

**KNOWLEDGE ON PROSTATE HEALTH AND FOOD CHOICES  
AMONG GHANAIAN MEN**

**BY**

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I hereby declare that this thesis is the result of my own original work under supervision and that no part of it has been presented for another degree award before in this University or elsewhere.

Work by others, which served as a source of information has been duly acknowledged.

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Prostate disorder is a major public health problem prevailing among men worldwide. In Ghana the prevalence is on the increase. This study examined the knowledge of Ghanaian men on prostate health and its influence on food choices. The study was multistage cross-sectional and involved 894 men aged 40 years and above who resided in Greater Accra, Bono and Northern Regions of Ghana. It employed a structured questionnaire to collect data on socio-demographics, knowledge on prostate health and consumption of foods associated with prostate health. Fruits and vegetables were defined in the study as *protective foods*. Alcohol, meat and meat products were considered as *high-risk foods*. Knowledge scores were added up to give the marks scored by respondents on their knowledge on prostate health. The Pearson's Chi-square test ( $\chi^2$ ) and binary logistic regression analysis were used to examine associations between socio-demographic characteristics, knowledge on prostate health and food choices. More than half of the participants had high knowledge on prostate health; respondents with a secondary education [AOR (adjusted odds ratio) = 1.664,  $p = 0.049$ ], family history of prostate disorders (AOR = 1.973,  $p < 0.001$ ) and ever been diagnosed of prostate disorder (AOR = 2.736,  $p = 0.002$ ) were at least 1.7 times more likely to have knowledge on prostate health. About three quarters of respondents consumed higher amounts of *protective foods* while 86.4% consumed lower amounts of *high-risk foods*. Respondents with high knowledge on prostate health were 1.4 times (AOR = 1.436,  $p < 0.047$ ) more likely to consume *protective foods* and 49% (AOR = 0.513,  $p = 0.002$ ) less likely to consume *high-risk foods*. Interventions by various health institutions to encourage healthy food choices should include strategies that focus on prostate health.



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**DEDICATION**

This work is dedicated to the memory of my father, Mr Joseph Awuni Anabs.

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**LIST OF ACRONYMS/ABBREVIATIONS**

**AUR** – Acute Urinary Retention

**BMI** – Body Mass Index

**BOO** – Bladder Outlet Obstruction

**BPE** – Benign Prostatic Enlargement

**BPH** – Benign Prostatic Hyperplasia

**CP** – Chronic Prostatitis

**CPPS** – Chronic Pelvic Pain Syndrome

**DHT** – Dihydrotestosterone

**DRE** – Digital Rectal Examination

**EBRT** – External-Beam Radiation Therapy

**ED** – Erectile Dysfunction

**GHS** – Ghana Health Service

**GLOBOCAN** – Global Cancer Incidence, Mortality and Prevalence

**IPSS** – International Prostate Symptom Score

**LUTS** – Lower Urinary Tract Symptoms

**MRI** – Magnetic Resonance Imaging

**PA** – Physical Activity

**PC** – Prostate Cancer

**PSA** – Prostate-Specific Antigen



**PVR** – Post-Void Residual [www.udsspace.uds.edu.gh](http://www.udsspace.uds.edu.gh)

**STEPS** – STEPwise Approach in Surveillance

**TRUS** – Transrectal Ultrasound

**TURP** – Transurethral Resection of the Prostate

**TUIP** – Transurethral Incision of the Prostate

**UDS** –Urodynamic Studies

**UTI** – Urinary Tract Infections

**WHO** – World Health Organization



INTRODUCTION

**1.1 Background**

The prostate is a small gland about the size of a walnut positioned between the bladder and the penis in front of the rectum. It plays a significant role in human reproduction, facilitating fertilization, sperm transit and survival (Omabe & Ezeani, 2011). It is small at birth but begins to increase in size during adolescence under the control of the male hormone, testosterone and its by-product dihydrotestosterone (DHT).

The major risk factors for prostate health are age (mostly 50 years and above), race, family history of prostate disorders and other inherited genetic conditions which are classified as non-modifiable risk factors (Derouen *et al.*, 2018; Hsing *et al.*, 2014; Rao, 2012). Modifiable risk factors include excessive alcohol consumption, occupational and environmental factors such as exposure to heavy metals, herbicides and pesticides, excessive smoking, poor diet, obesity, history of vasectomy, stress and sexually transmitted diseases (Kgatle *et al.*, 2016; Wu *et al.*, 2006).

Disorders of the prostate include prostate inflammation (prostatitis), prostate enlargement (Benign Prostatic Hyperplasia – BPH), lower urinary tract symptoms (LUTS), and prostate cancer (PC) (Xia *et al.*, 2012). Acute or chronic prostatitis may trouble any adult male but by the age of 70 years, almost 40% of men may develop an enlargement of the prostate due to BPH and most will have PC at the age of 80 years (Roumeguère *et al.*, 2017; Stacewicz-Sapuntzakis & Bowen, 2005).



Signs of prostate [disorders include](http://www.udsspace.uds.edu.gh) [painful](http://www.udsspace.uds.edu.gh) or burning urination, painful ejaculation, frequent urination, blood in urine, swelling in the groin area, loss of appetite, weight loss, impotence, voiding (slow and or weak stream), terminal dribble and post-micturition (sense of incomplete emptying) (Coyne *et al.*, 2009; Ilic & Misso, 2012; UCSF Medical Centre Prostate Cancer Advocates, 2011).

Increasingly, diet is now emerging as an important risk modulating factor for prostate health. Dietary habits that promote reduced intake of meat and fat but increased consumption of fruits and vegetables has been shown to reduce prostate-specific antigen (PSA) markers of prostate disorder progression in men (Carmody *et al.*, 2008; Nguyen *et al.*, 2006).

However, the beliefs of a society has a significant influence on food choices made by individuals (Wardle *et al.*, 2004). Men make food choices to reflect masculinity which is associated with red meat and large meals whiles intake of fruits and vegetables is considered a sign of femininity (Mróz & Robertson, 2015). This misconception by men was attributed to healthy nutrition education which often targets women and children (Courtenay, 2000; Mróz & Robertson, 2015; Sobal, 2005).

## 1.2 Problem statement

Prostate disorders are the most occurring diseases in men worldwide. PC, one of the most common prostate disorders was the second most prevalent cancer among men, accounting for 1.1 million new cases and 307,000 deaths worldwide in 2012 (Ferlay *et al.*, 2015). BPH affects approximately one quarter of men at the age of 50 years, a third at age 60 years and about half of all men





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at 80 years or older (Ferlay *et al.*, 2015; McVary, 2006). In Ghana, prevalence of PC and moderate to severe lower urinary tract symptoms (LUTS) caused by BPH among men, aged between 50 and 74 years were 7% and 19.9% respectively (Hsing *et al.*, 2014).

Adequate nutrition is important in maintenance of good health with intake of fruits and vegetables highly recommended for their chemo preventive effects while intake of red meat and processed meat are of higher risk (Tubaro, 2006). According to WHO (2003), daily consumption of 400 g or more of fruits and vegetables could save 2.7 million lives annually. A systematic review on nutrition and prostate health has provided insight to how nutrition prevents or delays the onset of prostate problems (Ilic & Misso, 2012). Also, general intake of nutrients, especially micronutrients such as vitamins A, B, C, D and E as well as selenium and zinc have been shown to be associated with prostate health in the prevention of prostate disorders and maintaining a healthy prostate (Rao, 2012).

Few studies conducted in the area of prostate disorders in Ghana, centred largely on assessing knowledge and early screening and treatment, particularly of PC (Otoo, 2010; Yeboah-asiamah *et al.*, 2017). There is little data on the role of nutrition in the management and prevention of prostate disorders. Such data may be required in the development of a national strategy to either prevent or reduce the incidence of such disorders in the Ghanaian society. Thus, this study sought to investigate knowledge on prostate health and food choices among Ghanaian men.



### 1.3 Conceptual framework for the justification of the study

The proposed conceptual framework to assess knowledge on prostate health and food choices among Ghanaian men is the Health Belief Model (HBM) (Figure 1.1).

HBM emphasises the perception that individuals take preventive action if they believe that

a) they are susceptible to a condition, b) the condition will have potentially serious negative consequences, c) there is a course of action that could be beneficial in reducing the susceptibility or the seriousness of the condition, and d) the cost of taking an action to reduce the seriousness or susceptibility of the condition outweighs the anticipated benefits (Glanz *et al.*, 2008; Hayden, 2003).

It contains four main constructs: perceived susceptibility to a health condition, perceived severity, perceived benefits and perceived barriers (Glanz *et al.*, 2008).

#### 1.3.1 Constructs as explained by Glanz *et al.* (2008) and Hayden, (2003)

##### *Perceived susceptibility of a disease condition*

This refers to the perception of the likelihood of developing a disorder. A person's perceived susceptibility is very powerful to prompt him to adopt healthy behaviours. When a person has the belief that he is at risk of having a prostate disorder, he will seek preventive measures to reduce the risk such as taking low fatty meat. When there is a greater susceptibility, there is a higher likelihood of engaging in behaviours to decrease the susceptibility. However, when a person perceives that he is not at risk of a disease, unhealthy behaviours may tend to set in.



***Perceived severity of a disease condition***

This refers to the perception about the seriousness of developing a disorder. When perceived susceptibility is combined with perceived severity, it leads to perceived threat. If the perception of threat is to a serious disease for which real risk exist, a person's behaviour always changes. If a person has a belief that having a prostate disorder is a serious condition that may lead to impotence and death, healthy behaviours such as eating well will be adopted.

***Perceived benefits of preventive health behaviour***

This is defined as one's belief of the worth and effectiveness of adopting preventive behaviour in reducing the risk of a disorder. Therefore, when an individual exhibits optimal belief in susceptibility and severity, he is expected to believe a new healthy behaviour that has the potential of reducing the onset of a disease condition. Therefore, it is expected that the perceived benefits of an individual who is aware of, for example, the causes of prostate disorders will adopt preventive behaviours such as making appropriate food choices to reduce the risk of developing prostate disorders.

***Perceived barriers to preventive health behaviour***

This refers to the perception that there might be obstacles when practising a new healthy behaviour. The obstacles include cost, time, embarrassment, stresses or availability of alternatives (which might not necessarily contribute to improved health, for example, taking multiple micronutrient supplements instead of eating a healthy diet) which will bring about avoidance. A person adopts a new behaviour when he believes the profits of adopting the new behaviour overshadow that of the old one. This helps to avoid barriers and the new behaviour is adopted.



***Cues for action to preventive health behaviour***

This refers to the precipitating force that triggers the need for a person to act. In addition to the four constructs, HBM recommends that behaviour is influenced by cues to actions. This was included as a construct to account for a prompting moment “to set a process in motion” (Courtenay, 2000). It includes events, people or things that push a person to adopt a new behaviour. Cues to action include mass media reports, advice from friends and family, history of a disease or friend’s illness. A person will be moved to know more about prostate health and look for preventive healthy behaviours to reduce his risk for prostate disorders if he gets to know that a family member has died of one. Similarly, documentaries, television and radio shows and campaigns for prostate health may push a person to take an action. Advice from a friend may also influence a person to seek or acquire knowledge about prostate health and strive for appropriate food choices. A person’s nutritional status can also prompt him to seek for help.

***Self-efficacy***

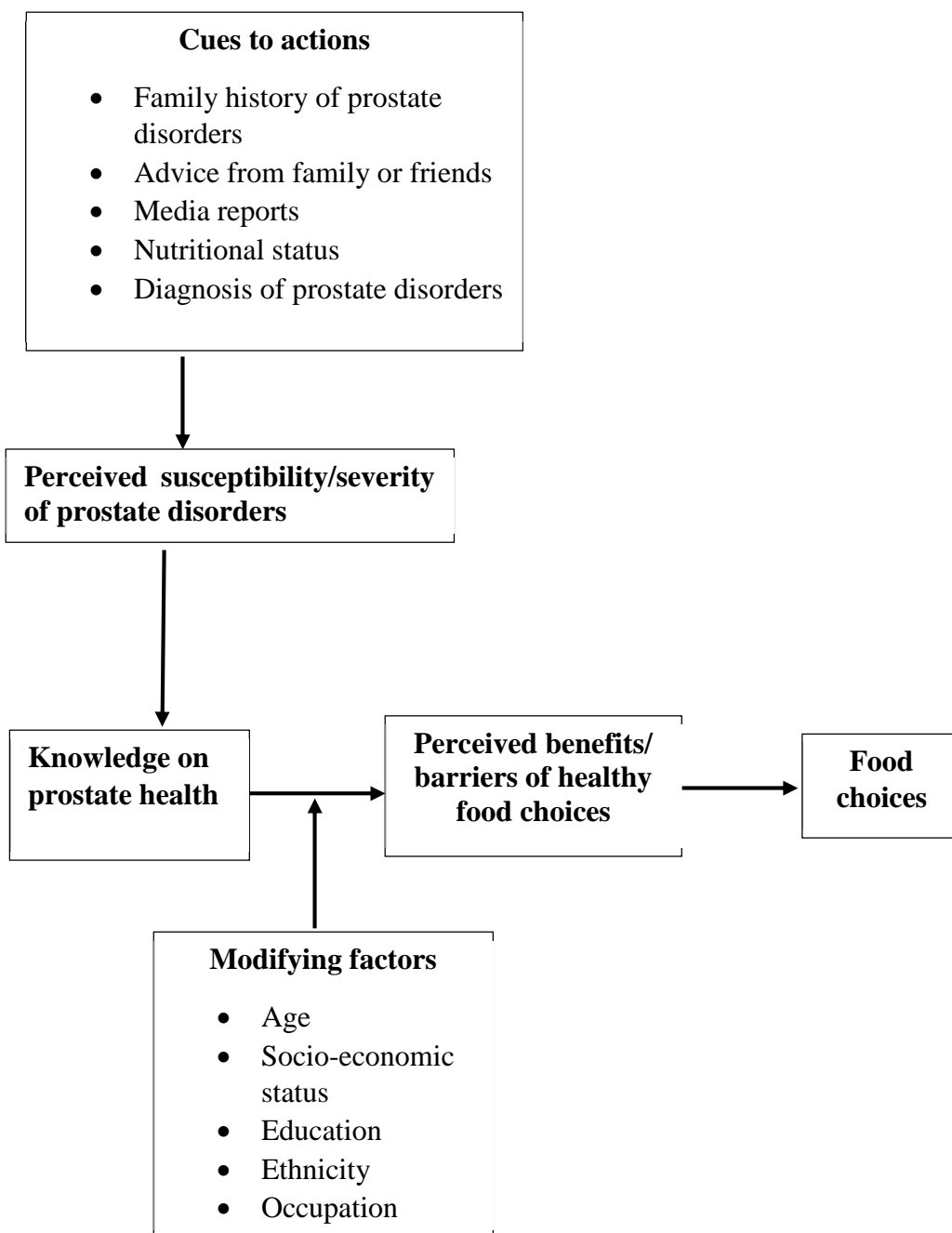
Self-efficacy refers to a person’s own ability to practice a new behaviour (Bandura, 2004). For instance, for a new behaviour to be adopted, a person must feel that he is capable (self-efficacious) to overcome perceived barriers to adopting a new behaviour. If a person thinks making appropriate food choices is useful and thinks he can do it, there is a possibility of practising the new behaviour.



***Modifying variables***

The main constructs of the Health Belief Model are modified by various demographics, social, psychological and structural variables that may influence a person's perception and indirectly influence the adoption of a new health behaviour. These include age, educational level, socio-economic status, occupation, religious affiliation which indirectly influences a person's benefit and barriers to adopting a new healthy behaviour. If a person wants to adopt appropriate food choices to reduce the risk of developing prostate disorders, the modifying variable behind this may be age, ethnicity, marital status, educational level, socio-economic status, occupation and religious affiliation.





Source: Anderson (2013), Hayden (2003) and Jones *et al.* (2016).

