



Association of Obesity measurements with symptoms of Benign Prostatic Hyperplasia among adult men of Maputo: A cross-sectional survey

Paul Ndubuisi Anyiam, Elsa Maria Salvador, Cristiano Joao Macuamule

Author Details

P. N Anyiam is currently pursuing a master degree at Department of Biological Sciences, Faculty of Sciences, Eduardo Mondlane University, Maputo, Mozambique. Phone: +258847266846. Email: paulndubuisi58@gmail.com

E. M Salvador is a professor of Public health at Department of Biological Sciences, Faculty of Sciences, Eduardo Mondlane University, Maputo, Mozambique. Phone: : +25821493377. Email: salvador@uem.mz

C. J Macuamule is a professor of biochemistry at Section of Pharmacology and Toxicology, Department of Paraclinical Sciences, Veterinary Faculty, Eduardo Mondlane University, Maputo, Mozambique. Phone: +258823000919. Email; cristiano.macuamule@uem.mz

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Abstract

Background: The most common cause of lower urinary symptoms is benign prostatic hyperplasia (BPH) which constitutes a lot of health burden for older men. The etiology of BPH remains unclear and it is thought to be related with obesity. However, epidemiological studies on this relationship have reported conflicting results. **Objective:** This study was developed to assess the prevalence and bother of LUTS in the population of men aged 40 years and above in Maputo and also evaluate the association between the symptoms of BPH and different measures of obesity. **Methods:** The International Prostate Symptoms Score (IPSS) index was used to screen the symptoms of BPH, the choice of the most troublesome symptoms and perception of quality of life. Anthropometric data were collected using standard protocol and measures of obesity were derived. **Results:** The results showed that 33.85% of the studied population had symptoms suggestive of BPH. The severity of symptoms increases with age. Urgency (21.09%) and Nocturia (19.01%) were regarded more troublesome, and 36.7% of the studied population reported to experience a poor quality of life. According to the results, LUTS was positively correlated ($P < 0.05$) with Waist Circumference and Waist-to-Hip Ratio, whereas Body Mass

Index showed no significant correlation ($P>0.05$). Conclusions: This study indicates that LUTS affect a significant percentage of male adults population aged 40 years and above in Maputo, and the prevalence increases with age. Regrettably, the awareness is poor. There is need for a jointed effort to reverse this trend. It appears that abdominal fat distribution is the mediator of the association between obesity and prostate enlargement

Introduction

The term Lower Urinary Tract symptoms (LUTS) refers to a wide variety of symptoms often caused by benign prostatic hyperplasia (BPH) - a non-cancerous neoplastic enlargement of the prostate gland, which is common among older men and affect their quality of life [1]. As the prostate enlarges, it squeezes and reduces the volume of the urinary bladder and constricts the urethra making urination difficult. This alteration in the normal size of the prostate results in LUTS which include weak urine stream, incomplete bladder emptying, urine urgency, frequency, nocturia and straining, that characterize the clinical setting of BPH [2]. BPH affects an estimated one-in-four men in their 50s, one-in-three men in their 60s, and one-in-two men in their 80s [3, 4]. It is a significant healthcare problem due to its prevalence and the cost associated with its treatment [5]. If left untreated, BPH may progressively lead to acute urinary retention and ultimately death [6].

The pathophysiology of BPH is yet to be elucidated despite its prevalence and impact on the quality of life of individuals affected. It is thought that the growth of the prostate gland is under age-related hormonal control [2]. A complex relationship between androgens, estrogens, prolactin and sex hormones binding globulin is central to BPH pathogenesis [7]. Testosterone and its metabolite (dihydrotestosterone) promote growth and differentiation of prostate cells by binding to the androgen receptor and inducing the synthesis of growth factors that act on the prostatic epithelia and stroma and triggers the onset of BPH [6, 7].

Apart from these conventional risk factors of age and androgen activities, recent studies have suggested that systemic metabolic disturbances such as obesity may have a major role in the development of BPH [8, 9]. This is supported by many studies [10-14], such that BPH has been suggested as an element of the metabolic syndrome. However, many epidemiological studies on the association between anthropometric measures of obesity and LUTS of BPH were inconsistent and conflicting, where positive association between BPH and different measures of obesity were observed in one study but not so in another study [10, 12].

