ORIGINAL ARTICLE

ISSN: 0331 - 670X

https://doi.org/10.51412/psnnjp.2024.18

The Nigerian Journal of PHARMACY
AS MEN OF HONOUR WE JOIN HANDS
THE OFFICIAL ORGAN OF THE PHARMACEUTICAL SOCIETY OF NIGERIA FOUNDED 1927

Prevalence of clinical symptoms and their effect on quality of life among patients with benign prostatic hyperplasia at a tertiary health facility in Minna, North central Nigeria

Florence Adule Nnatsu[1], Paul Otor Onah[2], Stella Folajole Usifoh[3]*

[1]Department of Foods and Drugs, Niger State Primary Healthcare Development Agency, Minna, Niger State.
[2]Department of Clinical Pharmacy and Pharmacy administration, Faculty of Pharmacy, University of Maiduguri, Borno State.
[3]Department of Clinical Pharmacy and Pharmacy Practice, Faculty of Pharmacy, University of Benin, Edo State

ARTICLE INFO

Article history:

Received 18th August 2024
Revised 5th October 2024
Accepted 6th October 2024
Online Published

Keywords:

Benign prostate hyperplasia,

Quality of life,

SF-12,

EPIC-CP,

Clinical symptoms

*Corresponding Author:
Stella Folajole Usifoh
Email: sfusifoh@uniben.edu
Tel: +2348025600615

ABSTRACT

Background: Benign prostate hyperplasia (BPH) is increasingly common among older adult males and its treatment has highly variable effect on patient's quality of life. The persistence of clinical symptoms varies widely and also frequently changes in the course of therapy. The severity of symptoms, side effect(s) of drugs, emotional distress and demographic factors have unpredictable impact on patient's quality of life. Furthermore, the persistence of residual clinical symptoms and abnormally high PSA levels remain an ongoing clinical challenge in the management of the disease. This study therefore aims to assess prevalence and severity of symptoms and quality of life of patients with benign prostate hyperplasia.
Methods: The study was carried out at Ibrahim Badamosi Babangida specialized hospital Minna, Niger State. The hospital's electronic patient's records were used to identify prospective respondents. The medical information of 443 eligible patients were extracted for analysis. The selected patients were followed up during physician appointments and then administered the EPIC-CP and SF-12 questionnaires to determine prevalence and severity of symptoms as well as quality of life respectively. Data was entered into Microsoft excel and scores calculated according to standard procedures. A subscale score of ≤4 implied absence or mild symptoms, 5 – 8 (moderate symptom) and 9 – 12 severe symptoms (EPIC-CP), while physical and mental components of quality of life score higher than 50 was satisfactory (SF-12).
Results: The mean age of respondents was 65 years and they had been on therapy for 4.9 years. Majority of patients were on Tamulosin monotherapy (63.1%) and Tamulosin / Dutasteride combination therapy (36.9%). The most reported symptoms included sexual dysfunction (96.1%), urinary incontinence (37.6%), urinary obstruction (34.5%) and hormonal symptoms (36%).The quality of life was generally poor and significantly associated with age ($p=0.042$) and PSA level ($p<0.001$).There was significant difference in quality of life based on demographic variables ($p<0.001$).
Conclusion: The persistence of high level of sexual dysfunction and urinary symptoms among patients remains a major medical challenge. Quality of life was generally poor and affected by residual symptoms and side effect of drugs.

Introduction

Benign prostate hyperplasia (BPH) is frequently diagnosed among adult males above 65 years with an estimated 1.4 million new cases annually and 3.8% mortality rate worldwide [1 - 3].Recent epidemiological evidence indicate that the highest number of cases are still found in North America, Europe and Oceania region, however it is believed that prevalence is under reported in developing countries[3,4]. It is estimated that by 2040most of the 2.3 million new cases will be in developing countries[3]. In the last three decades there have been rising cases of the disease[4,5] with prevalence of between 22.4% and 37.4% among older adults[6,7].

In high income countries there have been declining number of new cases driven by public health interventions involving screening and availability of new treatments[2,8]. This is in contrast to rising cases in developing countries where public awareness and availability of diagnostic services is encouraging men to seek preemptive screening for the disease[9].Several studies have also reported rapid rise

in cases of BPH in sub Saharan countries[10,11] and recent projections indicate that an additional 75 million new cases and 17 million deaths will be recorded in the region by 2030[12].

The rise in prevalence have been attributed to increasing ageing population, rising obesity, unhealthy diets and other risky lifestyles[13,14]. In addition the rise in metabolic diseases in recent decades has added a new layer to the risk of developing BPH[15]. The complex interplay between genetic predisposition and risky lifestyles, smoking, alcohol misuse and chronic urinary tract infections is poorly understood, although they have been reported to be significant contributors to the development of the disease[8,13].

In many developing countries prognosis after initiation of therapy is highly variable as a significant proportion of patients continue to experience residual symptoms severe enough to affect their quality of life[16 - 18]. A few studies reported poor long-term prognosis partly because of late presentation at health facilities[19], poor attitudes toward preventive screening[20,21], long waiting period before treatment[22,23] and poor access to quality healthcare services[24,25]. Furthermore, poor socioeconomic status of patients[25,26] and disability caused by the disease[27,2]negatively impact on affordability of care, adherence to treatment and clinical outcomes all of which influence prognosis for patients on therapy.

The increasing uptake of screening leading to early detection and treatment has significantly improved long term survival and increased life expectancy[29,30]. However, this comes with challenges with psychological distress[31 - 33]and poor quality of life[34,35,]although this is not a consistent finding from other studies[34,36]. Benign prostatic hyperplasia is also associated with feelings of "threat to masculinity" due to erectile dysfunction, loss of libido, poor satisfaction with sexual performance which is important to favourable perception of sense of manhood and quality of life[36].

The relationship between symptoms of the disease, quality of life and psychological distress is not linear[37 - 39], as several factors play important roles in determining patient's quality of life[40].While studies have frequently reported contrasting findings on distress and quality of life[41 –43], side effects of drug(s)[43], erectile dysfunction and urinary incontinence are known to affect the quality of life[44,45]. Furthermore, several demographic factors[46] including duration of therapy[47,48], age[49], comorbidities[50] and complications are reported determinants of patients quality of life[51,52]. The relative impact of these factors on quality of life vary widely between individuals and population groups so it is important to assess the impact of residual symptoms of the disease, drug(s) and demographic factors on patients quality of life.

The major goal of pharmacotherapy is not only to reduce prostate size but also to relieve clinical symptoms and normalize PSA level all of which are expected to improve patient'squality of life. The major aim of this study is therefore to assess the prevalence of clinical symptoms and their effect on patient's quality of life on long term drug therapy.

Methods

Settings: The study was done at the Urology Department of Ibrahim Badamosi Babangida Specialist Hospital in Minna, capital of Niger State, Nigeria. The hospital is a tertiary health facility with a 105 bed capacity owned by the State government and one of two health facilities where cases of BPH are managed in the State.

Study design: This was a cross-sectional retrospective survey of patients treatment outcomes documented in medical records for a three year period (2021 – 2023).

Sample size/sampling: The sample size was determined using the formula

$$N = \frac{Z^2 P(1-P)}{e^2}$$

Where: N = sample size, Z score at 95% confidence interval = 1.96, P = estimated prevalence of BPH (50%), e = (5%). The estimated sample size was calculated to be 443 which include 15% attrition rate to give the final sample size of 443 patients. The patients were sampled using convenience sampling method from information obtained from the hospitals database.

Patients were eligibility if they:

- § have been on drug therapy for at least six months
- § have had no previous surgery as part of BPH treatment
- § have attended ≥ 80% of clinic appointments

EPIC-CP questionnaire: The expanded BPH index composite for clinical practice (EPIC-CP) is a 10 item disease specific questionnaire that is used to measure severity of urinary incontinence, urinary irritation/obstruction, bowel, sexual and vitality/hormonal symptoms. The items rate severity of symptoms from "no problems to big problems" and scored on a 0 – 4 Likert scale. The score of zero indicate no reported clinical symptoms while increasing scores represent increasing

severity of symptoms. The questionnaire consist of five subscales which include '*urinary incontinence*" (item 1-4), "*urinary irritation/obstruction*" (item 5), "*bowel symptoms*" (item 6), "*sexual symptoms*" (item 7-9) and *vitality/hormonal* symptoms (item 10). Each subscale has a maximum score of 12 *(≤ 4 = no or mild symptoms, 5 – 8 = moderate symptoms and 9 – 12 = severe symptoms*) and higher scores represent increasing severity of clinical symptoms.

SF-12 questionnaire: This is a12 item tool used for assessing general quality of life and it consist of six sub scales including "*general health, physical functioning, limitation due to physical health, limitation due to emotional health, emotional wellbeing, energy/fatigue and pain*". The summary is calculated as physical and mental component scores and an average score of 50 and standard deviation of 10is used to determine quality of life. Physical and mental component scores less than 50 represent poor quality of life and vice versa.

Questionnaire administration: The selected patients identified from the hospitals electronic database were followed during routine physician consultations and questionnaires self-administered on them after verification of their medical information extracted prior to clinic days. A total of 443 questionnaires (EPIC-CP, SF-12) were self-administered out of which 412 were used for final analysis giving a return rate of 93%. The questionnaires were completed by ticking the option that best reflect patient's opinion or experience with symptoms and wellbeing.