**Figure 1.1: Conceptual framework for knowledge on prostate health and food choices among Ghanaian men.**



#### **1.4 Significance of study**

Management of prostate disorders has always been at the tertiary stage and focuses on treatment but prevention has been a big issue (Tubaro, 2006). This study will help increase prostate health awareness among men to seek preventive measures in reducing the risk of prostate disorders. It will also provide information on the food choices made by men in relation to their prostate health. The study will be necessary for formulating appropriate public health interventions to curb prostate disorder incidence. In addition, this study will add to the body of knowledge on prostate health and promote more research into it.

In general, this study will provide knowledge, behaviours, and attitudes which will help men to make choices to prevent diseases and promote healthy lifestyles rather than treating diseases and managing complications.

#### **1.5 Objectives**

##### **Main objective**

To assess knowledge on prostate health and how it affects food choices among men (40 years and above) in Ghana.

##### **Specific objectives**

1. To determine the prevalence of abdominal adiposity among Ghanaian men.
2. To assess knowledge on prostate health and factors associated with it among men.
3. To determine food choices made by men in relation to prostate health and factors that influenced these choices.



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4. To determine the association between knowledge on prostate health and food choices among men.





## LITERATURE REVIEW

### 2.1 Anatomy and physiologies of the prostate

The human prostate gland is an accessory organ of the male reproductive system which secretes a thin, alkaline fluid that forms a portion of the seminal fluid (Omabe & Ezeani, 2011; UCSF Medical Centre Prostate Cancer Advocates, 2011). It is mostly described as small about the size of a “walnut-shaped” structure which develops during the third month of gestation from the epithelial invaginations of the posterior urogenital sinus (Bhavsar & Verma, 2014). It is small during childhood but undergoes morphological changes into an adult phenotype during puberty. It then increases in size rapidly until adult weight of approximately  $20 \pm 6$  grams by 21–30 years of age and further to an average weight of 40 grams in later life (Hammerich *et al.*, 2009; Kgatle *et al.*, 2016; Lu & Chen, 2014).

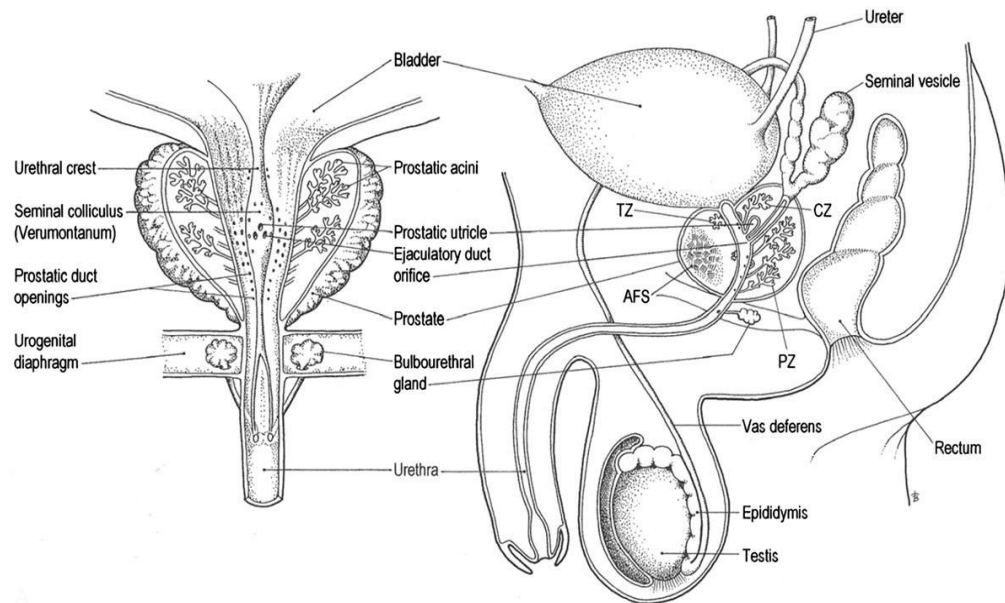
The prostate gland is situated in the sub peritoneal section between the pelvic diaphragm and peritoneal cavity posterior to the symphysis pubis, in front of the rectum and just below the urinary bladder (Lee *et al.*, 2011). It is comprised of glandular and stromal elements which are firmly attached within a pseudocapsule (Bhavsar & Verma, 2014). The prostate gland consists of a base and apex, anterior, posterior and inferior-lateral surface (Bhavsar & Verma, 2014; Lee *et al.*, 2011). The base is attached to the neck of the bladder, and the prostatic urethra enters the middle of the gland near the anterior surface, which is narrow and convex. The apex rests on the superior surface of the urogenital diaphragm and in contact with the medial surface of the levator ani muscles while the triangle and flat posterior surface rests on the anterior wall of the



rectum. The inferior-lateral surface joins the anterior surface and rests on the levator ani fascia above the urogenital diaphragm.

The prostate gland is further divided into four regions: the central, transition, peripheral and anterior fibromuscular stroma. These regions have different embryological origins and can be distinguished by their appearance, anatomic landmarks, biological functions and pathological susceptibility (Bhavsar & Verma, 2014).

Production of fluid for semen is the major function of the prostate. In the process of male orgasm, muscular contractions squeeze fluid from the prostate forcing out sperm and seminal fluid into the urethra which leave the penis during ejaculation (U. S. Patent No. 7,597,910 B2, 2009).

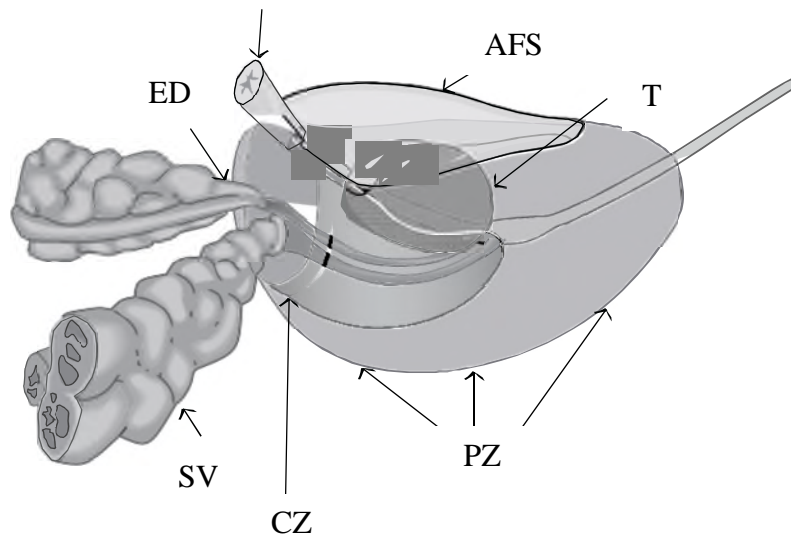


**Figure 2.1: Diagram of the frontal and sagittal sections of the male urogenital complex, illustrating the anatomical position of the adult prostate and associated structures.**

Source: Timms & Hofkamp (2011).



Proximal urethra



ED-Ejaculatory duct, SV-Seminal Vesicles, CZ-Central zone, PZ-peripheral zone, AFS- anterior fibromuscular stroma and TZ-transition zone.

Source: Bhavsar & Verma (2014)

**Figure 2.2: Zonal anatomy of the prostate gland**

## 2.2 Risk factors for prostate disorders

The common risk factors associated with the prostate include age, diet, race, family history, hormones, obesity, diabetes and physical inactivity.

Nandeesh (2008) mentioned that hypertension, diabetes mellitus, obesity, ischaemic heart disease, increased consumption of carbohydrates and fats, insulin resistance with hyperinsulinemia and dyslipidaemia are common risk factors in the development of BPH either through different mechanisms or by a common pathway via insulin. Parsons *et al.* (2009) also confirmed that obesity and associated abnormalities in glucose homeostasis may play a role in BPH development by influencing prostate growth. Potential risk factors for LUTS/BPH as reported by Kirby *et al.* (2013) and Parsons (2010) include age, sedentary lifestyle and lack of exercise, excessive smoking and alcohol intake, depression, hypertension, cardiovascular disease, hyperlipidaemia, Type 2



diabetes mellitus, [www.udsspace.uds.edu.gh](http://www.udsspace.uds.edu.gh), obesity/waist circumference, hypogonadism and genetic predisposition.

The only well-established risk factors for PC are age, family history of the disease and race/ethnicity (Brawley, 2012). However, no sexually transmitted diseases have been found to be significantly associated with PC (Caini *et al.*, 2014). In Ghana, Obu (2015) identified a sedentary lifestyle combined with lack of enough exercise, poor diet, exposure to excessive environmental toxins from conception onwards, medications including too many usages of antibiotics, hormonal imbalances and natural hormonal changes as probably the risk factors for prostate disorders such as PC.

### 2.2.1 Age

Age has been reported to be a key risk factor for all disorders associated with the prostate. As a male age over time, prostate cells may grow abnormally (intraepithelial neoplasia) resulting in cancer and can spread to the other side of the prostate gland and eventually to the other parts of the body through the blood and the lymph systems (UCSF Medical Center Prostate Cancer Advocates, 2011). While acute or chronic prostatitis may trouble any adult male, by the age of 70 years, more than 40% of men develop an enlargement of the prostate due to BPH, and by the age of 80 years, most will have PC (Stacewicz-Sapuntzakis & Bowen, 2005). Lim (2017) also reported that the prevalence of BPH rises markedly with increased age. An estimated 42% of men 51 to 60 years of age have histological BPH. The incidence increases to over 70% in men 61 to 70 years of age and to almost 90% in those 81 to 90 years of age. Thiruchelvam (2014), also established that BPH develops from the age of 30 and slowly increases as one ages with a peak of 90% of men aged over



80. According to [www.udsspace.uds.edu.gh](http://www.udsspace.uds.edu.gh) the author, BPH also seen in men above 70 years have increased prostate size from approximately 25 ml to 30 to 35 ml. More than 50% of men above 50 years are believed to experience LUTS secondary to enlarged prostate (Nickel, 2012).

The age-specific incidence rates of PC among men in more developed countries are generally between five and nine times more than for men in less developed countries as reported by Baade *et al.* (2009). Brawley (2012) reported that age was by far the strongest risk factor for PC incidence and death and a prognostic factor for especially older men. A study conducted by Arthur and co-workers revealed that 83.6% of their study subjects (56 to 85 years) had their Prostate Specific Antigen (PSA) levels above 4 ng/ml (known as the cut off level) and 96.5% who had PC at the time of the study were above 50 years (Arthur *et al.*, 2005).

### 2.2.2 Diet

So far, the common dietary factors seem to be associated with prostate disorders are higher intake of fatty meat and its products that increases risk and higher intake of fruits and vegetables that reduces risk (Brawley, 2012). Dietary fat, however, has been one of the most frequently investigated modifiable risk factors for prostate disorders (Nandeesh, 2008).

There are also indications that macronutrients and micronutrients may affect the risk of LUTS/BPH (Parsons, 2010). Red meat, fat, milk and dairy products, cereals, bread, poultry, and starch are the major sources of macronutrients that have the potential of increasing the risk of clinical LUTS/BPH while fruits and vegetables are the key sources of micronutrients that potentially decrease the



[www.udsspace.uds.edu.gh](http://www.udsspace.uds.edu.gh)  
risks of LUTS/BPH (Parsons, 2007, 2010). The major specific nutrients found to be increasing the risk of LUTS/BPH are total energy intake and energy-adjusted total protein while polyunsaturated fatty acids, linoleic acid, and vitamin D, higher circulating concentrations of vitamin E, lycopene, selenium, and carotene have been inversely associated with LUTS/BPH (Parsons, 2007, 2010).

On the part of PC, dietary factors which have been associated with the development of this disorder are specific fatty acids, fat, soy, calcium, various vegetables, lycopene and supplements of vitamin E, selenium, vitamin C and zinc (Barber & Barber, 2002; U. S. Patent No. 7,597,910 B2, 2009). Eating more fruits and vegetables has been shown to be a likelihood of reducing the risk of PC while intake of excessive fatty foods have been reported to be a likelihood of increasing risk (Perez-Cornago *et al.*, 2017).

Van Hoang *et al.* (2018) conducted a retrospective case-control study to investigate the association between intake of carotenoids and their food sources to PC risk among 652 men (244 incident PC patients, aged 64–75 years, and 408 age frequency-matched controls) in Ho Chi Minh City between 2013–2015. They found out that the risk of PC among respondents decreased with increasing intakes of purified lycopene (Odds ratio: 0.46, Confidence interval: 0.27 - 0.77), tomatoes (Odds ratio: 0.39, Confidence interval 0.23 - 0.66) and carrots (Odds ratio: 0.35, Confidence interval: 0.21, 0.58). This study, therefore, suggests that men with a higher intake of lycopene, tomatoes, and carrots may have a lower risk of PC. Additionally, Chan & Giovannucci (2001) also confirmed that foods such as tomatoes (raw, cooked, or in tomato products such as sauces or ketchup), pink grapefruit, and watermelon are rich in lycopene and may be



[www.udsspace.uds.edu.gh](http://www.udsspace.uds.edu.gh) correlated with a decreased risk of PC. However, diets with high levels of red meat and dairy products have been correlated with an increase in risk of advanced PC (U. S. Patent No. 7,597,910 B2, 2009). Reducing fat intakes has also been shown to reduce circulating levels of testosterone and other hormones that are known to fuel growth of PC cells (U. S. Patent No. 7,597,910 B2, 2009).

### 2.2.3 Race

A study conducted by Kristal *et al.* (2007) showed that there are increased risks for total BPH among black men which is higher compared to white men.

PC is the leading cancer among men of African descent in the United States of America (USA), Caribbean, and sub-Saharan Africa (Rebbeck *et al.*, 2013). Studies show that African-American men and Jamaican men of African descent have the highest PC incidence rates in the world (Brawley, 2012).

### 2.2.4 Family history

There are proven evidence on strong genetic components to LUTS/BPH (Parsons, 2010). A case control study where men below 64 years underwent surgery for BPH noted that male relatives and brothers had a 4-fold and 6-fold increase, respectively of age-specific risks of BPH surgery (Sanda *et al.*, 1994). These investigators further estimated that 50% of men below 60 years undergoing surgery for BPH had a heritable form. Subsequent study conducted showed that that heritable disease was associated with larger prostate volume and younger age of occurrence compared with sporadic BPH (Sanda *et al.*, 1997). These findings show that there is a clear pattern of heritable dominance of BPH among men who have a family history of prostate disorders (Lim, 2017).



Other studies also [suggest](http://www.udsspace.uds.edu.gh) that genetics play an important role in PC predisposition which may be responsible for 5–10% of the disease with some genes and common gene variations being correlated with risk of PC (Brawley, 2012). For example, a man's risk doubles when his father or brother had PC especially if these relatives were young at the time the cancer was found. Also, family history of PC does appear to increase risk of diagnosis as well as death due to prolonged PC.

### 2.2.5 Obesity

Past studies have constantly shown that increased adiposity is positively associated with prostate volume (Parsons, 2010). Obesity has been implicated in the aetiology of benign and malignant prostatic growth due to its influence on metabolic and endocrine changes (Nandeesh, 2008). Parsons *et al.*, (2006) conducted a study to determine total prostate volume by pelvic magnetic resonance imaging (MRI) among 422 participants. From the study, 22% had prostate enlargement at the first visit with overweight men, obese men and severely obese men being at a higher risk respectively than men with normal weight ( $p = 0.01$ ). Men with elevated fasting plasma glucose ( $> 110$  mg/dl) were more likely to have an enlarged prostate than men with normal fasting plasma glucose ( $\leq 110$  mg/dl) (OR, 2.98; 95% CI, 1.70–5.23), as were men with a diagnosis of diabetes (OR, 2.25; 95% CI, 1.23–4.11). They therefore concluded that obesity, elevated plasma glucose, and diabetes are risk factors for BPH. Thus, increased adiposity increases prostate volume.