Moreover, the prevalence of BPH is not well documented in Africa unlike in other parts of the world [15-18]. There is also insufficient data on the role of obesity as a risk factor of BPH, especially among Mozambican men. The impact of LUTS is wide-ranging and significant globally, with impairment of quality of life and workplace productivity which can have substantial economic effects [19-21]. There is considerable need to understand the extent of the problem and to ensure that affected individuals receive treatment when due because early detection of BPH makes management easy and lowers the impact that BPH has on the quality of life (QOL) of the patient [7]. Quantifying those with BPH and understanding the relationships

between BPH and modifiable lifestyle factors are central to distributing scarce resources for BPH management and developing appropriate prevention strategies [12].

Therefore, in this cross-sectional population survey, we investigated the prevalence of the symptoms of BPH in Maputo, Mozambique and assessed the relationship between different measures of obesity and clinical symptoms of BPH. This study is the first population-based epidemiological study of the prevalence of BPH in Mozambique.

Materials and methods

Study design

This was a random cross-sectional population-based survey conducted within the seven (7) Districts of Maputo City, Mozambique, using the International Prostate Symptom Score (IPSS) questionnaire survey. The study was approved by the Institutional Committee on Health Bioethics of the Faculty of Medicine and Maputo Central Hospital (*Comité Institucional de Bioética em Saúde da Faculdade de Medicina e Hospital Central de Maputo* - Ref. No: **CIBS FM&HCM/034/2019**) and was performed in compliance with Good Clinical Practice and in accordance with the Declaration of Helsinki. All subjects provided informed consent.

The subjects were individually approached to participate in the study. The objectives of the study were explained to them to encourage participation. Exclusion criteria included subjects with apparent symptoms of ill health. Trained personnel with the aid of an IPSS questionnaire interviewed those who consented. Privacy and confidentiality were maintained throughout the duration of the exercise. Three hundred and eighty four (384) subjects with no apparent symptoms of ill health were screened. No honoraria were paid to the subjects.

Data Collection

LUTS were assessed using the IPSS index questionnaire, which requires little skill and no laboratory equipment, and has been shown to be valid for the diagnosis and management of BPH [21]. All terms and questions in the questionnaire were validated in Portuguese, the official language of the studied population.

Symptom scores of BPH in the studied population were classified as Mild (0-7 points), Moderate (8-19) and Severe (20-35). Subjects with moderate-to-severe symptoms were regarded as having LUTS suggestive of BPH. Subjects were also grouped according to the symptom they considered most troublesome. Finally, based on the subjects' perception of their quality of life, they were divided into three groups: Satisfied (0-2), Mixed (3) and Dissatisfied (4-6).

To obtain data for measures of obesity, weight was measured using a digital display electronic scale (NOVA: Model: BGS-1240), with the subjects in light clothing without shoes, after emptying the bladder. Height was measured as the distance from the top of the head to the

bottom of the feet using an inelastic measuring tape, fastened to a vertical rod, to the nearest 0.1 cm, with the subject standing on bare feet. Waist circumferences and hip circumferences were measured around the umbilicus and the widest circumference around the buttocks respectively, using an inelastic measuring tape, to the nearest 0.1 cm. The same trained personnel took all measurements. From the anthropometric measurements taken, the subjects' Body Mass Index (BMI) was calculated as the weight (kg) divided by the square of the height (m). Whereas the Waist-to-Hip Ratio (WHpR) was calculated as the waist circumference (cm) divided by the hip circumference (cm)

Data analysis

Descriptive statistical analysis was carried out on the data generated and differences between means separated by one-way ANOVA. The relationships between the symptom scores of BPH and the measures of obesity were assessed using Pearson's correlation coefficients. The significant threshold was fixed at $p \leq 0.05$ for all analysis. Data analyses were done using IBM-SPSS Statistics for Windows, version 20 (IBM Corp., Atlanta, GA).

Results

The results of the population-based study to determine the prevalence of symptoms suggestive of BPH are shown in **Table 1**. A total of 384 subjects participated in the study and the total prevalence of LUTS suggestive of BPH (moderate-to-severe symptoms) is 33.85%. There was a progressive increase in the percentage of those with symptoms suggestive of BPH as the age range increased from 40-49 to 80 years or older.