Data analysis: The data was entered into Microsoft excel, coded and then loaded into SPSS version 21 for descriptive and inferential statistics. The EPIC-CP item scores for each subscale summed up and a score of > 4 (maximum score - 12) and global score of > 20 (maximum score- 60) indicate the presence of clinically significant symptoms[53]. The SF-12 was summarized into physical component score and mental component scores using standard procedure. The quality of life was determined to be good if the average score was above 50 and poor if less than this 50. One way ANOVA and Students t test were used to assess differences in quality of life based on demographic variables. Chi square test was used to determine association between patient factors and severity of clinical symptoms. P values <0.05 was considered statistically significant.

Ethical issues: The approval for this study was obtained from the health research ethics committee of the hospital (*Reference no. M2020-05*).

Results

Demographic data showed that most patients were retired (68.2%) and had tertiary level education (88.1%). The mean age was 65.1 ± 8.6 years and most had no comorbidities (78.2%). The mean duration of therapy was 4.9 ± 2.4years (Table 1).

Table 1: Demographic data

Variable	Number (%)
Age (yrs.)	
≤ 50	23 (5.5)
51 – 60	72 (17.5)
61 – 70	317 (77)
Mean (SD)	**66.7 ± 4.9**
Educational status	
Primary	35 (8.5)
Secondary	14 (3.4)
Tertiary	363 (88.1)
Occupation	
Civil servant	35 (8.5)
Self employed	77 (18.7)
Private sector employed	12 (2.9)
Unemployed	7 (1.7)
Retired	281 (68.2)

Comorbidities	
Diabetes mellitus	24 (5.8)
Hypertension	30 (7.3)
Asthma	7 (1.7)
Cardiovascular diseases	29 (3.1)
Income (N)	
≤60	35 (8.5)
61 – 90	115 (27.9)
91 – 120	161 (39.1)
121 – 150	101 (24.5)
Mean (SD)	**109.3 ± 23.8**
Therapy (yrs.)	
< 2	46 (11.1)
2 – 5	197 (47.8)
> 5	169 (41)
Mean (SD)	**4.9 ± 2.4**

The PSA results showed that only a third of patients achieved the normal level of ≤4 ng/ml (30%), while those with 5 – 10 ng/ml and 11 – 20 ng/ml constituted 25% and 18.1% respectively. A quarter of patients on therapy still had PSA levels above 30 ng/ml (25.6%) (**Figure 1**).

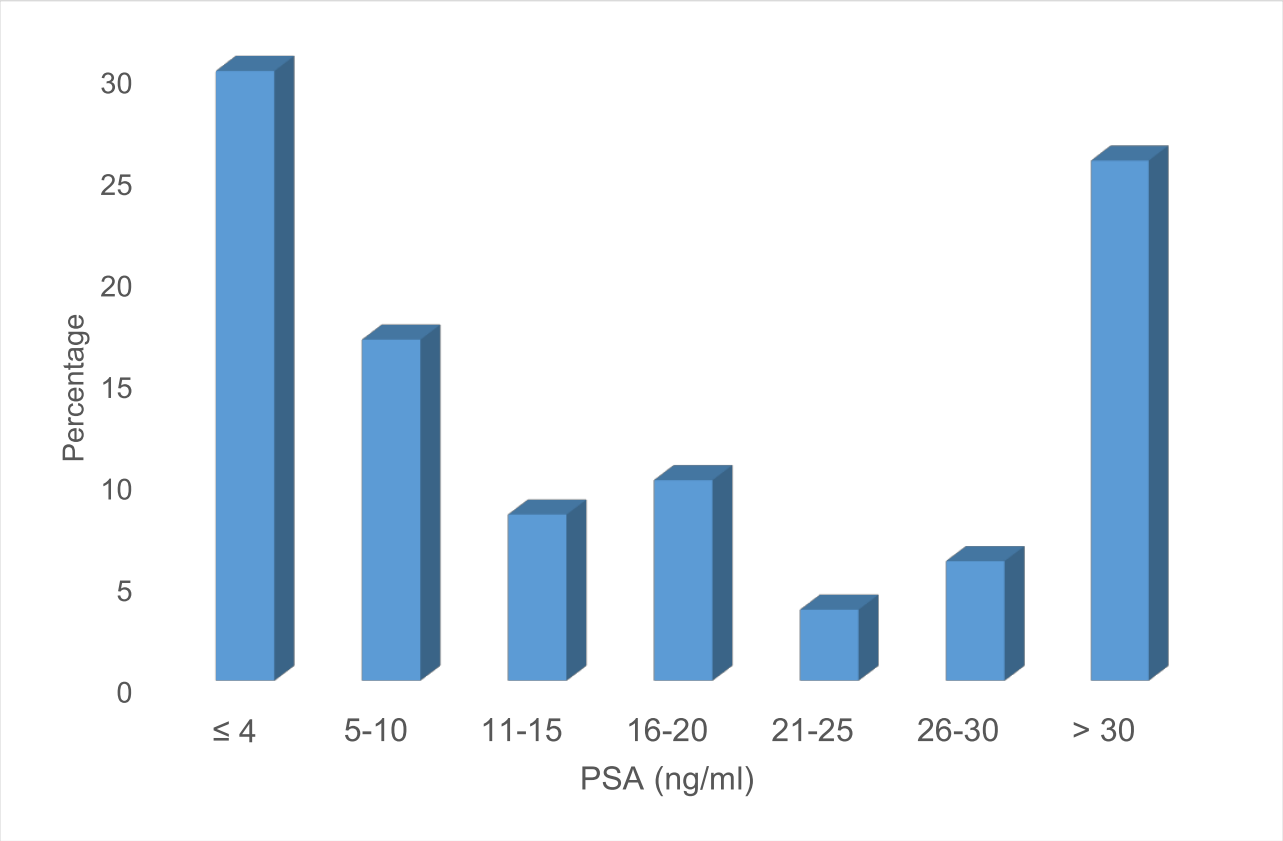
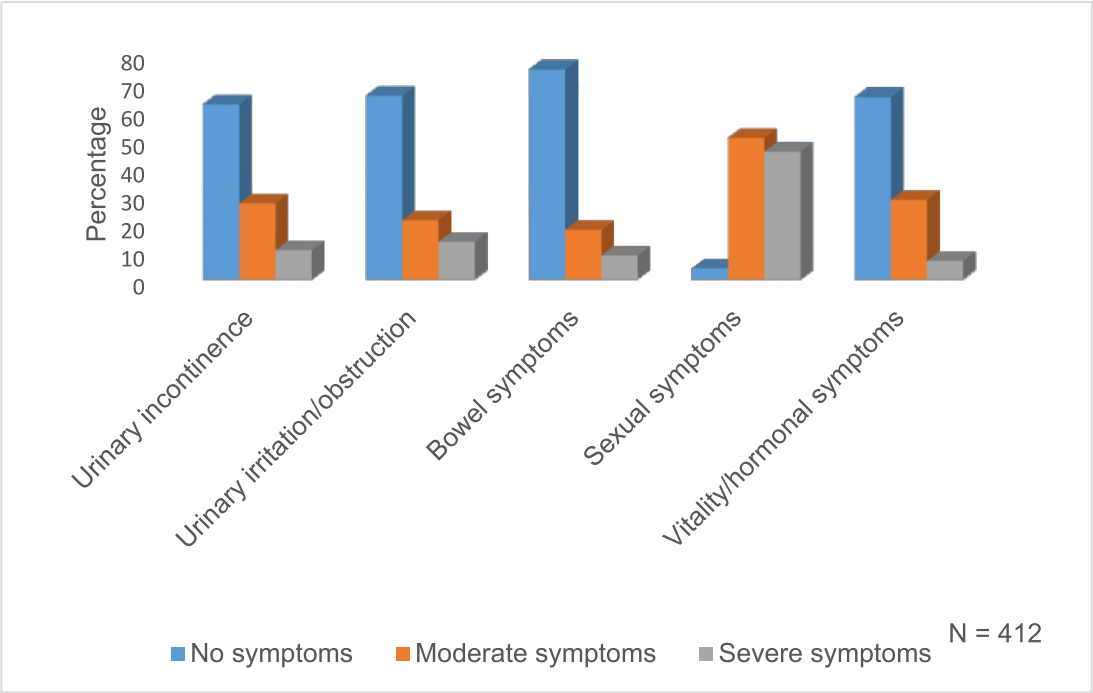


Figure 1: Distribution of PSA values

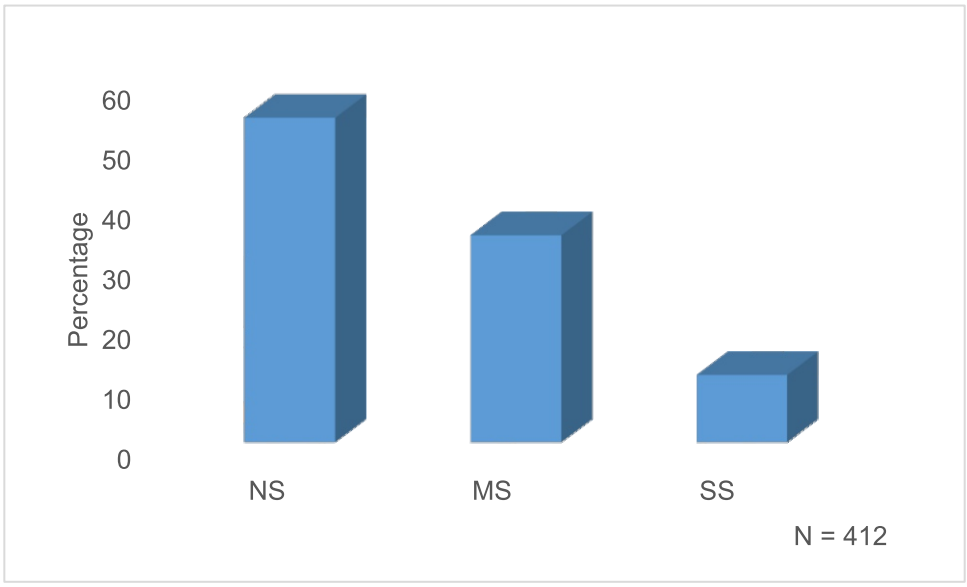
The most frequently encountered symptoms were sexual/erectile dysfunction (96.1%) and vitality/hormonal problems (35%). Other common problems included urinary incontinence (37.6%), urinary obstruction/irritation (34.5%) a and bowel symptoms (26.2%) (**Figure 2**).