Body weight, body mass index (BMI), and waist circumference all have been positively associated with prostate volume in multiple different study populations as well (Parsons *et al.*, 2006; Parsons & Im, 2009). In the Baltimore





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Longitudinal Study of Aging cohort, each 1 kg/m<sup>2</sup> increase in BMI was found to correspond to a 0.41 mL increase in prostate volume. Moreover, obese (BMI  $\geq 35$  kg/m<sup>2</sup>) participants had a 3.5 times increased risk of prostate enlargement compared with non-obese (BMI  $< 25$  kg/m<sup>2</sup>) participants (Parsons *et al.*, 2006). A study conducted by Fowke *et al.* (2014) also confirmed that prostate volume was significantly associated with BMI.

Some epidemiologic studies have also shown the relationship between obesity and the increase risk of BPH surgery, urinary symptom progression, initiation of BPH medical therapy and LUTS (Parsons, 2007; Parsons & Im, 2009). This is because of the endocrine changes that occur in men as they age. Abdominal obesity increases the oestrogen-to-androgen ratio and may increase sympathetic nervous activity, both known to influence the development of BPH and the severity of urinary obstructive symptoms (Giovannucci *et al.*, 1994). Hammarsten & Högstedt (1999) also reported a positive correlation between annual BPH growth rate and measures of obesity like BMI, waist measurement, hip measurement, and waist-to-hip ratio and hypothesised that obesity is a risk factor in the development of BPH. Kristal *et al.* (2007) also reported a positive association between abdominal obesity and increased benign prostatic hyperplasia risk.

Also, obese men appear to have a higher risk of being diagnosed with high-PC (Weisser & Krieg, 1998). In the presence of obesity, different mechanisms such as decreased serum testosterone, peripheral aromatization of androgens, insulin resistance, and altered adipokine secretion caused by inflammation, may precipitate the development of and even cause high-grade PC (Parikesit *et al.*, 2016). However, obese men, particularly older men, who often exercise (and



[www.udsspace.uds.edu.gh](http://www.udsspace.uds.edu.gh) tend to reduce in size) appear to have a lower risk of having PC (Brawley, 2012). Another prospective study among men aged 40–75 years indicated that abdominal obesity was related to prostatectomy for those with a waist circumference greater than 109 cm relative to those with a waist circumference less than 89 cm after adjusting for age, smoking, and BMI (Giovannucci *et al.*, 1994). These results suggest that abdominal obesity in men may increase the frequency and severity of urinary obstructive symptoms and may increase the likelihood that such obese men will undergo a prostatectomy (Nandeesh, 2008).

The role of obesity and prostatitis still remains unclear (Parikesit *et al.*, 2016). However, a study conducted by Wallner *et al.*, (2009) showed that increased BMI has a protective effect on prostatitis risk after adjustment for age. They found out that the odds of having a history of prostatitis were decreased by approximately 68% in obese men (BMI > 30 kg/m<sup>2</sup>) when compared with men with a BMI of 25 kg/m<sup>2</sup>. This result is likely due to the influence of physical activity on this relationship. This study revealed that the odds of developing prostatitis in men who were vigorously physically active were 67%. In the same study, about 58% of the men characterized as obese were found to engage in vigorous exercise compared with overweight (4.8%) and normal weight men (22.4%).

### 2.2.6 Diabetes

Previous studies hypothesised various mechanisms to explain the effect of insulin on prostate growth (Nandeesh, 2008). For instance, Parsons (2010) reported that, disruptions in glucose homeostasis from alterations in serum insulin growth factor concentrations to diagnosis of clinical diabetes are



associated with higher likelihoods of LUTS/BPH. Physician-diagnosed diabetes, increased serum insulin, and elevated fasting plasma glucose have been associated with increased risk of prostate enlargement, clinical BPH, BPH surgery and LUTS (Parsons, 2007; Parsons *et al.*, 2006; Parsons *et al.*, 2013; Stroup *et al.*, 2011). Insulin is claimed to be involved in pathogenesis of BPH through its action on sympathetic nerve activity, sex hormones, and insulin-like growth factor (Nandeesh, 2008). Nandeesh (2008) suggested that a possible explanation for an association between BPH and diabetes can cause similar urological symptoms such as LUTS.

The association between diabetes and clinical BPH has recently been shown to be more frequent (Rosette *et al.*, 2004) and there is the likelihood of diabetic men being screened for PC (Sanderson *et al.*, 2014). From their study, Sanderson *et al.* (2014) found out that the prevalence of screening for PC was higher nearer to the time of diabetes diagnosis, which may contribute to an early increase in PC detection followed by lowered PC detection after an extended time.

### **2.2.7 Physical inactivity**

Increased physical activity (PA) and exercise have been revealed to be associated with decreased risks of BPH surgery, clinical BPH and histological LUTS/BPH (Fowke *et al.*, 2014; Parsons, 2007). A meta-analysis of data from a number of studies indicated that moderate-to-vigorous PA reduces the risk of BPH by as much as 25% relative to a sedentary lifestyle, with the magnitude of the protective effect increasing with higher levels of activity (Parsons & Kashefi, 2008). Similarly, a cross-sectional study conducted by Nelson & Guyer (2012) confirmed the relationship between PA and LUTS severity. The results



of their study showed that LUTS may reduce if respondents incorporate PA into their daily life.

### 2.3 Aetiology of prostate disorders

Health is defined by “a state of complete physical, mental and social well-being, and not merely the absence of disease or infirmity” (WHO, 1948). A disorder is also defined as a disruption to regular bodily structure, function or both resulting from causes such as infection, inflammation, environmental or genetic factors (Bateman *et al.*, 2005). The human prostate is a sterile organ until different infectious agents begin to affect it leading to both asymptomatic and symptomatic disorders which affect the health and the quality of life of men (Omabe & Ezeani, 2011; Stacewicz-Sapuntzakis & Bowen, 2005).

Disorders of the prostate mostly interfere significantly with normal daily activities (Novara *et al.*, 2006). BPH and PC are among the most common diseases of the prostate gland and represent significant burdens for patients and health-care systems in many countries (Ørsted & Bojesen, 2012).

There are a variety of causes that lead to atrophy in the prostate, including inflammation, radiation, antiandrogens, chronic ischaemia and age-related androgen withdrawal (Kitzing *et al.*, 2017). Poor drainage of secretions from peripheral ducts or reflux of urine into prostatic tissue may also lead to inflammation, fibrosis, or stones (Lipsky, Byren, & Hoey, 2010).

Alterations in the size of the prostate could affect the bladder or constrict the urethra, resulting in LUTS (Ezeanyika *et al.*, 2006). LUTS in men are caused by a group of disorders affecting the prostate and bladder that share similar clinical manifestations (Kirby *et al.*, 2013). LUTS are typically categorised into storage



[www.udsspace.uds.edu.gh](http://www.udsspace.uds.edu.gh) symptoms which are frequency and urgency, voiding symptoms which are poor flow, hesitancy, straining and post-voiding symptoms which are post-micturition dribbling (Thiruchelvam, 2014). The causes of LUTS include bladder dysfunction, malignant prostatic disease, urethral disease and medical conditions such as polyuria (Thiruchelvam, 2014). LUTS due to BPH has also been recorded. Specific symptoms associated with the LUTS include frequency, urgency, nycturia, difficulty initiating urination, sense of an incomplete bladder emptying, decreased force of stream and interruption of stream (Parsons, 2010). Unfortunately, the extended underlying aetiology of LUTS is unclear (Nelson & Guyer, 2012).

Prostatitis, which may or may not be a result of an infection is characterised by inflammation and swelling of the prostate gland (Zaidi *et al.*, 2018). Prostatitis generally is categorised into a combination of infectious diseases (acute and chronic bacterial prostatitis), chronic pelvic pain syndrome and asymptomatic inflammation (Krieger *et al.*, 2008).

Acute and chronic bacterial prostatitis are characterised by urinary tract infection. *Escherichia coli* is the most commonly isolated organism, but other gram-negative organisms, such as *Klebsiella*, *Proteus*, and *Pseudomonas*, and gram-positive *Enterococcus* species are often isolated as well (Sharp *et al.*, 2010).

Chronic prostatitis/Chronic pelvic pain syndrome (CP/CPPS), is also characterised by chronic pelvic pain symptoms in the absence of UTI (Krieger *et al.*, 1999; Pavone-Macaluso, 2007). CP/CPPS is further grouped into two: inflammatory, which is associated with leukocytes in the expressed prostatic



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fluid, post-prostate massage urine or seminal fluid and non-inflammatory, which is with no evidence of urogenital inflammation.

The fourth type of prostatitis is asymptomatic inflammatory prostatitis, which occurs in patients who have no symptoms, but who have documented inflammation in prostatic tissue or in their seminal fluid. Symptoms associated with prostatitis are pain in the suprapubic or perineal region, or in the external genitalia, voiding symptoms such as nycturia, frequency and urgency of urination, incomplete voiding, and decreased force and or intermittency of the urinary stream, impotence and infertility (U. S. Patent No. 7,597,910 B2, 2009).

Setright (2012) also reported that various bacteria, including sexually transmitted infections can cause inflammation of the prostate. Systemic symptoms of fever, chills, malaise, nausea, emesis, and signs of sepsis (tachycardia and hypotension) are associated with prostatitis (Sharp *et al.*, 2010).

BPH, which is also known as adenoma of the prostate is a non-cancerous enlargement of the prostate gland characterised by overgrowth of the transitional and periureteral area resulting from proliferation stromal and glandular elements (Nandeesh, 2008). Verhamme *et al.* (2002) also described BPH as “an enlargement of the prostate that results in increasing pressure on the urethra and subsequent obstruction of the urinary flow”. Its aetiology is still unclear as well. However, according to Thiruchelvam (2014), BPH progression can lead to benign prostatic enlargement (BPE) resulting in benign prostatic obstruction (BPO) which also results in bladder outlet obstruction (BOO) and eventually leading to LUTS (Briolat, 2016; Nickel, 2012; Park *et al.*, 2013). The



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progression of BPH is observed in terms of increased prostate volume and decreased maximal urinary flow rate (Lu & Chen, 2014). BPH progression also increases the risk of acute urinary retention (AUR) and surgery.

Symptoms associated with BPH are like those of prostatitis (Kirby *et al.*, 2013). However, patients with BPH might be free of symptoms, but often present themselves with LUTS as a result of difficulties in voiding such as hesitancy, straining, weak stream, dribbling and irritability of the bladder such as urgency, frequency, urge incontinence (Verhamme *et al.*, 2002).

Mostly, PC develops slowly, although aggressive, rapidly growing forms also occur (Chistiakov *et al.* 2018). Most patients do not have any symptoms when diagnosed with PC. However, symptoms may include frequent urination (especially at night), urgency in urinating, inability to start urine stream, a weak or interrupted urine stream, pain or burning during urination, a feeling that the bladder does not empty completely, blood in the urine, pain in the back, hips or pelvis, weakness, weight loss and loss of appetite (UCSF Medical Centre Prostate Cancer Advocates, 2011).

Recent studies have also suggested a mutual relationship between inflammation and PC, as well (Ying, 2007).

PC is graded based on how abnormal it looks under the microscope with higher grade cancers looking more abnormal and more likely to grow and spread quickly (American Cancer Society, 2016b). The Gleason score and Grade group are the major ways used to grade prostate cancer progression.



## 2.4 Epidemiology of prostate disorders

According to Derogatis & Burnett (2008), epidemiology refers to the study of population in relation to health and disease. The aim of epidemiology is to maintain health and prevent disease. Prevalence refers to the number of cases of a disease in a particular population which constitutes both diagnosed cases and undetected cases but are present (Haas *et al.*, 2008). Disorders of the prostate increase in prevalence as the population ages, which is a key health issue (De Nunzio *et al.*, 2012). Throughout the past years, epidemiological studies on prostate disorders such as prostatitis, PC, LUTS/BPH have evolved (Parsons, 2010).

Prostatitis has been shown to also produce a widespread condition with an estimated prevalence of 8.2% (range: 2.2 to 9.7%) (Krieger *et al.*, 2008). It has been estimated that prostatitis may affect up to 50% of men at some point in their lives (Punab, 2017). A study of a population-based sample of African-American men estimated the prevalence of prostatitis to be 6.7% (Davis, 2018).

BPH is also one of the highly prevalent prostate disorders that affect men, especially those who are 50 years and older aged (De Nunzio *et al.*, 2012). A study in Jeju Island among men above 50 years showed that BPH prevalence occurred in 11.6% among those aged 50 to 59 years, 18.1% in those aged 60 to 69, 30.8% in those aged 70 to 79, and 50.8% in men aged 80 years or more (Huh *et al.*, 2012). Also a study among 950 men between the ages of 50 and 74 years revealed a high prevalence (62.3%) DRE-detected enlarged prostate and 35.3% PSA levels above 1.5 ng/ml, 19.9% moderate-to-severe LUTS and 13.3% IPSS above eight and an enlarged prostate on DRE (Chokkalingam *et al.*, 2012). From a study by Park *et al.* (2009) in Korea, the prevalence of BPH was shown among





study respondents to be 40% overall with 36% of men 65 to 69 years being diagnosed, 43% of men 70 to 79 years being diagnosed and 53% of men 80 years. Similarly, Ezeanyika *et al.* (2006) found out that about 25% of Nigerian men had symptoms of BPH.

PC, one of the common prostate disorders is the second commonest cancer among men accounting for 1.1 million new cases and 307, 000 deaths worldwide (Ferlay *et al.*, 2015). Each year, 230, 000 men are diagnosed and about 30, 000 die from it (Sarwar *et al.*, 2017). Incidence rates of PC have been found to be higher in Australia, Western and Northern Europe while South-Central Asia has the lowest incidence (Holzapfel *et al.*, 2013). The average PC incidence rate in America was 208.7 cases per 100, 000 black men in 2008-2012 which was 70% above that of white men (American Cancer Society, 2016a). In 2012, Europe recorded 400, 364 new cases of PC and 92, 328 deaths in regard to mortality (Wong *et al.*, 2016). PC is one of the common diseases in Africa, and has a significant public health burden in both occurrence and in death (Adeloye *et al.*, 2016; Rebbeck *et al.*, 2013). The International agency for Research on Cancer, GLOBOCAN, estimated 28, 006 PC deaths occurring in Africa in 2008 and predicted the number will double to 57, 048 by 2030 (Ferlay *et al.*, 2008). Babb *et al.* (2014) reported that there are large disparities in the age specific incidence rate of PC between black, white, coloured, and Asian/Indian populations: 19, 65, 46, and 19 per 100, 000, respectively, and age specific mortality rates was 11, 7, 52, and 6 per 100, 000, respectively from their study. They also concluded that there is a steady increase of incidence and mortality from PC in South Africa. Other studies have also indicated that Ghana and Nigeria have higher records of PC (Odedina *et al.*, 2009).



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In Ghana, PC is relatively high in men with an incidence of about 200 cases per 100, 000 of the population per year (Ministry of Health, 2011). It is the second most common cancer (13.2%) following liver cancer (21.1%) in Ghana (Laryea *et al.*, 2014; Ministry of Health, 2011) with a reported mortality of 17.35% (Wiredu & Armah, 2006). A population based study by Hsing *et al.* (2014) in Ghana on 1, 037 healthy men within the ages 50 to 74 years showed that 272 (26.2%) of the respondents had PSA levels above 2.5 ng/ml cut off and 166 had levels above 4 ng/ml. The study reported that a total of 352 (33.9%) men tested positive for PSA or DRE and 307 underwent biopsy. Of these men who were studied, 73 were confirmed to have PC, yielding a 7.0% screen detected PC prevalence (65 patients), including 5.8% with PSA levels greater than 4.0 ng/ml. An earlier report by Arthur *et al.* (2005), showed that 83% of men between 56 and 85 years had PSA levels above the upper limit of the reference range (4 ng/ml) and about 96% had PC.

### **2.5 Consequences of prostate disorders**

The prostate is a vulnerable organ that is prone to disorders which affect the health and wellbeing of men, particularly, the elderly (Stacewicz-Sapuntzakis & Bowen, 2005). However, little attention has been given to prostate disorders, despite the high prevalence (Nickel, 2012).

