in elderly men. European urology. 2000;37(4):413-20.
29. Naslund M, Gilsenan A, Midkiff K, Bown A, Wolford E, Wang J. Prevalence of lower urinary tract symptoms and prostate enlargement in the primary care setting. International journal of clinical practice. 2007;61(9):1437-45.
30. Roehrborn CG, Girman CJ, Rhodes T, Hanson KA, Collins GN, Sech SM, et al. Correlation between prostate size estimated by digital rectal examination and measured by transrectal ultrasound. Urology. 1997;49(4):548-57.
31. Bosch J, Bohnen A, Groeneveld F. Validity of digital rectal examination and serum prostate specific antigen in the estimation of prostate volume in community-based men aged 50 to 78 years: the Krimpen Study. European urology. 2004;46(6):753-9.

Cite this article as: Kenneth A, Francis A, Christian G, Ferguson LE, Emmanuel A, Benjamin TF, et al. Lower urinary tract symptoms suggestive of benign prostatic hyperplasia among Ghanaian men: a hospital-based cross-sectional prospective study. Int J Res Med Sci 2016;4:3905-11.