Key: *No symptoms - ≤ 4, moderate symptoms – (5 – 8), severe symptoms – (9 – 12)*

Figure 2: Subscale prevalence of symptoms

The results showed that more than half of patients have no clinical symptoms (54.1%), while those with moderate and severe symptoms accounted for 34.6% and 11.3% respectively[53](Figure 3).

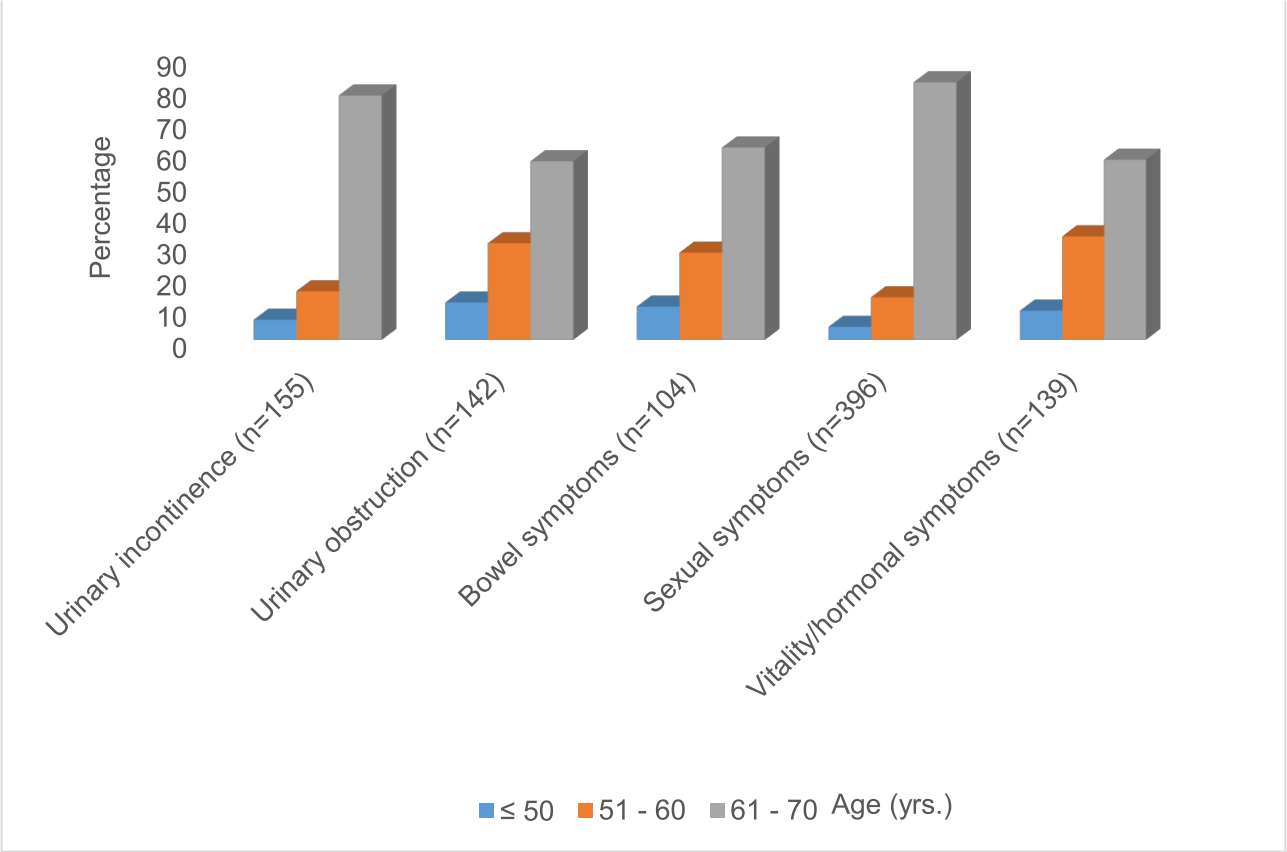


Key: NS – no symptoms, MS – moderate symptoms, SS – severe symptoms

Global score ≤ 20 – no symptoms, 21 – 40 – moderate symptoms, 41 – 60 – severe symptoms

Figure 3: Severity of clinical symptoms

There was increased prevalence of clinically significant symptoms with advancing age. Patients who were ≤ 50 years had symptoms prevalence of 4.1 – 11.9% compared to 13.6 – 33.1% (51 – 60-year-olds) and 57.1 – 82.3% among patients over 60 years of age. Sexual symptoms were the most reported (82.3%) compared to urinary incontinence (78.1%), bowel symptoms (61.5%), vitality/hormonal symptoms (57.6%) and urinary obstruction (57.1%). Among 61 – 70 year olds symptoms were more than twice the rates reported among other age groups **(Figure 4).**



Key:*Subscale score >4 is clinically significant*

Figure 4: Distribution of age related clinically significant symptoms

Majority of patients experienced one symptom (51.8%), followed by two symptoms (25.5%) and 4.9% who have symptoms from the five subscales **(Figure 5).**

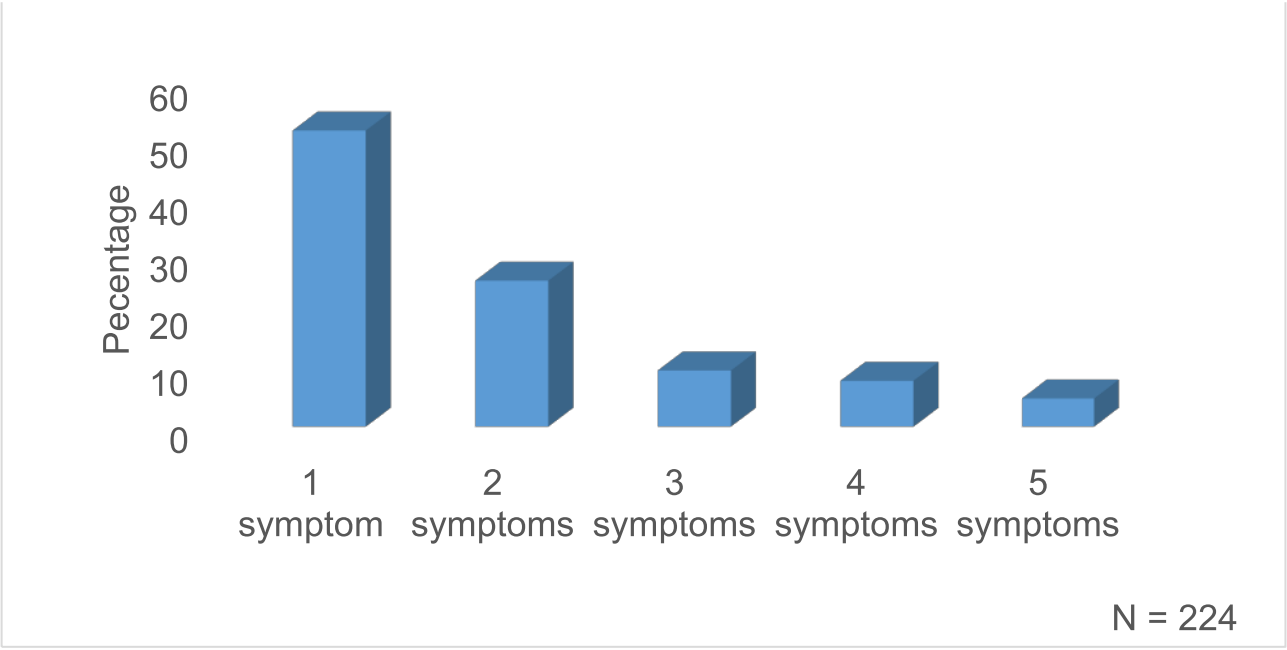


Figure 6: Prevalence symptoms per patient

There was significant association between severity of clinical symptoms and advancing age (*P = 0.042*) and PSA level (*P<0.001*) using subscale score of ≤ 4 on EPIC-CP scale to determine the absence of clinically significant symptoms **(Table 2).**