Firstly, BPH is a major public health problem, causing high morbidity and substantial worsening in men's quality of life (Nandeesh, 2008).

Furthermore, LUTS also affect sexual function leading to AUR and complications such as kidney stones if left unattended (Kirby *et al.*, 2013).

LUTS/BPH are associated with serious medical morbidities, an increased risk



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of falls, depression and diminished health-related quality of life (Parsons, 2010).  
Approximately 70% of men with LUTS/BPH have co-existing erectile dysfunction (Park *et al.*, 2013).

At later stages of PC, symptoms of bladder outlet obstruction, urethral obstruction and haematuria may appear, and metastasis to the bone may also occur (U. S. Patent No. 7,597,910 B2, 2009).

If left untreated, prostatitis can lead to overwhelming sepsis or the development of a prostatic abscess (Sharp *et al.*, 2010).

Another key public health issue is the cost associated with the diagnosis and treatment of prostate disorders which are very high to pay for. In 2000, BPH generated 1.1 billion dollars in direct health care expenditures and more than 21 million hours in lost productivity in the USA alone (U. S. Patent No. 7,597,910 B2, 2009).

Hypertension has also been shown to be prevalent in men with prostate disorders (Nandeesh, 2008).

## **2.6 Prevention, assessment, management and treatments of prostate disorders**

The prostate gland has several natural defences against infection, including the production of antibacterial substances and mechanical flushing of the prostatic urethra by voiding and ejaculation (Nickel *et al.*, 2001).

Different methods are currently being used, including total PSA value, change in PSA over time (velocity), the size of the prostate, a man's age, family history, race, and overall health to detect prostate disorders (UCSF Medical Centre Prostate Cancer Advocates, 2011).



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With the high prevalence of prostate disorders, prevention and treatment are one of the pressing needs for the survival of men. Treatment is directed towards reducing prostate size, stabilizing renal function, eradicating infection and discontinuing drugs that may induce obstruction.

An exploration of many lifestyle factors, including dietary compounds and their mechanism of action, clinical trials and experiments with animals, cell and tissue cultures to help manage prostate disorders is underway through epidemiological surveys (Stacewicz-Sapuntzakis & Bowen, 2005).

Weight loss may also be helpful for the prevention of BPH.

### **2.6.1 Dietary prevention of prostate disorders**

As with any diseases, the best approach is prevention. Changes in diet, the addition of dietary and herbal supplements may contribute to the prevention and reduction in the risk of developing prostate disorders (Setright, 2012).

Vaishampayan *et al.* (2007) opined that diet that may reduce the incidence of prostate disorders should be low in fat and red meat, high in fibre, fruit, and vegetables, especially soybean products, cooked tomato products, green tea, pumpkin seeds (lightly toasted) and spice turmeric. Dietary supplements such as zinc, natural vitamin E, selenium, fish oil, lycopene, saw palmetto and vitamin D3 may also help in prevention as well.

Studies have shown that genistein, the major phytoestrogen in soybean, could reduce the incidence of prostate cancer when added to the diet by inhibiting prostate cancer cells from becoming metastatic and spreading to other parts of the body (Setright, 2012). Saw palmetto, ginseng, pumpkin seed and red clover contain beneficial phytoestrogens that are very effective in reducing the size of the prostate gland.



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Frequent consumption of tomato products has been shown to prevent the incidence of prostate cancer (Giovannucci *et al.*, 2002). Antioxidant, lycopene in tomatoes is responsible for cancer risk reduction and is more bio-available when tomatoes are processed.

A meta-analysis conducted by Szymanski and co-workers showed that there is a significant 63% reduction in prostate cancer-specific mortality from fish consumption (Szymanski *et al.*, 2010).

## **2.6.2 Assessment of prostate disorders**

The main tools to diagnose prostate disorders include digital rectal examination, serum concentration of prostate specific antigen, and transrectal ultrasound-guided biopsy (Heidenreich *et al.*, 2014). An initial analysis is conducted to check for meatal stenosis, prostate and rectal malignancy.

### **2.6.2.1 Urinalysis**

This is conducted to exclude UTI, haematuria, diabetes, and renal disease (Thiruchelvam, 2014).

### **2.6.2.2 Serum creatinine – Serum prostate specific antigen (PSA)**

PSA is the protein secreted by a normal prostate gland to help nourish sperm. PSA in the blood reflects the volume of both normal and cancerous prostate tissue. It is measured in nanograms per millilitre (ng/ml) and levels below or equal to 4 ng/ml is considered normal while those above 4 ng/ml are considered high, indicating a risk for PC. PSA blood test is also used for screening men who have PC but do not show symptoms and is one of the first tests done in men who have symptoms that might be caused by PC (American Cancer



[www.udsspace.uds.edu.gh](http://www.udsspace.uds.edu.gh) Society, 2016). The test also determines the stage of PC and helps to monitor the progress of the cancer during and after treatment.

### **2.6.2.3 Digital rectal examination (DRE)**

During a DRE, a doctor inserts a gloved, lubricated finger into a man's rectum to feel for any irregular or abnormally firm area in the prostate. DRE is an important examination in men to determine the presence of PC and helps to enhance the capacity to estimate prostate volume to help choose the right treatment. This is because prostate size has been shown to be a determining factor for certain treatment options (Rosette *et al.*, 2004).

DRE and PSA blood test are the most common methods to screen for PC. A combination of PSA, DRE result, and age better defined the probability of a positive biopsy than any factor alone as reported by Potter *et al.* (2001).

Frank *et al.* (2001) also compared the knee-elbow (KE) and left-lateral (LL) positions for DRE. Their results showed that the two methods for prostate examination were equal for completeness of examination, pain and embarrassment. However, the KE offers an alternative to the LL position for those patients in whom the prostate is difficult to palpate or who find the examination painful.

### **2.6.2.4 Symptom scores**

The most common measure of LUTS and the primary instruments by which BPH is diagnosed in clinical practice are the American Urological Association Symptom Index and the international prostate symptom score (IPSS) (Parsons, 2010). The IPSS consists of seven symptom questions and one quality of life question (Rosette *et al.*, 2004).



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IPSS is used to assess symptom severity as well as monitor change in symptoms over time or following an intervention. By adding the scores (with equal weighting) to its constituent questions, a summary or index score is generated which has been shown to be an accurate reflection of a man's overall symptom over the preceding month (Eastham *et al.*, 2001). IPSS are group into three categories which are mild (0-7), moderate (8-19) and severe (20-35) (Rosette *et al.*, 2004). People with mild symptoms are most appropriately managed by a watchful waiting approach. Those with moderate symptoms benefit from pharmacotherapy, while those with severe symptoms may derive most benefit from prostatectomy.

#### **2.6.2.5 Frequency-volume chart**

The frequency-volume or void chart (diaries) is used to record time and the volume of each void to help give insights into LUTS. Although there is no standard volume chart available, a 24-hour frequency-volume chart has been recommended as useful (Rosette *et al.*, 2004).

#### **2.6.2.6 Uroflowmetry**

Uroflowmetry involves the measurement of fluid voided per unit of time and expressed in millilitres per second (ml/s). The flowmeter provides information on voided volume, maximum flow rate (Q<sub>max</sub>), average flow (Q<sub>ave</sub>) and time to Q<sub>max</sub>.

#### **2.6.2.7 Post-void residual (PVR)**

PVR refers to a urine measurement using ultrasound. It is calculated as a measurement of the bladder height, width, and length obtained by transabdominal ultrasonography. This is a simple, accurate and non-invasive



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method. Large PVR volumes (> 200-300 mL) may indicate bladder dysfunction and predict a less favourable response to treatment (Rosette *et al.*, 2004).

#### **2.6.2.8 Pressure-flow Urodynamic Studies (UDS)**

According to Thiruchelvam (2014), UDS test involves the placement of fluid-filled catheters into the bladder and the rectum to record flow rate. Whereas flow rates only determine the probability of obstruction, UDS categorise the degree of obstruction and identify patients in whom a low flow rate may be, due to a low-pressure detrusor contraction (Rosette *et al.*, 2004).

#### **2.6.2.9 Endoscopy**

According to Rosette *et al.* (2004), the main standard endoscopy procedure for diagnostic evaluation of the lower urinary tract (urethra, prostate, bladder neck and bladder) is a urethrocytoscopy. Urethrocytoscopy provides information about the cause, size and severity of obstruction, patency of the bladder neck, prostatic occlusion of the urethra and estimated prostate size.

#### **2.6.2.10 Magnetic resonance imaging (MRI)**

With the development of innovative MRI techniques, MRI is gradually playing a role in the clinical paths of detection, local staging, active surveillance and posttreatment follow-up (Kitzing *et al.*, 2017). MRI scans show detailed images of soft tissues in the body using radio waves and strong magnets instead of x-rays to show how cancer has spread outside the prostate into the seminal vesicles or other nearby structures (American Cancer Society, 2016).

#### **2.6.2.11 Transrectal ultrasound**

Transrectal ultrasound (TRUS) has been shown to be suitable for determination of prostate volume. For this test, a small probe about the width of a finger is





[www.udsspace.uds.edu.gh](http://www.udsspace.uds.edu.gh) lubricated and placed in the rectum. The probe gives off sound waves that enter the prostate and create echoes. The probe picks up the echoes, which are converted into a black and white image of the prostate with the aid of a computer (American Cancer Society, 2016). Weiss and co-workers conducted a study to compare prostate volume obtained by TRUS and endorectal MRI (eMRI) to assess the reliability of TRUS in determining PSA density among 2, 410 men diagnosed with localized PC and treated with radical retropubic prostatectomy (Weiss *et al.*, 2013). The study revealed a significant correlation ( $R= 0.801$ ;  $p < 0.0001$ ) between an average prostate size measured with TRUS and eMRI, thus, demonstrating a strong linear relationship ( $y = 0.891x + 2.622$ ,  $R^2 = 0.642$ ). Average prostate volume differed significantly ( $p < 0.001$ ) by 1.7 ml (TRUS relative to eMRI). Also, a significant correlation was found between three groups based on average TRUS volume ( $\leq 30$ ,  $>30-60$ , and  $>60$  ml) while differences were also found (- 2.1, 4.0, 5.1 ml;  $p < 0.0001$ ,  $p < 0.0001$ ,  $p < 0.05$ ). The study showed that TRUS is not only efficient and economical examined, but also an accurate and reproducible modality to estimate prostate size.

#### **2.6.2.12 Biopsy**

A prostate biopsy refers to the procedure where small samples of the prostate are removed and then looked at under a microscope by a method known as the core needle biopsy (American Cancer Society, 2016). During a core needle biopsy, a thin, hollow needle is inserted through the wall of the rectum and into the prostate. When the needle is pulled out it removes a small cylinder (*core*) of prostate tissue to identify cancer cells and assign it to the stage of progression. It is conducted after all tests suggest a man has developed PC.



### 2.6.2.13 Diagnostic tests for prostatitis

Several diagnostic tests are available to differentiate and categorise the four types of prostatitis. This test involves localisation tests and expressed prostatic secretions, using the 2-glass pre- and post-prostatic massage and Meares-Stamey 4-glass tests and urine Gram stain and culture (Sharp *et al.*, 2010). Diagnosis of chronic bacterial prostatitis requires a prostate examination, while the gold standard for diagnosis is urine culture with the Meares-Stamey 4-glass test before and after prostatic massage (Zaidi *et al.*, 2018). The presence of more than 10 white blood cells per high-power field suggests a positive diagnosis after a midstream urine culture testing for acute bacterial prostatitis (Sharp *et al.*, 2010). Pelvic pain is also evaluated. Treatment of non-infectious prostatitis is difficult because its cause is unknown. Asymptomatic prostatitis is diagnosed when inflammatory cells are identified on prostate biopsy or leukocytes are noted on semen analysis during urologic evaluation for other reasons (Sharp *et al.*, 2010).

### 2.6.3 Management and treatment of prostate disorders

Treatments for prostate disorders include medical therapy, radiation, various surgical procedures and anti-androgen hormone therapy. These therapies may however be combined with the treatment of a patient (U. S. Patent No. 7,597,910 B2, 2009). In Ghana, a study has shown that radical prostatectomy, brachytherapy and external beam radiotherapy are the most frequently used methods in the treatment of PC diagnosed by history, abnormal PSA/DRE, physical and histological examination and confirmed by biopsy from 2004-2013 (Yeboah *et al.*, 2016).



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An important strategy in the management of prostate disorders is physical exercise and diet management. Patients are encouraged to engage in regular physical exercise and reduce the need for surgery with its associated complications and long term recurrence (Lim, 2017).

Intake of fruits and vegetables rich in lycopene has shown to reduce the risk of prostate disorders. Thus, Kucuk *et al.* (2001) suggested that lycopene supplementation may decrease the growth of PC after diagnosis.

### **2.6.3.1 Watchful waiting or active surveillance**

Watchful waiting strategy or active surveillance is increasingly becoming another preferred choice for screening since cancers of the prostate are relatively slow growing, especially in older men (Stacewicz-Sapuntzakis & Bowen, 2005). It is mostly offered to men who have very low risk of PC (Heidenreich *et al.*, 2014). It is also conducted for the assessment of men with LUTS (Miano *et al.*, 2008). Watchful waiting includes education on prostate disorders, reassurance that some prostate disorders do not progress in everyone, periodic monitoring and lifestyle changes (Rosette *et al.*, 2004; Thiruchelvam, 2014).

### **2.6.3.2 Medical therapy (Alpha-blockers and antibiotic treatment)**

Alpha-blockers act by reducing the dynamic element of prostatic obstruction by antagonising the adrenergic receptors responsible for smooth muscle tone within the prostate and bladder neck. Tamsulosin, silodosin, and naftopidil and long-acting tamsulosin MR are now available. Tamsulosin remains a very popular alpha-blocker because of its selectivity, modest adverse events and production of rapid and reasonable symptomatic improvement (IPSS score improvement of about 35%) (Thiruchelvam, 2014).



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Antibiotics are mostly offered as treatment for prostatitis. Successful treatment of acute bacterial prostatitis and chronic bacterial prostatitis with antibiotics is well established. Acute bacterial prostatitis is treated with parenteral antibiotics and once patients have become afebrile, they may be transitioned to oral antibiotics such as penicillin derivatives based on the culture results (Sharp *et al.*, 2010). Ciprofloxacin (Cipro) and levofloxacin (Levaquin) have adequate gram-positive coverage, as well as excellent gram-negative coverage. Both medications penetrate the prostate tissue well for the treatment of chronic bacterial prostatitis (Sharp *et al.*, 2010).

Chronic Prostatitis/Chronic Pelvic Pain Syndrome (CP/CPPS) is generally treated with antibiotics and anti-inflammatory agents to relax muscle tension in the prostate and improve urinary flow (U. S. Patent No. 7,597,910 B2, 2009; Zaidi *et al.*, 2018).

The asymptomatic prostatitis treatment is mostly based on the primary reason for urologic evaluation. The clinical significance of this type of prostatitis is uncertain and there is no evaluation unless considering antimicrobial therapy (for example, antibiotic or 5-alpha reductase inhibitor therapy) for elevated PSA, infertility or biopsy (Nickel, 2011; Sharp *et al.*, 2010).

**2.6.3.3 Phyto therapy:** McDowell Jr developed compositions and methods for the treatment of prostatitis, BPH, and PC (U. S. Patent No. 7,597,910 B2, 2009).

The compositions contain either aqueous extract or dried mixtures of selenium- and zinc-enriched cannabis plant material, Shiitake mushrooms, and Maitake mushrooms. These are effective in treating prostate disorders to alleviate pain and voiding symptoms, decrease inflammation and prostate size, reduce cellular



[www.udsspace.uds.edu.gh](http://www.udsspace.uds.edu.gh) proliferation in prostate tissue, and/or reduce PSA levels to within the normal range of 0-4 ng/ml. Extracts of cannabis plant materials have been shown to have non-toxic, anti-inflammatory, antioxidant, and antitumorigenic properties in prostate tissue (U. S. Patent No. 7,597,910 B2, 2009).