Table 1: Prevalence of BPH symptoms in the studied population

IPSS/Age	40-49	50-59	60-69	70-79	80+	Total (%)
	N (%)	N (%)	N (%)	N (%)	N (%)	
Mild	112 (86.8)	75 (78.12)	46 (57.5)	14 (28.0)	7 (24.3)	254 (66.14)
Moderate	16 (12.40)	16 (16.67)	25 (31.25)	22 (44.0)	8 (27.58)	87 (22.66)
Severe	1.0 (0.77)	5 (5.20)	9 (11.25)	14 (28.0)	14 (48.27)	43 (11.19)
Total	129 (33.60)	96 (25.0)	80 (20.83)	50 (13.02)	29 (7.55)	384 (100)
LUTS*	17 (13.17)	21(21.87)	34 (42.5)	36 (72.0)	22 (75.86)	130 (33.85)

Luts* = Moderate + Severe symptoms

The prevalence of LUTS in this report (33.85%) is considerably in close range with reports both within and outside Africa. In Umudike, South Eastern Nigeria, Ejike and Eze [12], after studying 747 adult men reported a prevalence of 35.5%. Ojewole *et al.* [5] found a prevalence of 28.5% with IPSS score of ≥ 8 in a community-based cross-sectional survey amongst 615 men in South-

Western Nigeria. Similar prevalence of 25.4% and 19.9% was reported by Ezeanyika *et al.* [22] in Nsukka Nigeria, and Chokkalingnam *et al.* [23] in Ghana respectively. In South Africa, 1:3 men aged 45years older (approximately 30%) experience LUTS due to BPH and there is annual increase in men with symptomatic BPH [24].

Similar findings have also been reported outside Africa. A prevalence of 36.6% was reported in one epidemiological study conducted by Wang *et al.* [25] in China. Another study by Chapple *et al.* [17] showed that 39.8% and 43.2% of individuals who are aged 55-60 and above 60 years respectively had an IPSS score of ≥ 8 which represents a moderate-to-severe form of LUTS. These reports can be justifiably compared to the present study because the same IPSS questionnaire was used to diagnose the clinical symptoms (LUTS) of BPH. Unfortunately, awareness of this situation is poor within Mozambican men as the majority of the subjects had scarce knowledge of diseases related to the prostate gland; symptoms associated with it and treatment options.

Differences in prevalence of LUTS across various countries can be attributable to research setting, environment, lifestyle, cultural and linguistic differences, and the mode of data collection regarding sample size and characteristics, respondent's understanding and interpretation of the questions. Translation of the IPSS into various languages can as well increase variability. This study revealed an increase in the severity of symptoms of BPH with increasing age (**Table 1**). This is understandable and in agreement with other reports [12-15], which showed that the only clearly defined risk factors for BPH are age and circulating androgens.

The symptom regarded as most troublesome by the respondents depends on its severity. As shown in **Table 2**, those with mild symptoms reported urgency (21.65%) as the most troublesome symptom while none of them had intermittency and straining as troublesome symptoms. For those with moderate symptoms, frequency (33.33%) was felt as the most troublesome symptom. Nocturia (44.1%) was the most troublesome symptoms for those with severe symptoms of BPH. In the general population, urgency was regarded as the most troublesome (21.09%) while intermittency was reported as the least troublesome symptom (0.52%). The other symptoms fall in-between these two ends.

Table 2: Most reported troublesome symptoms stratified according to symptom scores

IPSS	N	None	Incomplete emptying	Frequency	Intermittency	Urgency	Weak stream	Straining	Nocturia
Mild	254	92	11	38	-----	55	12	-----	46
Moderate	87	----	21	29	2	22	1	4	8
Severe	43	----	14	1	-----	4	1	4	19
Total	384	92	46	68	2	81	14	8	73
%		(23.95)	(11.98%)	(17.7%)	(0.52)	(21.09)	(3.65)	(2.08)	(19.01)

N = number of individuals affected

Approximately fifty percent of the studied population felt satisfied with their quality of life. However, 13.82% and 36.71% of the same population felt “mixed” (satisfied and dissatisfied) and dissatisfied with their quality of life respectively (**Table 3**). The percentage of those who felt satisfied dropped as the age increases. The quality of life of respondents was also seen to decrease with increasing age and increasing severity of symptoms. A significant number (36.7%) of the subjects felt dissatisfied and unhappy to spend the rest of their life with their urinary condition, which shows that LUTS (the manifestation of BPH) interferes with the quality of life of the individual affected.