Table 2: Association between demographic factors and clinical symptoms

Variable	CSS	CIS	P value
Age (yrs.)			
≤ 50	8 (1.9)	15 (3.6)	**0.042**
51 – 60	24 (5.8)	48 (11.7)	
61 – 70	67 (16.3)	250 (60.7)	
Comorbidity (*n = 88*)			
Diabetes mellitus	10 (11.4)	12 (13.6)	0.543
Hypertension	16 (18.2)	14 (15.9)	
Asthma	4 (4.5)	3 (3.4)	
Cardiovascular diseases	19 (21.6)	10 (11.4)	
Duration of therapy (yrs.)			
< 2	21 (5.1)	25 (6.1)	0.077
2 – 5	68 (16.5)	129 (31.3)	
> 5	48 (11.6)	121 (29.4)	
PSA (mg/dl)			
≤ 4	69 (16.8)	59 (14.3)	**<0.001**
> 4	87 (21.1)	197 (47.8)	

Key: *CIS – clinically insignificant symptoms, CSS – clinically significant symptoms*

The physical quality of life was good for patients who earned ninety thousand naira and above (58.2), secondary education (55.1) and those living with diabetes (51.1), while mental quality of life was good for patients living with asthma (63.1), CVD (57.5), self-employed (57.1), Tamulosin/Dutasteride regimen (54.7) and retired (54.5). Overall patients had better mental quality of health compared to physical component (**Figure 6**).

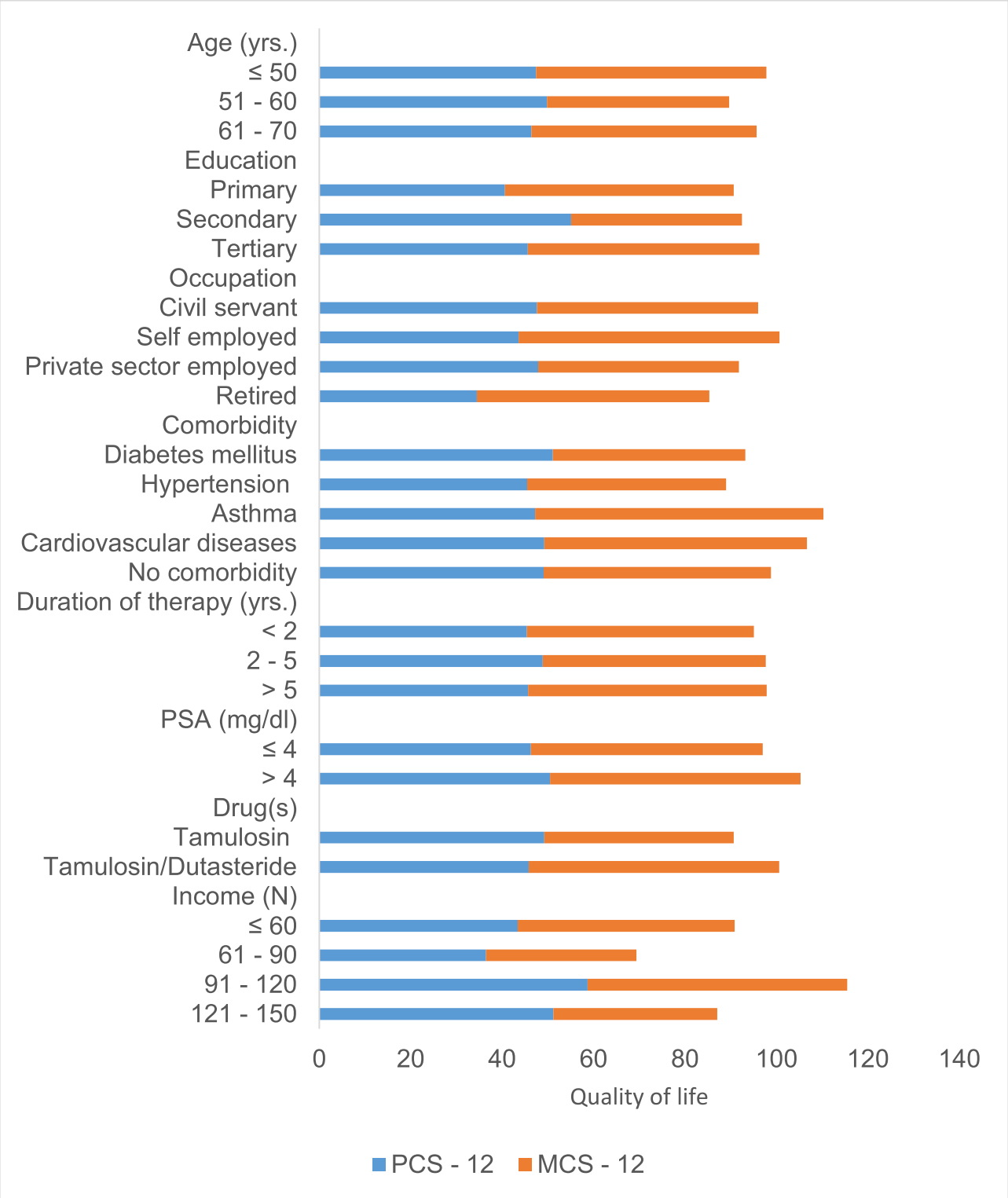


Figure 6: Quality of life based on patients variables

There were significant differences in physical and mental components of quality of life related to PSA level (*p<0.001*) and income (*p<0.001)*. Physical quality of life significantly differed with level of education (p=0.014), comorbidity (*p<0.001)* and duration of therapy (*p<0.001)*, while mental quality of life differed with age (*p*=0.014) and drug regimen (*p<0.001)* (**Table 3**).

Table 3: Demographic variables and quality of life

		PCS -12*				MCS**				
Variable	**Number (%)**	**Mean (SD)**	**Min**	**Max**	**CI** (95%)	**P value**	**Mean (SD)**	**Min**	**Max**	**CI**(95%)	**P value**
Age (yrs.)											
≤ 50	23 (5.6)	47.2 (7.2)	29.8	52.4	43.9 – 50.9	0.687	50.4 (10.7)	23.3	59.1	45.1 – 55.7	0.014**
51 – 60	72 (17.5)	49.7 (4.6)	33.7	61.4	48.6 – 50.9		54.1 (8.2)	23.5	62.5	52.0 – 56.1	
61 – 70	317 (76.9)	49.2 (5.4)	24.0	63.6	48.5 – 49.7		48.9 (11.5)	23.8	67.2	47.6 – 50.1	
Education											
Primary	35 (8.5)	54.5 (7.7)	45.7	59.7	35.5 – 73.5	0.014**	46.3 (10.2)	28.9	59.1	41.3 – 51.3	0.060
Secondary	14 (3.4)	49.2 (5.2)	24.0	63.6	48.9 – 49.7		50.1 (10.9)	23.3	67.2	49.0 – 51.2	
Tertiary	363 (88.1)	55.1 (5.9)	48.8	61.4	53.2 – 58.2		49.7 (11.1)	28.3	67.2	48.9 – 50.9	
Occupation											
Civil servant	35 (8.5)	48.4 (8.4)	29.8	61.8	45.6 – 51.1	0.734	46.2 (12.7)	23.3	68.9	42.0 – 50.4	0.080
Self employed	77 (18.7)	48.3 (4.3)	26.4	52.5	47.3 – 49.3		49.2 (10.7)	27.3	60.6	46.7 – 51.7	
Private sector employed	12 (2.9)	47.9 (3.6)	44.1	55.3	44.9 – 50.9		57.1 (2.1)	53.5	60.7	55.4 – 58.8	
Unemployed	7 (1.7)	49.5 (6.2)	24.0	63.6	48.9 – 50.1		50.2 (11.0)	23.8	67.2	48.9 – 51.5	
Retired	281 (68.2)	49.3 (3.2)	32.3	60.6	48.6 – 49.7		49.7 (11.1)	28.3	55.5	48.7 – 50.9	
Comorbidity											
Diabetes mellitus	22 (5.3)	51.1 (4.1)	46.4	55.3	44.6 – 57.6	<0.001**	57.1 (10.1)	42.0	63.9	40.9 – 73.2	0.141
Hypertension	30 (7.3)	44.5 (7.2)	34.9	49.7	39.4 – 49.7		42.9 (12.5)	28.3	67.3	33.9 – 51.9	
Asthma	7 (1.7)	37.1 (5.3)	28.7	45.6	28.7 – 45.6		42.8 (5.2)	39.1	50.1	34.5 – 51.0	
Cardiovascular diseases	29 (7.0)	44.5 (7.3)	41.1	47.9	41.1 – 47.9		46.5 (11.7)	28.3	67.2	41.1 – 52.1	
No comorbidity	324 (78.6)	49.4 (5.2)	24.0	63.6	48.9 – 49.9		49.7 (11.1)	25.3	67.2	48.6 – 49.9	
Duration of therapy (yrs.)											
< 2	46 (11.2)	47.9 (5.1)	24.0	62.0	47.3 – 48.6	<0.001	49.7 (10.2)	23.9	67.2	48.4 – 51.1	0.710
2 – 5	197 (47.8)	51.2 (5.3)	36.2	63.2	50.4 – 52.1		49.6 (12.1)	23.4	63.9	47.8 – 51.5	
> 5	169 (41.0)	45.7 (5.9)	34.9	55.3	42.3 – 49.1		52.2 (13.4)	28.3	67.2	44.5 – 59.9	
PSA (mg/dl)											
≤ 4	127 (30.8)	46.3 (6.9)	24.0	61.6	45.0 – 47.5	<0.001*	39.8 (10.5)	23.8	67.2	37.9 – 41.7	<0.001*
> 4	285 (69.2)	50.5 (3.9)	36.2	63.6	50.0 – 50.9		54.3 (8.1)	23.3	63.9	53.3 – 55.2	
Drug(s)											
Tamulosin	152 (36.9)	43.9 (7.7)	24.6	63.6	48.1 – 50.6	0.618*	41.7 (12.3)	24.3	67.2	39.7 – 43.7	<0.001*
Tamulosin/Dutasteride	260 (63.9)	49.1 (3.4)	29.8	53.4	48.6 – 49.5		54.4 (6.9)	26.6	62.5	53.6 – 55.3	
Income (₦)											
≤ 60	35 (8.5)	43.4 (8.7)	22.0	55.3	40.1 – 46.4	<0.001**	47.5 (10.6)	28.3	67.2	43.9 – 51.2	<0.001**
61 – 90	115 (27.9)	49.9 (7.5)	30.8	63.6	48.5 – 51.3		35.4 (8.9)	23.3	56.3	33.7 – 37.0	
91 – 120	161 (39.1)	49.3 (2.9)	36.2	60.2	48.9 – 49.8		56.4 (4.0)	39.9	63.9	55.8 – 57.0	
121 – 150	101 (24.5)	50.2 (2.0)	46.1	52.3	49.6 – 50.4		56.3 (1.3)	52.7	58.8	56.1 – 56.6	