Kyei and co-workers also conducted a study to identifying Ghanaian traditional medicines used for the management of prostate disorders (Kyei *et al.*, 2017). From their study, they found out that *Croton membranaceus* was found in all products under study. The products included Uro 500®, UR-Quick mixture®, Prostacure® and Prostat® 60 which are mostly sold in Ghana.

Agyare *et al.* (2018) also identified a variety of traditionally used anti-cancer plants from Ghana for the treatment of cancers such as PC.

#### 2.6.3.4 Surgical therapy

Surgery is the most definitive therapy for advanced prostate disorders. Transurethral resection of the prostate (TURP), transurethral incision of the prostate (TUIP) and open prostatectomy are the conventional surgical options (Thiruchelvam, 2014). However, the most widely used surgical procedure is transurethral resection of the prostate (U. S. Patent No. 7,597,910 B2, 2009).

**Prostatic stenting:** a prostatic stent is a tiny spring-like device inserted into the male urethra to either permanently or temporarily open it (Samadi, 2017). Stents are mostly used often for men with AUR and are poor in overall health. Spiral stents and malleable and heat-expandable stents are being used (Thiruchelvam, 2014). Permanent stents (such as UroLume or Memotherm) allow tissue growth that results in the stent being embedded in the urethral wall whiles temporary



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stents are made of biodegradable or nonabsorbable materials, allowing for easy removal (Miano *et al.*, 2008).

**Minimally invasive therapy:** this is a surgery used to treat urinary problems due to an enlarged prostate. According to Thiruchelvam (2014), monopolar TURP remains the gold standard treatment for the surgical management of BPH and BOO. Indications for TURP include moderate to severe LUTS, AUR, recurrent UTI, recurrent haematuria and obstructive uropathy.

However, there are other alternative minimally invasive endoscopic techniques that are used. These include transurethral vapourisation of the prostate, transurethral microwave thermotherapy, transurethral needle ablation of the prostate, high intensity focused ultrasound, hot water induced thermotherapy, transurethral ethanol ablation, onabotulinum toxin A injection and urethral lift.

**Laser surgery:** laser is an acronym for Light Amplification by Stimulated Emission of Radiation. Light is composed of photons (particles of energy) and is propagated in electromagnetic waves (Miano *et al.*, 2008). Lasers are used for BPH surgery by either coagulating, vaporizing or enucleating the prostate (Rosette *et al.*, 2004; Thiruchelvam, 2014).

**Prostatectomy:** Prostatectomy involves several surgical procedures to remove part of or all the prostate gland and surrounding lymph nodes. It is conducted as a treatment for men with prostate disorders such as PC and BPH (Heidenreich *et al.*, 2014; Thiruchelvam, 2014). Prostatectomy includes open or simple prostatectomy and radical prostatectomy. Prostatectomy is mostly conducted in most developing countries where resources, endourological equipment and expertise are inadequate (Thiruchelvam, 2014).



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**Radiation therapy:** this refers to the use of high-energy rays or particles to destroy cancer cells. These include external-beam radiation therapy (EBRT) and Transperineal brachytherapy. During EBRT, beams of radiation are focused on the prostate gland from a machine outside the body. Three-dimensional conformal radiation therapy (3D-CRT) remains the gold standard in EBRT in many countries and institutions (Heidenreich *et al.*, 2014). However, image-guided intensity-modulated radiation therapy, which is an optimised form of 3D-CRT using implanted fiducial markers in the prostate is being more widely used because of its ability to escalate dosage without increasing acute and/or late toxicity. Transperineal brachytherapy as a monotherapy is a safe and effective technique for low-risk PC.

**Proton-beam and carbon ion-beam therapy:** this is a type of therapy by which a beam of positively charged subatomic particles (protons) enters tissues and deposits the bulk of its energy to irradiate diseased tissue, most often in the treatment of cancer.

## 2.7 Health seeking behaviours of men

Help-seeking is considered to be the recognition of a health concern together with the range of actions that result, one of which is health service utilisation (Smith *et al.*, 2006). The act of seeking medical help is very key for critical recovery. However, there is evidence that men do not seek medical help compared to women (Addis *et al.*, 2003). Seeking medical help is important for early screening, detection, treatment and management of diseases, but many people delay consulting their doctor, and men tend to delay more and visit their doctor less often than women (Noone & Stephens, 2008). Many gender theorists suggest that health care practises are gendered. For instance, a man



[www.udsspace.uds.edu.gh](http://www.udsspace.uds.edu.gh) may be “unconcerned” about his health and wellbeing and places little value on health seeking behaviours to show his masculinity (Courtenay, 2000). Additionally, failure to seek medical help is a socially constructed phenomenon that men do not ask for help and do not need to go to the doctor as this denotes feminine vulnerability or weakness (Addis *et al.*, 2003; Courtenay, 2000).

To men, masculinity involves behaving in ways that puts their health at risk (Courtenay, 2000), such as consuming excessive amounts of alcohol (and drugs), being invulnerable, not seeking professional help, being violent and aggressive and engaging in risky sexual and driving behaviour (Noone & Stephens, 2008; Smith *et al.*, 2006). The lack of privacy and the nurses' attitudes have also been reported as one of the reasons why men do not visit health facilities (Nzama, 2013).

A cross-sectional, population-based survey conducted by Jacobsen *et al.* (1992) in Olmsted County, MN, USA showed that health care-seeking behaviour of men regarding prostate disorder is influenced by symptom severity of BPH, particularly if the symptoms are bothersome and interfere with a patient's daily activities. While symptom severity is a vital determinant of health care-seeking behaviour in men with urinary symptoms, age-related factors may drive men to seek care for urinary symptoms. Men aged 70 to 79 years were 4.6 times more likely (Confidence interval: 2.1 - 10.1) than those aged 40 to 49 years to have sought health care because of urinary symptoms.

A study conducted by Asampong *et al.* (2015) to describe health-seeking behaviours of male electronic waste workers in Ghana showed that respondents mostly engage in self-treatment when they are ill or injured. Respondents visit





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chemical shops due to affordability and accessibility of drugs and probably good communication by sellers.

Many myths surround men's health, the greatest of which is that men do not care about their health. The fact, however, is that men worry about health, but feel unable to talk about their concerns or seek help until it is often too late (Banks, 2001). For instance, men increase their healthcare utilisation as compared to women only after they receive the diagnosis of diseases (Hudson *et al.*, 2018) and when they do seek help, they ask fewer questions than do women (Courtenay, 2000). This may be because of lack of government initiative on general male health screening and the fact that virtually no health promotion is centred on men as compared to women and children.

## **2.8 Knowledge on prostate health**

For early diagnosis and treatment of any disorder, awareness of the disease and its impact, presentation and potential treatments are very important (Schulman *et al.*, 2003). However, it is not so for prostate disorders.

Schulman *et al.* (2003) studied the awareness of PC among the public in selected countries in Europe and the USA among 700 men and 700 women. The results of their study revealed the lack of awareness of PC, PSA testing and treatment for early disease among the general population, both in Europe and the USA. Only 39% of men and 28% of women spontaneously mentioned PC when asked about the types of cancers they were aware of, although 97% of respondents said they had heard of the disease when asked directly. The number of women who spontaneously mentioned breast cancer (79%) was more than the number of men who spontaneously mentioned PC. The study also revealed that breast



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cancer was more frequently mentioned than PC even among men (46% versus 39%, respectively). They summed up the findings as follows: men were more aware of breast cancer than of PC; awareness of simple tests for detecting PC is low; the risk factors for PC were poorly understood and few people were aware of the full range of treatment options for early disorders.

Fitzpatrick *et al.* (2009) also conducted another survey to assess the level of awareness of PC among 1, 008 men with PC and their partners (the 'prostate sample'), and 911 men without PC and their partners (the 'well sample'), all aged 50 years. The results showed that, 1 in 10 people from the well sample (10%) thought that PC affects both men and women. When the prostate sample was asked about their perceived level of risk of PC before diagnosis, 50% believed that they and their partners were previously at low or very low risk, before they were diagnosed. Awareness of the major risk factors for PC (age and family history) was generally good, but respondents were less clear about the role of other potential factors, such as smoking and drinking alcohol. Additionally, Pedersen *et al.* (2012) also identified poor PC knowledge across all groups of men, but particularly in Black men in their review. Also a remarkable lack of awareness of PC among the Nigerian native African urban populace was reported by Ajape & Babata (2010). A cross-sectional study conducted to assess the general awareness, knowledge and attitude towards PC and its early detection among four hundred and twenty-four Ghanaian male soldiers aged between 30 to 59 years showed that the level of awareness was poor, although majority had heard about it, the knowledge base of the participants and the attitude towards early detection of PC were also poor (Otoo, 2010).



Generally the lack of awareness may be attributed to poor health seeking behaviours including poor uptake of health promotion messages, avoiding help-seeking and engaging in risky behaviours (William *et al.*, 2011).

## 2.9 Food choices

The decision to eat, and to eat particular foods, varies for different individuals and situations (Epuru *et al.*, 2014). Food choice is a very complicated behaviour. What determines a person's food choice is dependent on the individual himself, resulting from a complex interplay of individual, interpersonal, social, cultural and environmental determinants (Raine, 2005). Factors which influence food choice include: biological determinants, for example hunger, appetite and taste; economic determinants such as cost, income, availability; physical determinants such as access, education, skills (example, cooking) and time; social determinants like culture, family, peers and meal patterns; psychological determinants such as mood, stress, guilty; attitudes, beliefs and knowledge about food (Epuru *et al.*, 2014).

Habits refers to the specific everyday behaviours that are intimately related to ideals or discourses that are in turn constructed in relation to macro social structures (Sellaeg & Chapman, 2008).

Behavioural determinants of food choice have been hypothesised as individual (physiological, personal and behavioural) and collective (social, cultural, environmental and political) (Chapman *et al.*, 2010; Raine, 2005). A study conducted by Cavazza *et al.* (2015) showed that food type, portion size, and course presentation influence the perceived association between food and gender.



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Food has been synthesised to be gender-based and anthropologists have shown that associations between food and masculinity or femininity are present in every human culture, though with some specific variations (Cavazza *et al.*, 2015). For example, meat (preferably roasted and in large portions) has been found to be mostly associated as food for men while fruits, and vegetables have been associated with women (Cavazza *et al.*, 2015). Another example is that, there is a notion that meat eaters are more masculine than vegetarians. Therefore, men use impression management through food intake to boost their masculine identity (Vartanian, 2015).

Also, men sometimes show concern about their diet when they face certain challenges (such as an illness) that forces them to live a lifestyle. For example, a study by William *et al.* (2011) showed that subjects who were men reported developing interest in nutrition and becoming more involved in their diets following their PC diagnosis through research and collection of PC specific nutritional information and/or recipes.

In the USA, meat (specifically beef and pork) is associated with masculinity which is consumed more by men, whereas fruits, vegetables, salads, and sweets like chocolate and ice cream are associated with femininity and consumed more by women (Thomas, 2015). Thomas (2015) also suggested that, when provided with enough time to make decisions, men are more likely to choose dishes with meat than those without, but when choosing between similar meat dishes they are more likely to choose meat dishes that have fuller and fattier flavours. These findings suggest that many men's food practices are partly shaped by masculine food ideals (William *et al.*, 2011). Few studies on masculinity and men's food practices have shown that men's perceptions of healthy eating reflect societal



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masculine food ideals and are typically positioned as contrary to healthy eating guidelines (William *et al.*, 2011).

Furthermore, intakes of smaller meals and eating ‘healthy’ foods are perceived to be associated with femininity while eating larger meals and eating larger and ‘unhealthy’ meals are perceived to be associated with masculinity (Vartanian, Herman, & Polivy, 2007).

### **2.10 Knowledge and food choices**

Knowledge on health and nutrition is key and plays a pivotal role in raising public awareness (Epuru *et al.*, 2014). However, studies conducted to assess the statistical significance between knowledge and food choices have been a debate since time immemorial. This has led researchers to question the relevance of nutrition knowledge to food choice, and the value of nutrition education campaigns (Wardle *et al.*, 2000).

Worsley (2002) suggested that nutrition knowledge although necessary for food choices, is not enough to influence food choices. This is because, there are other environmental and intra-individual factors, including motivations which also influence food choices. For example, ways to lose weight, ways to prevent cancer, the effects of vitamins on skin condition, food safety, ‘additives’ and their effects. Thus, they make and use knowledge to meet their own goals and purposes.

Wardle *et al.* (2000) conducted a postal survey, using 1, 040 18-75-year-old adult participants selected at random from General Practitioners' lists in England to investigate the relationship between nutrition knowledge and intake of fat, fruit and vegetables. They found out that knowledge was significantly



[www.udsspace.uds.edu.gh](http://www.udsspace.uds.edu.gh) associated with healthy eating (that is, fruit and vegetable intake), and the effect persisted after controlling for demographic variables. Respondents in the highest quintile for knowledge were almost 25 times more likely to meet current recommendations for fruit, vegetable and fat intake than those in the lowest quintile. They also concluded that their study supports the likely value of including nutrition knowledge as a target for health education campaigns aimed at promoting healthy eating.

Fitzgerald *et al.* (2008) also conducted a case-control study to examine the associations of nutrition knowledge, food label use, and food intake patterns among Latinas with and without diagnosed diabetes. The study found that, food labels, self-efficacy and stage of change, and average nutrition knowledge scores were similar between cases and controls ( $p>0.05$ ). However, within the diabetes group, nutrition knowledge was higher among those who consulted qualified dietitians or diabetes educators ( $p=0.020$ ). Pooled sample cross-sectional analyses showed that nutrition knowledge was positively related to food label use, which in turn related to a more healthful food intake pattern ( $p<0.05$ ). After adjusting for likely confounders, socioeconomic status was positively related to nutrition knowledge ( $p=0.001$ ) and intakes of fruits, vegetables, and meats ( $p=0.01$ ).

In contrast to studies showing statistically significant associations between knowledge and food choices, Alibabića *et al.* (2016) conducted a study which included 176 respondents to explore the facts of knowledge about the importance of iron in nutrition in female population and dietary iron intake. They found out that although women from rural area, women in younger age



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groups and pregnant women showed a higher level of knowledge about the importance of iron in nutrition, iron dietary intake were low. They, however argued that respondents may not have enough information about the importance of iron in the diet, which had accounted for the low intakes.

Similarly, a study was conducted by Heydenreich *et al.* (2014) to assess the nutrition knowledge and food choice of young athletes. They also found out that there was no statistically significant correlation between nutrition knowledge score and food choice [Healthy Eating Index-score (HEI-score)] was observed ( $r_p=0.03$ , 95% CI [-0.17, 0.39],  $p=0.45$ ) amongst the total sample size (N=542). Moreover, there was no differences in food choice among different categories of the nutrition knowledge score  $H(3)=2.24$ ,  $p=0.52$ ; neither in male (N=319,  $r_p=0.05$ , 95% CI [-0.22, 0.54],  $p=0.41$ ) nor in female athletes (N=223,  $r_p=0.01$ , 95% CI [-0.39, 0.45],  $p=0.89$ ). There was no correlation between nutrition knowledge score and HEI-score observed among the different categories of sports discipline ( $p>0.05$ ) as well. Furthermore, for the total study population no relationship between nutrition knowledge and fruit or vegetable intake was also found. They, however argued that there might be several reasons for the lack of correlation which are cultural, religious, and family beliefs which have been shown to have a greater impact on food intake than nutrition knowledge (Worsley, 2002).



## **METHODS**

### **3.1 Study area**

#### **3.1.1 Profile of Ghana**

Ghana is in West Africa with a total land area of 248,535 square kilometres. It is boarded by Togo on the east, Burkina Faso on the north and north-west, Ivory Coast to the west and The Gulf of Guinea on the south (GSS *et al.*, 2014). Before 2019, the country was divided into 10 regions, but has further been divided into 16 administrative regions, namely Greater Accra, Western, Western North, Central, Ashanti, Eastern, Bono East, Bono, Ahafo, Volta, Oti, Upper East, Upper West, North East, Savannah and Northern Region. It is further divided into six ecological zones which are Sudan Savannah, Guinea Savannah, Forest Savannah Transition, Semi-Deciduous Rainforest, High Rainforest and Coastal Savannah (Issaka & Buri, 2012). The national capital city is Accra and it is also the capital city of Greater Accra. The Northern region has the largest land area, almost a third of the total land area of Ghana (29.5%) while the Greater Accra occupies the least land area of 1.4% (GSS, 2013).