Table 3: Impact of lower urinary tract symptoms on respondent’s quality of life

Age	40-49	50-59	60-69	70-79	80+	Total
QoL	N (%)					
Satisfied	94 (72.86)	56 (58.33)	32 (40.00)	5 (10.00)	3 (10.34)	190 (49.47)
Mixed	17 (13.17)	17 (17.71)	11 (13.75)	6 (12.00)	2 (6.90)	53 (13.82)
Dissatisfied	18 (13.95)	23 (23.95)	37 (46.25)	39 (78.00)	24 (82.75)	141 (36.71)

The correlation data between symptoms of BPH and different measures of obesity (**Table 4**) revealed that waist circumference (WC) and waist-to-hip ratio (WHpR) were positively correlated ($p < 0.05$) with symptom scores. Body Mass Index (BMI) was not significantly correlated ($p > 0.05$) with symptom scores of BPH.

Table 4: Correlating symptom with measures of obesity irrespective of age

Measures of obesity	Correlation coefficient	P-Value
WC	0.311	$P < 0.05$
BMI	0.060	$P > 0.05$
WHpR	0.372	$P < 0.05$

The present research suggests that central obesity might be the major mediator of the risk of obesity which triggers the onset of BPH. The lack of association between BMI and LUTS of

BPH showed in this report is not a lonely case. Ejike and Eze [12] in their report revealed that WHpR was associated with BPH (albeit minimally) but no significant association was observed with BMI. Lee *et al.* [13] also reported no association between BMI and symptoms of BPH among 602 Korean men with LUTS. These authors reported a positive significant correlation between WC and LUTS and further concluded that men with WC>90 cm experienced a 1.36-fold increased risk of severe LUTS compared with men with WC<90 cm.

Dahle *et al.* [26] after studying 502 Chinese men reported no association between BMI and symptoms of BPH but showed that individuals with a WHpR in the highest quartile have a significant 2.0-fold higher risk of developing symptomatic BPH compared to those in the lowest quartile. In another study [13] serum PSA level was found to be associated with WC but not BMI. The authors also observed that the irritative symptoms such as nocturia and urgency increased with the enlargement of prostate volume in men with WC>90 cm. In this study, urgency and nocturia are seen as the most troublesome symptoms, which is in agreement with their report.

On the contrary to our findings, Xie *et al.* [10] reported that BMI was associated with 1-cm³ increase in prostate enlargement after studying 649 Chinese men. No association was seen between prostate volume and hypertension. Similarly, Seim *et al.* [27], after studying the data of 21,694 Norwegian men reported that both BMI and WHpR significantly predicted LUTS using same IPSS as we used in our study. Our data agrees with theirs on WHpR but not with BMI. Parsons *et al.* [11, 27] reported that men with BMI $\geq 35\text{kg/m}^2$ had 3.5-fold risk of developing enlarged prostate. There are several other reports in the literature showing an association between BMI and BPH. Again, the differences might be attributed to the larger sample size in their study compared to the present; methodological difference and respondent's characteristics.

From our data, it appears that visceral adiposity is likely the key predictor of the linkage between obesity and BPH. According to Ejike and Eze [12], the problem with obesity for which it is linked to BPH is excess adiposity. This is because BMI falsely distributes the excess weight throughout the entire body due to the formulae used to derive it. It is possible to be obese by BMI standards and yet post a healthy metabolic profile [19], but WHpR is known to predict obesity-related health risks better than BMI [29]. Abdominal obesity raises the estrogen to androgen ratio and may increase sympathetic nervous activities which are known to influence the development of BPH and the severity of LUTS [30]. Furthermore, in the centrally obese men, big abdominal mass just above the testicular venous system may affect the prostate and thus link obesity to BPH [12]. These reasons may provide the explanation behind our findings. The causal relationship between the central obesity and LUTS of BPH needs further investigation.

This study however was limited by the inability to carry out any laboratory confirmatory diagnosis of BPH in our subjects. This was due to the unavailability of the needed equipment, skill and the lack of funds required for financing such a huge and elaborated project. Therefore, the results of this study might be interpreted on the basis of LUTS suggestive of BPH. The study

was also limited by small sample size. A larger nationally representative study is therefore warranted.

We therefore hope that this initial report on the LUTS prevalence in Maputo would help in highlighting the problem of men's health and create more awareness to stimulate funding for more elaborated research in this area.

Conclusions: In conclusion, this study indicates that symptoms of BPH affect approximately 1 in 3 male adults aged 40 years and above in Maputo and the prevalence increases with age. Regrettably, the awareness on this condition is poor. There is need to increase subject awareness of LUTS in the country so as to improve the rates of diagnosis and treatment. The data in this study also provides evidence that central obesity rather than overall obesity seems to be the more important predictor of LUTS/BPH.

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Conflict of Interest

The authors declare that the research was conducted in the absence of any commercial or financial relationship that could be construed as a potential conflict of interest.

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