Key: *PCS – physical component summary, MCS – mental component summary, *- students t test, **- one way ANOVA*

Discussion

The management of BPH involving drug therapy for patients diagnosed in the early stages of the disease is able to lead to relief of symptoms and reduction in prostate size. However, patients on drug therapies have frequently reported continuing experience with residual symptoms of varying severity[54] and reduction in prostate size[55 - 57]. The nature and severity of these symptoms and their impact on the quality of life of patients vary widely between studies[36,44,48]. The results of this study showed that clinical symptoms persist in about half of all patients and disproportionately affect older patients above 60 years of age. The most reported symptoms include sexual dysfunction, urinary incontinence/obstruction and hormonal symptoms comparable to previous studies[58-60].

The prevalence of comorbidities like diabetes mellitus, hypertension and cardiovascular diseases is consistent with previous studies, although wide variations have been reported[61-63]. The widespread prescription of Tamulosin and Tamulosin / Dutasteride combination therapy is comparable to previous studies[64,65]because these drugs have demonstrated remarkable reduction in prostate size[66,67], reduce clinical symptoms[68,69]and lessen the severity of symptoms[70,71]. While Tamulosin monotherapy is effective in reducing symptoms in the early stages of the disease[69,72], Tamulosin/Dutasteride combination therapy have shown superiority in the relief of urinary and other clinical symptoms[71,72].

In spite of concerns about specificity and sensitivity of PSA test as laboratory indicator[74],it remains widely used in diagnosis and monitoring of therapy either alone or in combination with other methods[75,76]. Drug therapy is expected to reduce plasma PSA level to within normal range, however only a small percentage of patients achieved this target in this study similar to other studies[77].

While symptoms of urinary incontinence/obstruction were considerably lower than in a similar study[78], sexual symptoms were widespread among respondents particularly among older patients[79].The prevalence of symptoms observed in this study are comparable to several studies in Nigeria[80 - 82], however contrasting results have been reported[83]. The high variability of residual symptoms may be attributed to differences in study settings, patient characteristics and assessment tool as well as prostate size reduction achieved with therapy[64].

The high prevalence of clinical symptoms observed in this study among older patients have also been consistently reported[82,83] for which sexual dysfunction is the most prominent complaint of patients[35,79]. While urinary incontinence/obstruction, bowel and hormonal symptoms were reported by a third of patients in this study, the proportion vary widely between studies[31,63].

The quality of life among patients was generally poor and within the range reported in other studies[83 - 85], although contrasting results have been reported in similar studies[86,87]. The high prevalence of clinically significant symptoms is a major contributor to decline in patient's quality of life[46]. It has been suggested that in the course of therapy patients develop psychological adjustment[35,37,38] to distress from the disease and its associated symptoms, however some impact on emotional wellbeing remain in spite of clinical improvement that may be achieved with drug therapy.

There are several studies that highlighted the psychological impact of "masculine identity threat"[36] caused by sexual dysfunction[30] which adds another layer of distress from interruptions to sexual intimacy and spousal relationships[35,58,79]. In addition, medication side effects[64,66,69], financial difficulties and unmet emotional needs particularly among the retired may further contribute to stress[39] and poor quality of life[32 - 34]. The presence of undiagnosed depression[40] is a common occurrence among patients with BPH. The distress from routine laboratory tests, medical procedures and meeting up with physician appointments further compound psychological distress and reduction in quality of life[39].

Recent studies reported direct association between severity of urinary symptoms[7] and reduced quality of life[83]. Among older patients comorbidities[50,62], age related frailty[75]negatively affects emotional wellbeing and quality of life[84]. The association between age[7] and PSA level[75] on severity of clinical symptoms observed in this study contrasts with findings from literature[65,84]. While psychological coping mechanism for distress from sexual dysfunction and other clinical symptoms is complex, the impact on quality of life is not in doubt[34-36].

The relationship between demographic factors and quality of life is not linear[83,88 - 90], as educational status[91], comorbidities[62,91,92], severity of symptoms and income have unpredictable impact on quality of life[93,94]. There are significant differences in physical and mental quality of life related to age, level of education, comorbidities, duration of therapy, PSA level and income similar to results from similar studies[47 – 50]. While the interplay between demographic factors and quality of life is highly variable, there is need for patient specific interventions designed to address factors affecting improvement in quality of life in the course of therapy.

Conclusion: The high prevalence of clinical symptoms such as erectile dysfunction and urinary incontinence / obstruction remains an ongoing clinical challenge. While the quality of life was generally poor, mental component was comparatively better. There were significant differences in quality of life based on demographic variables; however suboptimal control of symptoms is a major issue that needs to be addressed if better quality of life is to be achieved for patients.

Acknowledgment: The support of hospital staff in questionnaire administration and electronic data retrieval from database is hereby acknowledged.

Conflict of interest: The authors declare no conflict of interest

References

1. Sung H, Ferlay J, Siegel RL, Laversanne M, Soerjomataram I, Jemal A, Bray F (2021) Global Disease Statistics 2020: GLOBOCAN Estimates of Incidence and Mortality Worldwide for 36 Diseases in 185 Countries. *CA: A Cancer Journal for Clinicians* 71(3): 209–249. https://doi:10.3322/caac.21660
2. Culp MB, Soerjomataram I, Efstathiou JA, Bray F, Jemal A (2022) Recent global patterns in benign prostate hyperplasia incidence and mortality. *Frontiers in Public Health* 10: 811044. https://doi.org/10.1016/j.eururo.2019.08.005
3. Bray F, Laversanne M, Sung H, Ferlay JEM, Siegel RL, Soerjomataram I, Jemal A (2024) Global cancer statistics 2022: GLOBOCAN estimates of incidence and mortality worldwide for 36 cancers in 185 countries. CA: *A Cancer Journal for Clinicians* 74(3): 229 – 263. https://doi.org/10.3322/caac.21834
4. Emiogun FE, Williams OO, Obafunwa JO (2019) Epidemiology of Benign prostate hyperplasia in Nigeria: Observations at Lagos State University Teaching Hospital. *Disease Health Disparities* 4: e1-e-9. https://doi:10.9777/chd.2019.1003
5. Obiora JU (2020)Disease Incidence in Nigeria: A Tertiary Hospital Experience. *Asian Pacific Journal of Disease Care* 5(1): 27-32. https://doi:10.31557/apjcc.2020.5.1.27-32
6. Ojewole RW, Oridota ES, Balogun OS, Alabi TO, Ajayi AI, OlajideTA, Tijani KH, Jeje EA, Ogunjimi MA, Ogundare EO (2017) Prevalence of clinical benign prostatic hyperplasia amongst community-dwelling men in a South-Western Nigerian rural setting: A cross-sectional study. African Journal of Urology23(2): 109-115. https://doi.org/10.1016/j.afju.2016.02.004
7. Nwankwo GA, Asukwu UG, Igwe DU, Ugwuoke AC, Ojide RN, Gbaduo CC (2023) Prevalence of prostate problems among adults in Obio/Akpor Local Government Area (LGA) of Rivers State. *Nigerian Journal of Health Promotion* 16: 1. https://journals.aphriapub.com/index.php/NJHP/article/view/2334
8. Bray F, Ferlay J, Soerjomataram I, Siegel RL, Torre LA, Jemal A (2018) Global disease statistics 2018: GLOBOCAN estimates of incidence and mortality worldwide for 36 diseases in 185 countries. *A Cancer Journal for Clinicians* 68(6):394- 424. https://doi: 10.3322/caac.21492
9. Oluwole OP, Rafindadi AH, Shehu MS, Samaila MOA (2015) A ten-year study of benign prostate hyperplasia specimens at Ahmadu Bello University Teaching Hospital (A.B.U.T.H), Zaria, Nigeria. *African Journal of Urology* 21: 5-18. https://doi:10.1016/j.afju.2014.09.004
10. Wabinga HR, Nambooze S, Amulen PM, Okello C, Mbus L, Parkin DM (2014) Trends in the incidence of disease in Kampala, Uganda 1991–2010. *International Journal of Cancer* 135: 432–439. https://doi: 10.1002/ijc.28661
11. Lorenzoni CF, Ferro J, Carrilho C, Colombet M, Parkin DM (2020) Disease in Mozambique: results from two population based disease registries. *International Journal of Cancer* 14: 1629–1637. https://doi.org/10.1002/ijc.32953
12. Awedew AF, Han H, Abbasi B, Abbasi-Kangevari M, Ahmed MB, Almidani O, Amini E, Arabloo J, Argaw AM, Athari SS et al (2022) The global, regional, and national burden of benign prostatic hyperplasia in 204 countries and territories from 2000 to 2019: a systematic analysis for the global burden of disease Study 2019. *Lancet Healthy Longevity* 3: e754–e776. https://doi.org/10.1016/S2666-7568(22)00213-6
13. Peisch SF, Van Blarigan EL, Chan JM, Stampfer MJ, Kenfield SA (2017) Benign prostate hyperplasia progression and mortality: a review of diet and lifestyle factors. *World Journal of Urology* 35: 867–874.