The 2010 population and housing census (PHC) reported a total population size of 24,658,823 with a projected population size of 30,280,811 in 2019 (GSS, 2012). However, Greater Accra (16.3%) and Ashanti (19.4%) regions had a greater share of the population whiles Upper East and Upper West (2.8%) regions had a smaller share (GSS, 2012).

According to the report of Ghana Living Standards Survey (sixth edition) more people live in the rural forest (6.9 million) than in the rural savannah (4.7 million) and rural coastal (1.5 million) (GSS, 2014d). The survey reported that





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the male population form 48.3% compared to females with men 40 years and older forming 10.1%.

The 2010 PHC recorded 5,467,136 households in the country, 55.8% of which were in the urban areas. Ashanti and Greater Accra regions had the highest proportions of 20.6% and 19.0% of the households respectively, whilst Upper East (3.2%) and Upper West (2.0%) regions had the lowest proportions. About two-thirds of household heads in Ghana were males with an average age of the male household head being 43.8 years (GSS, 2013).

More than half (56.3%) of the adult population are literate in English with a higher rate for males (67.3%) than for females (46.9%). Among the regions, Greater Accra reported the highest literacy rate of 89.3%, followed by Ashanti (82.6%) and Eastern (81.0%) regions while Northern, Upper East and Upper West regions had the least proportions of literates (GSS, 2013). According to the 2014 Ghana Demographic and Health Survey (GDHS), men aged 45 to 49 years were more likely to have no education (17%) than younger men age 15-19 years (3%) with urban dwellers attaining higher levels of education than their rural counterparts (GSS *et al.*, 2014). By contrast, 16% of men in urban areas have more than secondary education, compared with 6% of rural men. The proportion of men with no education was highest among men in the Northern region (47%) and lowest among men in the Eastern region (2%).

About 57.7% of the population 12 years and older have ever married (consensual union, married, divorced, separated or widowed) while 42.3% have never married. Christians formed 71.2% of the population, followed by Muslims (17.6%), Traditionalists (5.2%) and about 5.3% indicated that they had no religious affiliation (GSS, 2013).



As of the year 2016, the country had 3,335 CHPS compounds, 982 clinics, 134 district hospitals, 792 health centres, 258 hospitals and 32 polyclinics (GHS, 2016). The patronage of public health facilities is highest in the rural forest (56.0%) and rural savannah (60.6%) (GSS, 2014d).

In terms of nutritional status, most of the men (74%) aged 15 to 49 years had a BMI in the normal range, 10% were thin, and 16% were either overweight or obese. Men aged 15 to 19 years (27%) were more likely to be thinner than older men. Men with primary education (18%) were three times more likely to be thin compared to men with secondary or higher education (6%). Generally, the prevalence of overweight/obesity among men (16%) was lower than in women (40%) (GSS *et al.*, 2014).

Ghana is largely an agricultural economy, with a large proportion of the population engaged in this sector. Reports from the 2014 GDHS indicated that, 39% of households were agricultural landowners and 36.0% of households possessed farm animals (GSS *et al.*, 2014).

The 2010 PHC recorded about 5.0% of those who never attended school were employees compared to 85.8% of those with a degree or higher (GSS, 2013). Also, the proportion of self-employed without employees was 70.3% among those who had never attended school and 6.4% among those with a degree or higher.

### 3.2 Study design

A cross-sectional descriptive study among Ghanaian men was employed in the research. The study also followed a quantitative data collection approach using a questionnaire.



### 3.3 Study population

The study population comprised of all men aged 40 years and above in Ghana. This is because they were at a higher risk of having prostate disorders than younger men (Brawley, 2012).

### 3.4 Inclusion criteria

All males 40 years and above formed part of this study irrespective of whether they have been diagnosed with any prostate disorder or not.

### 3.5 Sampling

#### 3.5.1 Sample size

The minimum sample size for the study was calculated using the formula for sample size calculation for cross-sectional studies in medical research (Pourhoseingholi *et al.*, 2013).

$$n = \frac{t^2 * p(1 - p)}{m^2}$$

Where n = required sample size

**t** = critical value for 95% confidence interval (1.96)

**p** = estimated prevalence of prostate disorders. There is no known population-based prevalence of prostate disorders in the country, Ghana. Therefore, assumed prevalence of 50% (0.5).

**m** = acceptable margin of error for proportion allowed (0.05)

The minimum sample size was then multiplied by a design effect (df) of 2 because the study employed a clustering sampling method.



Therefore,  $n =$  [www.udsspace.uds.edu.gh](http://www.udsspace.uds.edu.gh)

$$n = \frac{(1.96)^2 * 0.50(1 - 0.50)}{(0.05)^2}$$

$$n = \frac{3.8416 \times 0.25}{0.0025}$$

$$n = 384.16$$

Multiplying by the design effect of 2

$$n = 384.16 \times 2$$

$$n = 768.32$$

However, 894 males who were aged 40 and above participated in the study.

### 3.5.2 Sampling procedure

The study employed a multi-stage cluster sampling method. This method was adopted and modified from the Expanded Programme of Immunization (EPI) sampling method for data collection involving three stages (Bostoen & Chalabi, 2006; WHO, 2008a).

**First stage:** The regions of the country under study were divided into three major belts based on certain common environmental characteristics; coastal, forest and savannah sectors as described elsewhere by Bukari *et al.* (2014). The coastal sector comprised of Greater Accra, Western, Western North, Central, Oti and Volta regions, the forest sector comprised of Eastern, Ashanti, Bono, Bono East and Ahafo regions, whilst the savannah sector included Northern, North-East, Savannah, Upper East and Upper West regions. A region from each sector was randomly selected using a



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 lottery method. With the lottery method, names of regions in each sector were separately written on pieces of paper and, folded, mixed up and drawn. The districts of the regional capitals of selected regions were used as data collection points. Clusters were assigned to communities under each district of the selected regional capitals (Accra Metropolitan District, Sunyani Municipality and Tamale Metropolitan District) based on the population of men 40 years and above (GSS, 2014a, 2014b, 2014c). The cluster assignment was used for the final allocation of households of the target respondents. Cluster assignment was conducted with the help of Emergency Nutrition Assessment (ENA) for Standardized Monitoring and Assessment for Relief and Transitions (SMART) software using probability proportional to size (PPS) (Erhardt *et al.*, 2015). From the clustering, Accra Metropolitan was assigned 24 clusters, Sunyani Municipal was assigned two and Tamale Metropolitan was assigned 4 making a total of 30 clusters under study.

**Table 3.1 Proportional distribution of clusters across selected data collection points**

Sector	Region	Number of clusters
	<b>selected</b>	
Coastal	Greater Accra	24
Forest	Bono	2
Savannah	Northern	4



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**Second stage:** At the community level, with the help of a community volunteer, the areas of the communities were divided into sections using their respective maps. The boundaries of the communities were clearly identified. Each section was numbered, and one subsection was randomly picked. After a random selection of a subsection, a location in the subsection, such as a market, a mosque or a church was used as the starting point. A direction was then randomly selected at the centre by spinning a bottle on even ground; wherever the bottle pointed when it stopped spinning was indicated as the direction to start with. The houses along the selected direction were serially numbered until the edge of the selected subsection was reached. Using the lottery method (described earlier), a number was randomly drawn. The selected number was the first house to visit. For instance, if number five was selected, the fifth house from the counts along the direction line from the central location was visited first. The nearest house from the first randomly selected house was the second visited until the expected number of houses were picked.

**Third stage:** Any male from each household visited who meets the selection criteria was interviewed for the study. A household is defined as a group of people who eat from the same pot. Because selected communities were urban in nature, there was the possibility that there will be different households living in the same building. To ensure an unbiased selection of respondents in multiple households if any, all households within a house were numbered, and a household was selected using a lottery method as described earlier. The selected household was the first household from which a respondent was interviewed. The second household visited was the



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door nearest to the first and this was repeated until the last household was visited. The method of selection of households was repeated in the next house visited only when there were more than one household. In the instance where a house is a storey, one floor chosen at random in lottery method was visited and after the last household on that floor, another floor was randomly drawn and the households on the selected floor visited. This continued until the last floor of the storey building was visited.

Only one respondent was interviewed from a household. In the case where there were more than one qualified respondent in a household, the respondent with the earliest year of birth was interviewed as described by Chokkalingam *et al.* (2012).

Before starting the data collection process, a community entry was conducted with a volunteer to inform residents about the study.

### **3.6 Data collection methods and instruments**

The data collection tool used for this study was a closed-ended structured questionnaire which was designed using android mobile computer-assisted personal interviewing (CAPI) application Epi-collect version 5. The questionnaires were developed based on set objectives to seek answers to the main objective of the study and for the needs of this survey. The first part of the questionnaire was centred on the socio-demographic characteristics (ethnicity, age, economic status, education, occupation, marital status), anthropometric measurement (waist and hip measurement to the nearest 0.1 cm) to calculate abdominal adiposity, assessment of knowledge on prostate health which was subjected to a three-point Likert scale ranging from 1-Agree, 2-Do not know and 3-Disagree, access to prostate health information and prostate health status



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(family history of prostate disorders, ever been diagnosed of prostate disorders).

The internal consistency in the knowledge questionnaire was evaluated (Cronbach's alpha = 0.907). The other part of the questionnaire was centred on foods associated to be *protective* (fruits and vegetables such as water melon, carrot, pumpkin, tomatoes, papaya and guava) or *high-risk foods* (alcohol, red meat and processed meat) of prostate health and their frequency of intake using a non-quantifiable food frequency questionnaire.

Face-to-face interviews were used to collect information from respondents with the aid of android phones and tablets that hosted the questionnaires.

A non-stretch tape measure was used to take the waist circumference and hip measurement of respondents following the WHO STEPS protocol (WHO, 2008c).

### **3.7 Data management and statistical analysis**

#### **3.7.1 Data processing**

The data collected with android CAPI application were exported as a comma separated values (csv) file to a Microsoft Office Excel 2016 document for pre-processing. Data analysis was then conducted with the help of IBM SPSS statistical software version 25 (SPSS Inc., Chicago, IL, USA).

#### **3.7.2 Variables measured**

##### **3.7.2.1 Dependent variable**

**Food choices among Ghanaian men:** Respondents' frequency of intake of both *protective foods* (foods that prevent or reduce risk of prostate health disorders) and *high-risk foods* found to be associated with prostate health.





### 3.7.2.2 Independent variables

**Knowledge on prostate health:** Respondents' level of knowledge about prostate health.

**Socio-demographic characteristics:** ethnicity, age, economic status, occupation, educational level, marital status and religious affiliation.

## 3.8 Statistical method

Preliminary analysis was conducted to summarize the data on socio-demographic characteristics of respondents, access to prostate health information, family history of prostate disorders, ever been diagnosed with prostate disorders, nutritional status and food choices in relation to prostate health into percentages and frequencies using Microsoft Office Excel 2016.

### 3.8.1 Socio-economic status

In all, 20 household items such as television, bicycle, radio among others were employed in the measurement of socio-economic status using household wealth index as a proxy. Possession of each of the items attracted a score of 1 otherwise a score of 0. Categorical Principal Component Analysis was used to generate household wealth scores for each household and all the scores were ranked and divided into 3 equal groups: low, average, high.

### 3.8.2 Knowledge on prostate health

Knowledge on prostate health was measured using 20 questions on risk factors of prostate disorders, causes, signs, symptoms and treatment of prostate disorders, and nutrition and prostate health. The scale was scored as agree 1, don't know 0 and disagree 0. The scores were added up to obtain marks scored by respondents on their knowledge on prostate health. With a maximum score of 20, respondents who had a score of 10 and above were classified as having



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high knowledge whilst those with scores less than 10 were classified as having a low knowledge.

### **3.8.3 Frequency of intake of foods associated with prostate health**

Thirteen food items each for *protective* (example, tomatoes, pumpkin, watermelon) and *high-risk* foods (example, pork, corned beef, alcohol) were used as measures to assess the frequency of intake of foods associated with prostate health. Intake of each item at least once in a day was given a score of 1 and 0 if at most once in a week. Categorical Principal Component Analysis was used to generate scores for each respondent and all the scores were ranked and divided into halves: low consumption, high consumption.

### **3.8.4 Statistical tests**

The Pearson's Chi-square test ( $\chi^2$ ) analysis was used to examine the associations between the variables: socio-demographic characteristics, family history of prostate disorders, ever been diagnosed of prostate disorders and knowledge on prostate health, the associations between socio-demographic characteristics of respondents, knowledge on prostate health and food choices in relation to prostate health. The binary logistic regression analysis was used to further explore whether independent variables predict the dependent variable to measure if statistical differences exist across the independent variable in terms of the probability of consuming foods associated with prostate health. Odds ratios were generated to produce a summary score of effect of independent variables on the dependent variable.

Results from both the Pearson's Chi-square test and binary logistic regression analysis were presented in tables.

A significant level of 5% was set for all statistical tests.



### **3.9 Quality control**

#### **3.9.1 Training of enumerators**

The researcher was the main field supervisor as well as a trainer for the study. Field assistants (9) were trained on the sampling procedure, interview techniques, interpretation of the questions and on the use of android mobile CAPI application for data collection as well as how to take waist and hip measurement of respondents appropriately.

#### **3.9.2 Pre-test**

The questionnaire was pre-tested on a sample of 76 male respondents within the year group in Nyankpala, Tolon District to test the reliability of the questionnaire. The pre-test was also conducted to check for mistakes and completeness of the questionnaire to help make corrections and modifications to questions with unclear responses.

#### **3.9.3 Privacy and confidentiality**

The privacy and confidentiality of the respondents were assured. Respondents' identities were indicated with codes and were not disclosed for any purpose. This is because the names and identities of respondents were not needed for the study. Respondents were assured that the study was solely for academic purposes, confidential and participation was solely voluntary and withdrawal from participation did not involve any penalty or reasons for dropping out.

The respondents' involvement was only through interviews and they were not exposed to any form of risks.

No respondent was given any form of reward for participation. All the information provided was solely used for the study.



### **3.9.4 Ethical clearance**

Ethical clearance was obtained from the Ghana Health Service Ethics Review Committee in Adabraka, Greater Accra. After review of the study protocol, the study was given approval to commence with Protocol Identity Number: GHS-ERC 007/12/18.

Respondents were given information sheets which contained a summary of the proposal in plain language. Written consent forms were given as well for signing or thumb printing upon acceptance to participate in the study. Translator's and witness forms were also provided to be signed in the case where translation of questions into the preferred local dialect of the respondent was necessary.

### **3.10 Methodology limitation**

Although the study gathered information on the frequency of consumption of foods known to be associated with prostate health, it failed to examine the quantity of intake of these foods because it was based on a non-quantifiable food frequency questionnaire. This was as a result of a lack of nutrient content database for Ghanaian foods. However, the study provided consumption frequency of foods associated with prostate health.



## RESULTS

### 4.1 Introduction

This chapter presents results of the study on socio-demographic characteristics, access to prostate health information, family history of prostate disorders, ever been diagnosed of prostate disorders, food choices in relation to prostate health and nutritional status and prostate disorders/health status of respondents. The section also covers the associations between socio-demographic characteristics, family history of prostate disorders, ever been diagnosed of prostate disorders and knowledge on prostate health, associations between socio-demographic characteristics, knowledge on prostate health and food choices in relation to prostate health.