https://doi:10.1007/s00345-016-1914-3
14. Reiter-Brennan C, Dzaye O, Al-Mallah MH, Dardari Z, Brawner CA, Lamerato LE, Keteyian SJ, Ehrman JK, Blaha MJ, Visvanathan K et al (2021) Fitness and benign prostate hyperplasia screening, incidence, and mortality: Results from the Henry Ford Exercise Testing (FIT) project. *Cancer* 127(11):1864–1870. https://doi:10.1002/cncr.33426
15. Cam K, Muezzinoglu T, Aydemir O, Buyukalpelli R, Toktas G, Gemalmaz H (2013) Development of a quality of life scale specific for patients with benign prostatic hyperplasia. *International Journal of Urology and Nephrology*45: 339–346. https://doi:10.1007/s11255-013-0384-4
16. Asamoah FA, Yarney J, Awasthi S, Vanderpuye V, Venkat PS, Fink AK, Naghavi AO, Abrahams A, Mensah JE, Sasu E et al (2018) Contemporary radiation treatment of benign prostate hyperplasia in Africa: a Ghanaian experience. *Journal of Global Oncology* 4: 1–13. https://doi:10.1200/JGO.17.00234
17. Allemani C, Matsuda T, Di Carlo V, Harewood R, Matz M, Niksic M, Bonaventure A, Valkov M, Johnson CJ, Estève J et al (2018) Global surveillance of trends in disease survival 2000–2014 (CONCORD-3): analysis of individual records for 37 513 025 patients diagnosed with one of 18 diseases from 322 population-based registries in 71 countries. *Lancet* 391: 1023–1075. https://doi:10.1016/S0140-6736(17)33326-3
18. Smits J, Permanyer I (2019) Data descriptor: the subnational human development database. *Scientific Data* 6: 1–15. https//doi.org/10.1038/sdata.2019.38
19. Nakandi H, Kirabo M, Semugabo C, Kittengo A, Kitayimbwa P, Kalungi S, Maena J (2013) Knowledge, attitudes and practices of Ugandan men regarding benign prostate hyperplasia. *African Journal of Urology*. 19: 165–170. https://doi:10.1016/j.afju.2013.08.001
20. Baratedi WM, Tshiamo WB, Mogobe KD, McFarland DM (2020) Barriers to benign prostate hyperplasia screening by men in sub-Saharan Africa: an integrated review. *Journal of Nursing Scholarship* 52: 85–94. https://doi:10.1111/jnu.12529
21. Coughlin SS (2020) A review of social determinants of benign prostate hyperplasia risk, stage, and survival. *Prostate International* 8: 49–54. https://doi:10.1016/j.prnil.2019.08.001
22. Singh K, Abdel Goad EH, Ramklass SS (2015) Waiting times for benign prostate hyperplasia diagnosis in KwaZulu-Natal. *South African Medical Journal* 105: 484. https://doi:10.7196/samj.9192
23. Meara JG, Leather AJM, Hagander L, Alkire BC, Alonso N, Ameh EA, Bickler SW, Conteh L, Dare AJ, Justine D et al (2015) Global Surgery 2030: evidence and solutions for achieving health, welfare, and economic development. *Lancet* 386: 569–624. https://doi:10.1016/j.ijoa.2015.09.006
24. Zubizarreta E, Van Dyk J, Lievens Y (2017) Analysis of global radiotherapy needs and costs by geographic region and income level. *Clinical Oncology* 29: 84–92. https://doi:10.1016/j.clon.2016.11.011
25. Krimphove MJ, Cole AP, Fletcher SA, Harmouch SS, Berg S, Lipsitz SR, Sun M, Nabi J, Nguyen PL, Hu JC et al (2019) Evaluation of the contribution of demographics, access to health care, treatment, and tumor characteristics to racial differences in survival of advanced benign prostate hyperplasia. *Prostate Cancer and Prostatic Disease* 22: 125–136. https://doi:10.1038/s41391-018-0083-4
26. DeRouen MC, Schupp CW, Koo J, Yang J, Hertz A, Shariff-Marco S, Cockburn M, Nelson DO, Ingles SA, John EM et al (2018) Impact of individual and neighborhood factors on disparities in benign prostate hyperplasia survival. *Cancer Epidemiology* 53: 1–11. https://doi:10.1016/j.canep.2018.01.003
27. Memirie ST, Habtemariam MK, Asefa M, Deressa BT, Abayneh G, Tsegaye B, Abraha MM, Ababi G, Jemal A, Rebbeck TR et al (2018) Estimates of disease incidence in Ethiopia in 2015 using population-based registry data. *Journal of Global Oncology* 4: 1–11. https://doi:10.1200/JGO.17.00175
28. Naghavi M, Abajobir AA, Abbafati C, Abbas KM, Abd-Allah F, Abera SF, Aboyans V, Adetokunboh O, Ärnlöv J, Afshin A et al (2017) Global, regional, and national age-sex specific mortality for 264 causes of death, 1980–2016: a systematic analysis for the Global Burden of Disease Study 2016. *The Lancet* 390(10100):1151–1210.

https://doi.org/10.1016/S0140-6736(17)32152-9
29. Ferlay J, Soerjomataram I, Dikshit R, Eser S, Mathers C, Rebelo M, Parkin DM, Forman D, Bray F (2015) Disease incidence and mortality worldwide: Sources, methods and major patterns in GLOBOCAN 2012. *International Journal of Cancer* 136: E359–E386. https://doi:10.1002/ijc.29210
30. Tucker SR, Speer SA, Peters S (2016) Development of an explanatory model of sexual intimacy following treatment for localized benign prostate hyperplasia: A systematic review and meta-synthesis of qualitative evidence. *Social Science Medicine* 163: 80–88. https://doi:10.1016/j.socscimed.2016.07.001
31. Gavin AT, Drummond FJ, Donnelly C, O'Leary E, Sharp L, Kinnear HR (2015) Patient-reported 'ever had' and 'current' long-term physical symptoms after benign prostate hyperplasia treatments. *British Journal of Urology International* 116 (3): 397–406. https://doi:10.1111/bju.13036
32. Baker H, Wellman S, Lavender V 2016) Functional quality-of-life outcomes reported by men treated for localized benign prostate hyperplasia: A systematic literature review. *Oncology Nursing Forum* 43(2): 199–218. https://doi:10.1188/16.ONF.199-218
33. Lardas M, Liew M, van den Bergh RC, De Santis M, Bellmunt J, Van den Broeck T, Cornford P, Cumberbatch MG, Fossati N, Gross T et al (2017) Quality of life outcomes after primary treatment for clinically localized benign prostate hyperplasia: a systematic review. *European urology* 72(6): 869–885. https://doi:10.1016/j.eururo.2017.06.035
34. Ralph N, Ng SK, Zajdlewicz L, Lepore SJ, Heathcote P, Kneebone A, Dunn JC, Chambers SK (2020) Ten-year quality of life outcomes in men with benign prostate hyperplasia. *Psycho-oncology* 29(2): 444. https://doi:10.1002/pon.5255
35. Spendelow JS, Joubert HE, Lee H, Fairhurst BR (2018) Coping and adjustment in men with benign prostate hyperplasia: A systematic review of qualitative studies. *Journal of Cancer Survivor* 12(2): 155–168. https://doi:10.1007/s11764-017-0654-8
36. Alexis O, Worsley AJ (2018) A meta-synthesis of qualitative studies exploring men's sense of masculinity post–benign prostate hyperplasia treatment. *Cancer Nursing* 41(4): 298–310. https://doi:10.1097/NCC.0000000000000509
37. Curtis R, Groarke A, Sullivan F (2014) Stress and self-efficacy predict psychological adjustment at diagnosis of benign prostate hyperplasia. *Scientific Reports* 4(1): 1–5. https://doi:10.1038/srep05569
38. Dubey C, De Maria J, Hoeppli C, Betticher DC, Eicher M (2015) Resilience and unmet supportive care needs in patients with disease during early treatment: A descriptive study. *European Journal of Oncology Nursing* 19(5): 582–588. https://doi:10.1016/j.ejon.2015.03.004
39. Sharpley CF, Christie DR, Bitsika V, Agnew LL, Andronicos NM, McMillan ME, Richards TM (2017) The use of salivary cortisol as an index of chronic stress that correlates with depression in benign prostate hyperplasia patients. *Psycho-Oncology* 26(9): 1400–1402. https://doi:10.1002/pon.4327
40. Esser P, Mehnert-Theuerkauf A, Friedrich M, Johansen C, Brahler E, Faller H, Härter M, Koch U, Schulz H, Wegscheider K et al (2020) Risk and associated factors of depression and anxiety in men with benign prostate hyperplasia: results from a German multicenter study. *Psycho-Oncology* 13: 1–9. https://doi:10.1002/pon.5471
41. Drummond FJ, Kinnear H, O'Leary E, Gavin A, Sharp L (2015) Long-term health-related quality of life of benign prostate hyperplasia survivors varies by primary treatment. Results from the PiCTure (Benign prostate hyperplasia Treatment, your experience) study. *Journal of Cancer Survivor* 9(2): 361–372. https://doi:10.1007/s11764-014-0419-6
42. Chen RC, Basak R, Meyer A-M, Kuo T-M, Carpenter WR, Agans RP, Broughman JR, Reeve BB, Nielsen ME, Usinger DS et al (2017)Association between choice of radical prostatectomy, external beam radiotherapy, brachytherapy, or active surveillance and patient-reported quality of life among men with localized benign prostate hyperplasia. *Journal of American Medical Association* 317(11): 1141–1150. https://doi:10.1001/jama.2017.1652
43. Donovan JL, Hamdy FC, Lane J, Mason M, Metcalfe C, Walsh E, Blazeby JM, Peters TJ,

Holding P, Bonnington S et al (2016) Patient-reported outcomes after monitoring, surgery, or radiotherapy for benign prostate hyperplasia. *New England Journal of Medicine* 375(15): 1425–1437. https://doi:10.1056/NEJMoa1606221

44. Tuppin P, Samson S, Fagot-Campagna A, Lukacs B, Alla F, CNAMTS scientific board members et al. Benign prostate hyperplasia outcomes in France: treatments, adverse effects and two-year mortality. BMC Urology 2014; 14: 48. https://doi:10.1186/1471-2490-14-48

45. Hamdy FC, Donovan JL, Lane JA, Mason M, Metcalfe C, Holding P, Davis M, Peters TJ, Turner EL, Martin RM et al (2016) 10-year outcomes after monitoring, surgery, or radiotherapy for localized benign prostate hyperplasia. *New England Journal of Medicine* 375(15): 1415–1424. https://doi:10.1056/NEJMoa1606220

46. Chambers SK, Ng SK, Baade P, Aitken JF, Hyde MK, Wittert G, Frydenberg M, Dunn J (2017) Trajectories of quality of life, life satisfaction, and psychological adjustment after benign prostate hyperplasia. *Psycho-oncology* 26(10): 1576–1585. https://doi:10.1002/pon.4342

47. Kerleau C, Guizard A-V, Daubisse-Marliac L, Heutte N, Mercier M, Grosclaude P, Joly F (2016) Long-term quality of life among localized benign prostate hyperplasia survivors: QALIPRO population-based study. *European Journal of Cancer* 63: 143–153. https://doi:10.1016/j.ejca.2016.05.020

48. Jang JW, Drumm MR, Efstathiou JA, Paly JJ, Niemierko A, Ancukiewicz M, Talcott JA, Clark JA, Zietman AL (2017) Long-term quality of life after definitive treatment for benign prostate hyperplasia: patient-reported outcomes in the second post-treatment decade. *Cancer Medicine* 6(7): 1827–1836. https://doi:10.1002/cam4.1103

49. Beesley LJ, Morgan TM, Spratt DE, Singhal U, Feng FY, Furgal AC, Jackson WC, Daignault S, Taylor JMG (2019) Individual and population comparisons of surgery and radiotherapy outcomes in benign prostate hyperplasia using Bayesian multistate models. *JAMA Network Open* 2(2): e187765. https://doi:10.1001/jamanetworkopen.2018.7765

50. Halder P, Bhandari Y, Das A, Mamgai A (2020) Association of benign prostatic hyperplasia with multi-morbidity among older adults: Insights from the longitudinal ageing study in India (LASI), First Wave. *Cureus* 15(12): e50608. https://doi:10.7759/cureus.50608

51. Zelefsky MJ, Poon BY, Eastham J, Vickers A, Pei X, Scardino PT (2016) Longitudinal assessment of quality of life after surgery, conformal brachytherapy, and intensity-modulated radiation therapy for benign prostate hyperplasia. *Radiotherapy and Oncology* 118(1): 85–91. https://doi:10.1016/j.radonc.2015.11.035

52. Barocas DA, Alvarez J, Resnick MJ, Koyama T, Hoffman KE, Tyson MD, Conwill R, McCollum D, Cooperberg MR, GoodmanM et al (2017) Association between radiation therapy, surgery, or observation for localized benign prostate hyperplasia and patient-reported outcomes after 3 years. *Journal of American Medical Association* 317(11): 1126–1140. https://doi:10.1001/jama.2017.1704

53. Lavina AA, Hernandez A, Huang LC, Zhao Z, Koyama T, Conwill R, Hoffman K, Feurer ID, Goodman M, Hamilton AS et al (2019) Interpretation of domain scores on the expanded prostate cancer index composite: How does the domain scores translate to functional outcome? *Journal of Urology* 2020(6): 1150 – 1158. https://doi.org/10.1097/JU.0000000000000392

54. Ntekim A, Folasire A, Odukoya OA (2023) The prevalence of prostate cancer among young men below 55 years of age in Nigeria. *Cancer Control* 30: 1–7. https://doi:10.1177/10732748231175255

55. Nakaganda A, Solt K, Kwagonza L, Driscoll D, Kampi R, Orem J (2021) Challenges faced by cancer patients in Uganda: implications for health systems strengthening in resource limited settings. *Journal of Cancer Policy* 27: 100263. https://doi:10.1016/j.jcpo.2020.100263

56. Chidebe RCW, Orjiakor CT, Pereira I, Ipiankama SC, Lounsbury DW, Moraes FY (2019) Navigating prostate cancer control in Nigeria. *Lancet Oncology* 20(11): 1489-1491. https://doi.org/10.1016/S1470-2045(19)30625-4

57. Okuku F, Orem J, Holoya G, De Boer C, Thompson CL, Cooney MM (2016) Prostate cancer burden at the Uganda cancer institute. *Journal of Global Oncology* 2(4): 181–185. https://doi:10.1200/JGO.2015.001040

58. Ekwan R, Bua E, Nantale R, Opito R, Abingwa P, Serwanja Q, Kuteesa J, Mukunya D (2023)Uptake of prostate cancer screening and associated factors among men aged 50 years and above in Lira city, Uganda: a cross-sectional study. *BMC Public Health* 23: 432. https://doi:10.1186/s12889-023-15348-w

59. Phua TJ (2021)The etiology and pathophysiology genesis of benign prostatic hyperplasia and prostate cancer: A new perspective. *Medicine* (Basel) 8(6): 30. https://doi:10.3390/medicines806003

60. Vickman RE, Franco OE, Moline DC, Vander Griend DJ, Thumbikat P, Hayward SW (2020) The role of the androgen receptor in prostate development and benign prostatic hyperplasia: A review. *Asian Journal of Urology* 7: 191–202. https://doi:10.1016/j.ajur.2019.10.003

61. Wang Q, Zhang B, Li B,Yang S, Wang Z,Han C, Wu J, Tian R (2023).Correlation between benign prostatic hyperplasia/lower urinary tract symptoms and renal function in elderly men aged 80 years and older. *Clinical Intervention in Aging* 18: 61 – 69. https://doi:10.2147/CIA.S392519

62. Xin C, Fan H, Xie J, Hu J, Sun X, Liu Q (2021) Impact of diabetes mellitus on lower urinary tract symptoms in benign prostatic hyperplasia patients: A meta-analysis. *Frontier in Endocrinology (Lausanne)* 12: 741748. https://doi:10.3389/fendo.2021.741748

63. Güven EO, Selvi I, Karaismailoğlu E (2019) Association between benign prostate enlargement-related storage and voiding symptoms and systolic blood pressure: a single-center cross-sectional study. *Sao Paulo Medical Journal* 137(5): 446 – 453. https://doi:10.1590/1516-3180.2018.0543.R3.160919

64. Yu ZJ, Yan HL, Xu FH, Chao HC, Deng LH, Xu XD, Huang JB, Zeng T (2020) Efficacy and side effects of drugs commonly used for the treatment of lower urinary tract symptoms associated with benign prostatic hyperplasia. *Frontier in Pharmacology* 11: 658. https://doi:10.3389/fphar.2020.00658