### 4.2 Socio-demographic characteristics of respondents

The socio-demographic characteristics of the respondents are shown in Table 4.1. A total of 894 men aged 40 years or older participated in this study, 79% were from Greater Accra, 6% from Bono and 15% from Northern region. The most dominant ethnic and religious groups were Akan (63.3%) and Christianity (68%) respectively. There were minority ethnic groups classified as others (Frafra, Grusi, Dagaba, Guang, Kokomba, Sisala, Basare, Builsa, Busanga, Gruma, Hausa, Mampurusi, Mossi).

More than forty percent (44.5%) were aged between 40 and 49 years and the mean age of all the respondents was 51.44 years ( $SD = \pm 7.98$ ). Most (82.1%) were married. Most of the respondents (87.9%) had some form of formal education (basic, secondary, tertiary). Nearly all respondents (96.3%) were gainfully employed and functioned as managers, professionals, technicians and



associates, clerical support, service and sales workers, skilled agricultural, forestry and fishery workers, craft and related trade workers, plant and machine operators and assemblers and elementary occupational workers. About 54.3% were within average economic status group.

**Table 4.1: Socio-demographic characteristics of respondents**

Characteristics	Frequency (n=894)	Percentage (%)
<b><i>Ethnicity</i></b>		
Akan	566	63.3
Mole-Dagbon	119	13.3
Ewe	104	11.6
Ga-Dangme	78	8.7
Others	27	3.0
<b><i>Age (years)</i></b>		
40-49	398	44.5
50-59	223	24.9
60-69	192	21.5
70+	81	9.1
<b><i>Marital Status</i></b>		
No partner	160	17.9
Have a partner	734	82.1
<b><i>Level of education</i></b>		
No education	108	12.1
Basic	238	26.6
Secondary	477	53.4



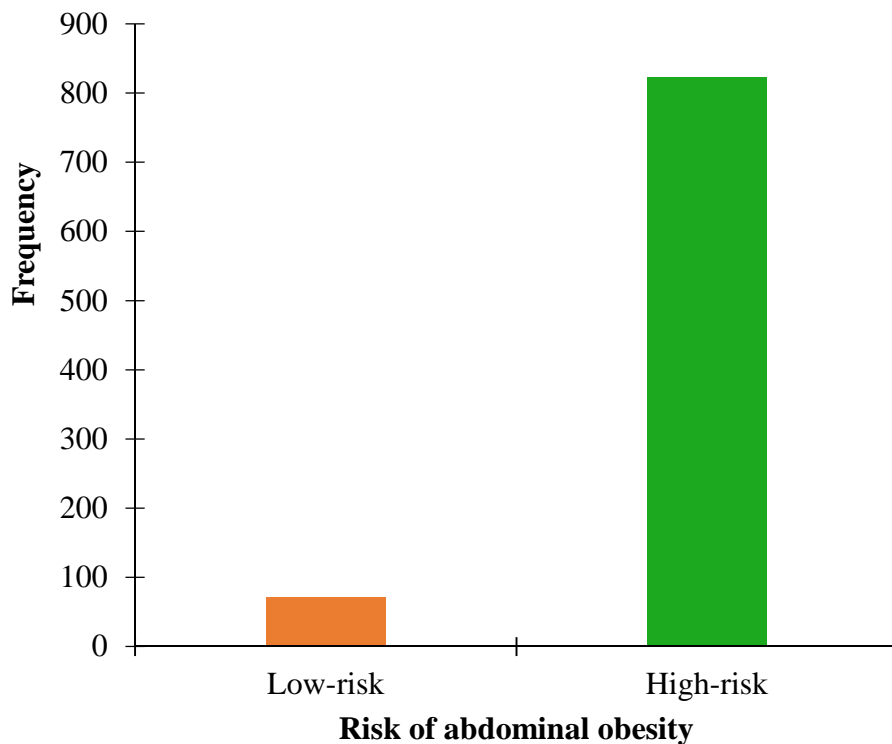
Tertiary	71	7.9
<b><i>Religious affiliation</i></b>		
Christianity	608	68.0
Muslim	244	27.3
Traditionalist	42	4.7
<b><i>Occupation</i></b>		
Employed	861	96.3
Not employed	33	3.7
<b><i>Socio-economic status</i></b>		
Low	223	24.9
Average	485	54.3
High	186	20.8

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#### **4.3 Nutritional status (abdominal adiposity) of respondents**

Figure 4.1 shows the waist-to-hip ratio of the study respondents. Most of the respondents had waist-to-hip ratio of 0.90 cm or above representing 92.1% prevalence of abdominal obesity and placing them in the high-risk group for developing health complications including prostate disorders. The mean waist-to-hip ratio of the respondents was 0.98 (SD =  $\pm 0.68$ ).





**Figure 4.1: Waist-to-hip ratio of study respondents**

#### **4.4 Prostate health status of respondents**

Most (92.8%) of the respondents had no family history of prostate disorders and about forty-two percent (42.2%) out of 64 of those with history of prostate disorders were linked to their fathers, whilst 23.4% were connected to their uncles. Sixty-five of the respondents were ever diagnosed of prostate disorders and of these 78.5% were diagnosed of LUTS whilst 12.3% were diagnosed of BPH (Table 4.2). Based on self-report, the prevalence of prostate disorders was 7.3%.

Most of the study respondents (92.5%) never took any substance for either prevention, treatment or management of the prostate disorders whether diagnosed positively or not. Those who took substances (7.5%) agreed to taking substances such as antibiotics, extracts of cannabis and Uro 500®, Prostatecure®





and other substances such as pepper, for prevention, treatment or management purposes (Table 4.2).

**Table 4.2: Prostate health status of respondents**

Status	Frequency ( <i>n</i> )	Percentage (%)
<i>Family history of prostate disorders</i>		
<i>n</i> =894		
Yes	64	7.2
No	830	92.8
<i>If yes, specify</i>		
<i>n</i> =64		
Grandfather	12	18.8
Father	27	42.2
Uncle	15	23.4
Brother	10	15.6
<i>Have you been diagnosed of any prostate disorder?</i>		
<i>n</i> =894		
Yes	65	7.3
No	829	92.7
<i>If yes, specify</i>		
<i>n</i> =65		



LUTS	51	78.5
Prostatitis	4	6.2
BPH	8	12.3
PC	2	3.1

*Do you take any substance for the treatment /management/ prevention of prostate disorders?* n=894

Yes	67	7.5
No	827	92.5

*If yes, specify* n=67

Antibiotics	57	85.1
Extract cannabis	1	1.5
Uro 500®	2	3.0
Prostacure®	2	3.0
Others*	5	7.5

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\*: Pepper.

#### **4.5 Access to prostate health information**

From the current study, 46.0% of respondents accessed information about prostate health from television (46.0%), radio (43.1%), friends (35.5%) and family (28.4%) (Table 4.3).



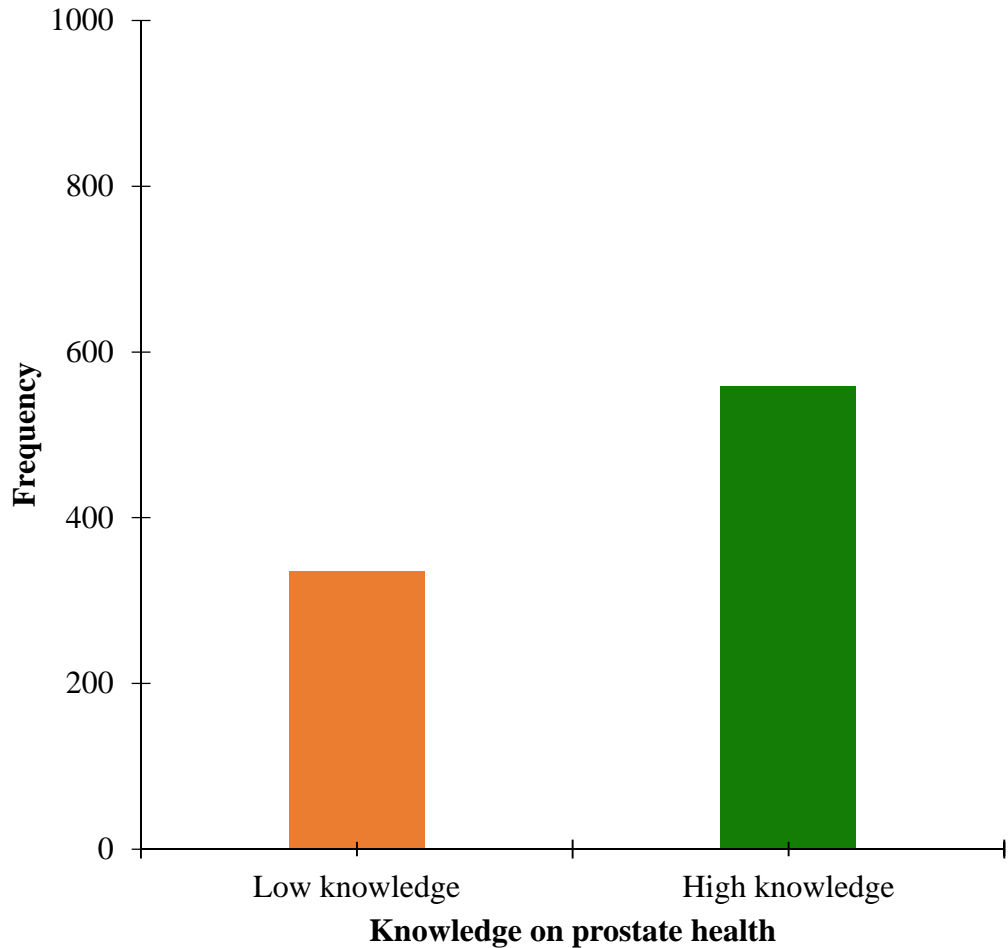
**Table 4.3: Sources of prostate health information among respondents**

Source	Frequency N = 894	Percentage (%)
Television	411	46.0
Radio	385	43.1
News paper	244	27.3
Internet	233	26.1
Religious leaders	233	26.1
Health facility	225	25.2
Health books/Magazine	225	25.2
Family	254	28.4
Friends	316	35.5



#### 4.6 Knowledge on prostate health

Knowledge of respondents on prostate health was categorised as low and high (Figure 4.2). The study showed that more than half (62.5%) of the respondents had high knowledge on prostate health.



**Figure 4.2: Respondents' level of knowledge on prostate health**

Generally, about half (49.8%) of the respondents heard about LUTS, 32.6% about BPH whilst 15.9% and 1.8% heard about prostate cancer and prostatitis respectively. Most (86.9%) stated prostate disorders affect only men, whilst 1.7% and 5.8% said prostate disorders affect only women and both men and women respectively. Small percentage, 5.6% could not tell who prostate disorders affect.



#### 4.7 Associations between socio-demographic characteristics, family history of prostate disorders, ever been diagnosed of any prostate disorder and knowledge on prostate health

Results from bivariate analysis of possible predictors of knowledge on prostate health among respondents showed that education, religion, socio-economic status, family history of prostate disorders and ever been diagnosed of prostate disorders had significant associations (Table 4.4).

**Table 4.4: Associations between socio-demographic characteristics, family history of prostate disorders, ever been diagnosed of any prostate disorder, and knowledge on prostate health**

Exposure variable	Knowledge on prostate health		$\chi^2$ ( <i>P</i> -value)
	Low	High	
	n (%)	n (%)	
<i>Ethnicity</i>			8.299 (0.081)
Akan	214 (63.9)	352 (63.0)	
Mole-Dagbon	52 (15.5)	67 (12.0)	
Ewe	27 (8.1)	77 (13.8)	
Ga-Dangme	32 (9.6)	46 (8.2)	
Others*	10 (3.0)	17 (3.0)	
<i>Age (years)</i>			0.714 (0.870)
40-49	150 (44.8)	248 (44.4)	
50-59	86 (25.7)	137 (24.5)	
60-69	72 (21.5)	120 (21.5)	



70+	<a href="http://www.udsspace.uds.edu.gh">www.udsspace.uds.edu.gh</a> 27 (8.1)	54 (9.7)	
<b><i>Marital Status</i></b>			1.612 (0.204)
No partner	67 (20.0)	93 (16.6)	
Have a partner	268 (80.0)	466 (83.4)	
<b><i>Level of education</i></b>			15.187 (0.002)
No education	25 (7.5)	83 (14.8)	
Basic	84 (25.1)	154 (27.5)	
Secondary	202 (60.3)	275 (49.2)	
Tertiary	24 (7.2)	47 (8.4)	
<b><i>Religious affiliation</i></b>			14.029 (0.001)
Christianity	247 (73.7)	361 (64.6)	
Muslim	68 (20.3)	176 (31.5)	
Traditionalist	20 (6.0)	22 (3.9)	
<b><i>Occupation</i></b>			1.521 (0.217)
Employed	326 (97.3)	535 (95.7)	
Not employed	9 (2.7)	24 (4.3)	
<b><i>Socio-economic status</i></b>			22.057 ( <b>&lt;0.001</b> )
Low	100 (29.9)	123 (22.0)	
Average	148 (44.2)	337 (60.3)	
High	87 (26.0)	99 (17.7)	



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<b><i>Family history of prostate disorders</i></b>			8.663 <b>(0.003)</b>
No	322 (96.1)	508 (90.9)	
Yes	13 (3.9)	51 (9.1)	
<b><i>Ever been diagnosed of prostate disorders</i></b>			10.841 <b>(0.001)</b>
No	279 (83.3)	507 (90.7)	
Yes	56 (16.7)	52 (9.3)	

n: Sample size.  $\chi^2$ : Chi-square statistic. Bolden  $p$ -value indicates statistical significance at 95% confidence level.

#### 4.8 Determinants of knowledge on prostate health

Determinants of knowledge on prostate health showed that having a secondary education, high socio-economic status, family history of prostate disorders and ever been diagnosed of prostate disorders were independently associated with knowledge on prostate health (Table 4.5). Respondents with a secondary education were 2 times (AOR = 1.644,  $p = 0.049$ ) more likely to acquire higher knowledge on prostate health compared to those with no formal education. Respondents with high socio-economic status were 41% (AOR = 0.594,  $p = 0.003$ ) less likely to have higher knowledge on prostate health compared to those in low socio-economic category. Also, respondents with family history of prostate disorders and those who were ever diagnosed of prostate disorder were 2 times (AOR = 1.973,  $p < 0.001$ ) and 3 times (AOR = 2.736,  $p = 0.002$ ) more likely to have higher knowledge on prostate disorders than those with no family history or have never been diagnosed of prostate disorder respectively.



**Table 4.5: Determinants of knowledge on prostate health**

Exposure variable	Knowledge on prostate health	
	AOR (95% CI)	P-value
<b><i>Religious affiliation</i></b>		
Christians*	1	
Muslims	0.706 (0.496 – 1.004)	0.053
Traditionalists	1.244 (0.654 – 2.368)	0.506
<b><i>Level of education</i></b>		
No education*	1	
Basic	1.196 (0.689 – 2.077)	0.525
Secondary	1.644 (0.982 – 2.752)	<b>0.049</b>
Tertiary	1.146 (0.573– 2.292)	0.700
<b><i>Socio-economic status</i></b>		
Low*	1	
Average	1.123 (0.745 – 1.693)	0.580
High	0.594 (0.420 – 0.840)	<b>0.003</b>
<b><i>Family history of prostate disorders</i></b>		
No*	1	
Yes	1.973 (1.028 – 3.784)	<b>&lt;0.001</b>
<b><i>Ever diagnosed of prostate disorders</i></b>		
No*	1	
Yes	2.736 (1.604 – 4.669)	<b>0.002</b>

\*: Reference groups. AOR: Adjusted odds ratio. CI: 95% Confidence interval. Bolden *p*-value indicates statistical significance at 95% confidence level.





#### 4.9 Food choices in relation to prostate health

Consumption of prostate *protective* or *high-risk foods* was classified as high or low. Analysis of data on consumption of foods associated with modulation of risk of prostate disorders showed that consumption of *protective foods* was high (75.1%) compared to low consumption among respondents and intake of *high-risk foods* was low (13.6%) compared to high consumption (Table 4.6).