65. Bhatt NR, Davis NF, Witjes WP, Bjartell A, Caris C, Patel A, de la Taille A, Tubaro A (2021) Quality of life with pharmacological treatment in patients with benign prostatic enlargement: results from the Evolution European Prospective Multicenter Multi-National Registry study. *World Journal of Urology* 39: 517 – 526. https://doi:10.1007/s00345-020-03219-7

66. Lee JH, Park YW, Park MH, Yoo TK (2023) Safety and efficacy of Tamulosin 0.4 mg as an initial dose in 1,219 Korean patients with moderate to severe lower urinary tract symptoms: data from a phase IV study. Prostate International 11(4): 228-232. https://doi.org/10.1016/j.prnil.2023.09.003

67. Lulic Z, Son H, Yoo SB, Cunnington M, Miller D, Cortes V, Park S, Bhak RH, Duh MS (2021) Free combination of Dutasteride plus Tamulosin for the treatment of benign prostatic hyperplasia in South Korea: analysis of drug utilization and adverse events using the National Health Insurance Review and Assessment Service database. BMC Urology 21(1): 178. https://doi:10.1186/s12894-021-00941-1

68. Song Y, Chen G, Huang P, Hu C, Liu X (2020) Effects of Tamulosin combined with Solifenacin on lower urinary tract symptoms: evidence from a systematic review, meta-analysis, and trial sequential analysis of randomized controlled trials. *Frontiers in Pharmacology* 11: 763. https://doi:10.3389/fphar.2020.00763

69. Dimitripoulos K, Gravas S (2016) Fixed dose combination therapy with Dutasteride and Tamulosin in the management of benign prostatic hyperplasia. *Therapeutic Advances in Urology* 8(1): 19 – 28 https://doi:10.1177/1756287215607419

70. Lee JW, Kim JH (2022) Drug prescription patterns during initial treatment of lower urinary tract symptoms associated with benign prostatic hyperplasia: A study based on health insurance review and assessment database. *Journal of Korean Medical Science* 37(12): e95. https://doi:10.3346/jkms.2022.37.e95

71. Abrahams AD, Mensah JE, Tettey Y (2015) Prostate cancer diagnostic methods in Korle Bu Teaching hospital, Accra, Ghana. *Postgraduate medical Journal of Ghana* 4(2): 51 – 54. https://doi:10.60014/pmjg.v4i2.147

72. Jo JK, Shinn SH, Kim KS, Moon HS (2021) Changes in prevalence and treatment pattern of benign prostatic hyperplasia in Korea. *International Neurology Journal* 25(4): 347- 354.

https://doi:10.5213/inj.2040412.206
73. Lerner LB, McVary KT, Barry MJ, Bixler BR, Dahm P, Das AK, Gandhi MC, Kaplan SA, Kohler TS, Martin L (2021) Management of lower urinary tract symptoms attributed to benign prostatic hyperplasia: AUA GUIDELINE PART I-Initial Work-up and medical management. *Journal of Urology* 206(4): 806-817. https://doi:10.1097/JU.0000000000002183
74. Jiwrajka M, Yaxley W, Ranasinghe S, Perera M, Roberts MJ, Yaxley J (2018) Drugs for benign prostate hypertrophy. *Australian Prescriber* 41(5): 150 – 153. https://doi:10.18773/austprescr.2018.045
75. Albertsen PC (2018) Prostate cancer screening with prostate-specific antigen. Where are we going? *Cancer* 124(3): 453 – 455. https://doi.org/10.1002/cncr.31140
76. Leal J, Welton NJ, Martin RM, Donovan J, Hamdy F, Neal D, Noble S, Lane A, Wolstenholme J (2018) Estimating the sensitivity of a prostate cancer screening programme for different PSA cut-off levels. A case study. *Cancer Epidemiology* 52: 99 – 105. https://doi:10.1016/j.canep.2017.12.002
77. Kith G, Lisker S, Sarkar U, Barr-Walker J, Breyer BN, Palmer NR (2021) Defining and measuring adherence in observational studies assessing outcomes of real-world active surveillance for prostate cancer: A systematic review. European Urology and Oncology 4(2): 192-201. https://doi.org/10.1016/j.euo.2019.06.009
78. Lloyd GL, Marks JM, Ricke WA (2019) Benign prostatic hyperplasia and lower urinary tract symptoms: What is the role and significance of inflammation? *Current Urology Report* 20(9): 54. https://doi:10.1007/s11934-019-0917-1
79. Obiatuegwu K, Atim T, Abu S, Aisuodionoe-Shadrach O, Dakum N (2021) Correlation between the severity of erectile dysfunction and prostate size in patients with benign prostatic enlargement. *African Journal of Urology* 27: 31. https://doi:10.5455/medarh.2016.70.449-452
80. Asiedu B, Anang Y, Nyarko A, Doku DA, Amoah BY, Santa S, Ngala RA, Asare GA (2017) The role of sex steroid hormones in benign prostatic hyperplasia. *Aging Male* 20(1): 17–22. https://doi:10.1080/13685538.2016.1272101
81. Ajayi A, Abraham K (2018) Understanding the role of estrogen in the development of benign prostatic hyperplasia. *African Journal of Urology* 24(2): 93 – 97. https://doi:10.1007/s11934-015-0534-6
82. Adejumo B, Williams O, Odigie E, Unachukwu I, Abdulrahman O, Dimkpa U, Uzor S, Adebowale OM, Oke OM (2020) Serum levels of reproductive hormones and their relationship with age in men with benign prostatic hyperplasia in Benin City, Edo State. *Health* 12(9): 1121 – 1131. https://doi:10.4236/health.2020.129082
83. Udoh EA, Eyo AE, Ekwere PD (2020)The most bothersome lower urinary tract symptom affecting quality of life using international prostate symptom score in patients with benign prostate hyperplasia. *Ibom Medical Journal* 13(1): 43 – 49. https://doi.org/10.61386/imj.v13i1.178
84. Pinto JDO, He H-G, Chan SWC, Wang W (2016) Health-related quality of life and psychological well-being in men with benign prostatic hyperplasia: An integrative review. *Japan Journal of Nursing Science* 13(3): 309–323. https://doi:10.1111/jjns.12115
85. Cai H, Xu Z, Xu T, Yu B, Zou Q (2015) Diabetes mellitus is associated with elevated risk of mortality amongst patients with benign prostate hyperplasia: a meta-analysis of 11 cohort studies. *Diabetes and Metabolic Research Review* 31: 336–343. https://doi:10.1002/dmrr.2582
86. Seymour ZA, Daignault-Newton S, McLaughlin PW, Sandler H, Jackson W, Johnson SB, Miller D, Wei J, Sanda M, Hamstra DA (2022) Patient reported outcomes for quality of life (QOL) by expanded prostate cancer index (EPIC) on average 15 years post treatment. *Clinical and Translational Radiation Oncology* 36: 56–62. https://doi:10.1016/j.ctro.2022.05.007
87. Bulamu NB, Mpundu-Kaambwa C, O'Callaghan M, Kaambwa B (2022) Responsiveness and construct validity of EPIC-26, A QoL-6d and SF-6D following treatment in prostate cancer. *BMC Cancer* 23: 297. https://doi.org/10.1186/s12885-023-10732-6
88. Houede N, Rebillard X, Bouvet S, Kabani S, Fabbro-Peray P, Tretarre B, Ménégaux F (2020) Impact on quality of life 3 years after diagnosis of prostate cancer patients below 75 at diagnosis: an observational case control Study. *BMC Cancer* 20:757. https://doi.org/10.1186/s12885-020-

07244-y

89. Braeckman J, Denis L (2017) Management of BPH then 2000 and now 2016 – From BPH to BPO. *Asian Journal of Urology* 4(3): 138 – 147. https://doi:10.1016/j.ajur.2017.02.002

90. Kosilov K, Loparev S, Kuzina I, Kosilova L, Ivanovskaya M, Prokofyeva A (2018) Health related quality of life's dependence on socioeconomic status and demographic characteristics among males with benign prostatic hyperplasia. *Andrologia* 50: 3. https://doi:10.1111/and.12892

91. Wang M, Jian Z, Gao X, Yuan C, Jin X, Li H, Wang K (2021) Causal associations between educational attainment and 14 urological and reproductive health outcomes: A Mendelian randomization Study. *Frontier in Public Health* 9: 742952. https://doi: 10.3389/fpubh.2021.742952

92. Hamid H, Khan IA, Huma S, Khan MN, Khan MI, Salman M, Ali Y, Rahman I (2022) Frequency of cardiovascular problems in patients with benign prostate enlargement. Pakistan *Journal of Medical and Health Sciences* 16(6): 748 – 750. https://doi.org/10.53350/pjmhs22166748

93. Park S, Lee K-S, Choi M, Lee M (2022) Factors associated with quality of life in patients with benign prostatic hyperplasia, 2009–2016. *Medicine* (Baltimore) 101(36): e30091. https://doi:10.1097/MD.0000000000030091

94. Wang C-k, Zhang JH, Gao Y, Meng X-Y, Zhang H-X, Luo H-H (2024) Quality of life and influencing factors in older adults with benign prostatic hyperplasia. *International Journal of Urology Nursing* 18(1): e12391. https://doi.org/10.1111/ijun.12391