**Table 4.6: Intake of prostate *protective* and *high-risk foods***

Food choice	Frequency (n = 894)	Percentage (%)
<i>Protective foods</i>		
Low	223	24.9
High	671	75.1
<i>High-risk foods</i>		
Low	772	86.4
High	122	13.6

#### 4.10 Association between independent and outcome variables

The associations between outcome variable (food choices among Ghanaian men) and possible predictor variables (socio-demographic characteristics and knowledge on prostate health) determined in Chi-square tests are presented in this section.



**4.10.1 Associations between socio-demographic characteristics, knowledge on prostate health and protective food choices**

Bivariate, Chi-square analyses showed that ethnicity, marital status, education, religion, occupation, socio-economic status and respondents' knowledge on prostate health were significantly associated with protective food choices made by respondents in relation to prostate health (Table 4.7).

**Table 4.7: Associations between socio-demographic characteristics, knowledge on prostate health and prostate health protective food choices**

Exposure variable	Protective food choices		$\chi^2$ (P-value)
	Low	High	
	n (%)	n (%)	
<b>Knowledge on prostate health</b>			<b>5.158 (0.023)</b>
Low	278 (36.0)	57 (46.7)	
High	494 (64.0)	65 (53.3)	
<b>Age (years)</b>			<b>3.542 (0.315)</b>
40-49	105 (47.1)	293 (43.7)	
50-59	61 (27.4)	162 (24.1)	
60-69	40 (17.9)	152 (22.7)	
70+	17 (7.6)	64 (9.5)	
<b>Level of education</b>			<b>44.693 (&lt;0.001)</b>
No education	43 (19.3)	65 (9.7)	



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Basic	85 (38.1)	153 (22.8)	
Secondary/ Vocational/Technical	81 (36.3)	396 (59.0)	
Tertiary	14 (6.3)	57 (8.5)	
<b><i>Ethnicity</i></b>			<b>13.649 (0.009)</b>
Akan	126 (56.5)	440 (65.6)	
Mole-Dagbon	36 (16.1)	83 (12.4)	
Ewe	39 (17.5)	65 (9.7)	
Ga-Dangme	16 (7.2)	62 (9.2)	
Others	6 (2.7)	21 (3.1)	
<b><i>Marital Status</i></b>			<b>3.958 (0.047)</b>
No partner	47 (21.1)	113 (16.8)	
Have a partner	176 (78.9)	558 (83.2)	
<b><i>Religious affiliation</i></b>			<b>34.543 (&lt;0.001)</b>
Christians	187 (83.9)	421 (62.7)	
Muslims	32 (14.3)	212 (31.6)	
Traditionalists	4 (1.8)	38 (5.7)	
<b><i>Occupation</i></b>			<b>5.592 (0.018)</b>
Employed	209 (93.7)	652 (97.2)	



Not employed [www.udsspace.uds.edu.gh](http://www.udsspace.uds.edu.gh)  
 14 (6.3) 19 (2.8)

**Socio-economic** 32.895 (<**0.001**)

*status*

Low 77 (34.5) 146 (21.8)

Average 127 (57.0) 358 (53.4)

High 19 (8.5) 167 (24.9)

---

n: Sample size.  $\chi^2$ : Chi-square statistic. Bolden *p*-value indicates statistical significance at 95% confidence level.



#### 4.10.2 Associations between socio-demographic characteristics, knowledge on prostate health and choice of *high-risk foods* in relation to prostate health

Results from bivariate analysis of possible predictors of food choices among respondents showed that ethnicity, education and respondents' knowledge on prostate health had significant influence on the choice of *high-risk foods* of prostate disorders (Table 4.8).

**Table 4.8: Associations between socio-demographic characteristics, knowledge on prostate health and *high-risk* food choices**

Exposure variable	<i>High-risk foods</i>		$\chi^2$ ( <i>P-value</i> )
	Low	High	
	n (%)	n (%)	
<b><i>Knowledge on prostate health</i></b>			<b>5.408 (0.020)</b>
Low	69 (30.9)	266 (39.6)	
High	154 (69.1)	405 (60.4)	
<b><i>Age (years)</i></b>			<b>4.081 (0.253)</b>
40-49	339 (43.9)	59 (48.4)	
50-59	189 (24.5)	34 (27.9)	
60-69	169 (21.9)	23 (18.9)	
70+	75 (9.7)	6 (4.9)	
<b><i>Level of education</i></b>			<b>46.273</b>
			<b>(&lt;0.001)</b>
No education	85 (11.0)	23 (18.9)	
Basic	180 (23.3)	58 (47.5)	
Secondary	441 (57.1)	36 (29.5)	
Tertiary	66 (8.5)	5 (4.1)	



	<a href="http://www.udsspace.uds.edu.gh">www.udsspace.uds.edu.gh</a>		
<b><i>Ethnicity</i></b>			35.966 <b>(&lt;0.001)</b>
Akan	514 (66.6)	52 (42.6)	
Mole-Dagbon	94 (12.2)	25 (20.5)	
Ewe	76 (9.8)	28 (23.0)	
Ga-Dangme	62 (8.0)	16 (13.1)	
Others	26 (3.4)	1 (0.8)	
<b><i>Marital Status</i></b>			2.199 (0.138)
No partner	144 (18.7)	16 (13.1)	
Have a partner	628 (81.3)	106 (86.9)	
<b><i>Religious affiliation</i></b>			9.311 (0.051)
Christianity	514 (66.6)	94 (77.0)	
Muslim	216 (28.0)	28 (23.0)	
Traditionalist	42 (5.4)	0 (0.0)	
<b><i>Occupation</i></b>			0.068 (0.795)
Employed	743 (96.2)	118 (96.7)	
Not employed	29 (3.8)	4 (3.3)	
<b><i>Socio-economic status</i></b>			0.446 (0.800)
Low	190 (24.6)	33 (27.0)	
Average	422 (54.7)	63 (51.6)	
High	160 (20.7)	26 (21.3)	

n: Sample size.  $\chi^2$ : Chi-square statistic. Bolden *p*-value indicates statistical significance at 95% confidence level.

#### 4.10.3 Determinants of *protective* food choices

Binary logistic regression analysis showed that ethnicity, education, religion, socio-economic status and knowledge on prostate health were consistently



significant in their associations with [www.udsspace.uds.edu.gh](http://www.udsspace.uds.edu.gh) *protective* food choices. However, compared to Akans, Ewe respondents were 41% (AOR = 0.595  $p=0.039$ ) less likely to consume *protective foods*.

With reference to respondents with no formal education, those with basic, secondary and tertiary education were 2 times (AOR = 2.023,  $p = 0.013$ ), 5 times (AOR = 4.911,  $p <0.001$ ) and 5 times (AOR = 4.927,  $p <0.001$ ) more likely to consume *protective foods* respectively.

With regards to religious affiliation of respondents, Muslims (AOR = 4.327,  $p <0.001$ ) and Traditionalists (AOR = 3.458,  $p = 0.022$ ) were 4 and 3 times respectively more likely to consume *protective foods* compared to Christians. Respondents who were within the average socio-economic class were 3 times (AOR = 3.372;  $p <0.001$ ) more likely to consume *protective foods* than those in lower socio-economic class. Also, respondents with high knowledge on prostate health, were 1.4 times (AOR = 1.436,  $p <0.047$ ) more likely to consume *protective foods* than those with low knowledge.



**Table 4.9: Determinants of protective food choices**

Exposure variable	<i>Protective foods</i>	
	AOR (95% CI)	P-value
<i>Knowledge on prostate health</i>		
Low*	1	
High	1.436 (1.004 – 2.054)	<b>0.047</b>
<i>Level of education</i>		
No education*	1	
Basic	2.023 (1.159 – 3.532)	<b>0.013</b>
Secondary	4.911 (2.852 – 8.457)	<b>&lt;0.001</b>
Tertiary	4.927 (2.223 – 10.919)	<b>&lt;0.001</b>
<i>Ethnicity</i>		
Akan*	1	
Mole-Dagbon	0.855 (0.526 – 1.390)	0.527
Ewe	0.595 (0.363 – 0.975)	<b>0.039</b>
Ga-Dangme	0.598 (0.300 – 1.192)	0.144
Others	0.939 (0.354 – 2.495)	0.900
<i>Marital Status</i>		
No partner*	1	





Have a partner	1.138 (0.745 – 1.738)	0.551
<b><i>Religious affiliation</i></b>		
Christianity*	1	
Muslim	4.327 (2.554 – 7.330)	< <b>0.001</b>
Traditionalist	3.458 (1.192 – 10.026)	<b>0.022</b>
<b><i>Occupation</i></b>		
Not employed*	1	
Employed	1.754 (0.810 – 3.798)	0.154
<b><i>Socio-economic status</i></b>		
Low*	1	
Average	3.372 (1.883 – 6.039)	< <b>0.001</b>
High	1.186 (0.808 -1.742)	0.382

\*: Reference groups. AOR: Adjusted odds ratio. CI: 95% Confidence interval. Bolden *p*-value indicates statistical significance at 95% confidence level.

#### 4.10.3 Determinants of *high-risk* food choices

Predictors of *high-risk* food choices among respondents were tested for their independent contributions in binary logistic regression analysis. Results showed that ethnicity, education and knowledge on prostate health had statistically significant effect on *high-risk* food choices. The likelihood of respondents of Mole-Dagbon, Ewe and Ga-Dangme ethnic groups to consume *high-risk foods* were 2 times (AOR = 2.415, *p* = 0.002), 4 times (AOR= 3.884, *p* < 0.001) and 2 times (AOR = 2.426, *p* = 0.008) more compared to Akan ethnic group.



Compared to respondents with no formal education, those with secondary and tertiary education were 76% (AOR = 0.241,  $p < 0.001$ ) and 80% (AOR = 0.201,  $p = 0.003$ ) respectively less likely to consume *high-risk foods*. Also, respondents with high knowledge on prostate health were 49% (AOR = 0.513,  $p = 0.002$ ) less likely to consume *high-risk foods* compared to those with low knowledge.

**Table 4.10: Determinants of high-risk food choices**

Exposure variable	High-risk foods	
	AOR (95% CI)	P-value
<b>Knowledge on prostate health</b>		
Low*	1	
High	0.513 (0.339 – 0.778)	<b>0.002</b>
<b>Level of education</b>		
No education*	1	
Basic	0.885 (0.497 – 1.578)	0.679
Secondary	0.241 (0.132 – 0.440)	<b>&lt;0.001</b>
Tertiary	0.201 (0.070 – 0.576)	<b>0.003</b>
<b>Ethnicity</b>		
Akan*	1	
Mole-Dagbon	2.415 (1.399 – 4.169)	<b>0.002</b>
Ewe	3.884 (2.233 – 6.755)	<b>&lt;0.001</b>
Ga-Dangme	2.426 (1.266 – 4.649)	<b>0.008</b>
Others	0.439 (0.057 – 3.379)	0.439

\*: Reference groups. AOR: Adjusted odds ratio. CI: 95% Confidence interval. Bolden  $p$ -value indicates statistical significance at 95% confidence level



## DISCUSSION

### 5.1 Introduction

The goal of this study was to assess knowledge on prostate health among Ghanaian men and how it contributes to their food choices. This chapter therefore contains discussions of the findings of the study in relation to existing literature on the subject, showing where possible convergent or divergent opinion in interpretation of the results.

#### 5.1.1 Nutritional status (abdominal adiposity) of respondents

Waist-to-hip ratio greater than or equal to 0.90 cm in men indicates abdominal obesity which exposes them to increased risk of diseases due to its influence on metabolic and endocrine changes (Nandeesh, 2008; WHO, 2008b). In the present study, the prevalence of abdominal obesity was extremely high (92.1%). This is much higher than the prevalence of 42.4% reported by Li *et al.* (2007) among men living in USA. Increased abdominal adiposity has been associated with greater volume of the prostate leading to prostate disorders such as BPH and PC (Parikesit *et al.*, 2016; Wang *et al.*, 2011)..

Also most of the of respondents in this study had mean waist-to-hip ratio much higher than WHO cut-off of 0.90 cm which placed them in the high-risk category of morbidity and mortality (WHO, 2008c)

The level of prevalence of abdominal adiposity among the study population is not surprising because of the long held perception in Africa that high abdominal fat commonly called ‘pot belly’ in a man suggests wealth and power (Oha, 2000). It is therefore possible to suggest that the observed prevalence might be influenced among others by improved income levels of respondents coupled



[www.udsspace.uds.edu.gh](http://www.udsspace.uds.edu.gh) with changes in diet and lifestyle. Another reason could be as explained by Amuna & Zotor (2019), who opined that lack of adequate nutrition training and counselling due to poorly resourced-health settings reduced health care access and affordability may increase health risk among people. The high prevalence of abdominal obesity should raise potential concerns of health complications, including prostate disorders in the Ghanaian society and requires urgent national attention.

### **5.1.2 Prostate health status of study respondents**

The study revealed 7.3% prevalence of prostate disorder among the study population. This was higher than the prevalence of 7% PC and lower than 8.2% prostatitis reported among Ghanaian men in studies by Hsing *et al.* (2014) and Krieger *et al.* (2008) respectively. In a similar study in 2005, Arthur *et al.* found that 83% of men in Ghana had PSA levels above 4 ng/ml (upper limit of the reference range) which suggest prostate disorder and about 96% had PC. In a West African study involving 950 men, Chokkalingam *et al.* (2012) published a prevalence of 62.3% DRE-detected enlarged prostate and 19.9% moderate-to-severe LUTS.

As observed in the present study, almost all respondents diagnosed of prostate disorders reported a family history of prostate disorders, either from a grandfather, father or a brother. There was established knowledge of strong genetic component of prostate disorders as observed from family history of persons diagnosed of the disease (Brawley, 2012; Lim, 2017; Parsons, 2010). It was suggested that genetics may account for 5-10% of incidence of prostate cancer among men (Brawley, 2012).



### 5.1.3 Access to health information

Access to health information about one's health status is a key 'coping strategy' in health-promotion activities and psychosocial adjustment to diseases (Lambert & Loiselle, 2007). In this current study, television, radio, print media and friends were the major sources of information on prostate health. This is similar to the findings of Yeboah-Asiamah (2015) who also identified television, radio, print media and friends as the main sources of health information available to respondents in his study of perceptions and knowledge about prostate cancer and attitudes towards prostate cancer screening among male teachers in the Sunyani Municipality, Ghana. This might be due to prostate health education programmes and increasing advertisements of traditional medicine such as Uro 500® and Prostatecure® which are believed to reduce prostate disorders (Kyei *et al.*, 2017). However, the findings of the study contrast that of Redmond *et al.* (2010) in the USA among 5, 367 respondents, who found that health care providers and internet (56%), were major sources of health and medical information whilst print media (12%), television (0.6%), friends and family (15%) were least accessed. This difference may be due possibly to developmental gap between sub-Saharan African and USA where health care providers and internet facility were readily available and could be easily accessed.

### 5.1.4 Knowledge on prostate health and factors associated with it

Knowledge on prostate health is defined as having adequate information about the risk factors for prostate disorders, prevention and management through intake of foods known to modulate risk of prostate disorders. Knowledge was shown to have positive effects on eating habits and food selection thus



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promoting health and wellbeing of people (Chapman *et al.*, 2010; Raine, 2005).

In the present study, knowledge on prostate health was higher among most of the respondents. This was higher than the knowledge level of 38% knowledge reported by Otoo (2010) among Ghanaian military men but compared favourably with 57.5% reported among respondents studied by Yeboah-Asiamah (2015). This may be accounted for by the high level of literacy among respondents in present study where nearly 90% had some form of education and therefore had some level of enlightenment and could seek health information from different sources. As revealed in this study, education could be a strong determinant of knowledge on prostate health. The influence of having a family history and ever been diagnosed of prostate disorders on high knowledge on prostate health as observed in the study may have been attributed to the fact that these variables may have prompted them to seek medical advice of which nutrition education might have taken place.

#### **5.1.5 Determinants of food choices in relation to prostate health**

Generally, about three quarters of respondents consumed higher amounts of *protective foods* than lower amounts while 86.4% of respondents consumed lower amounts of *high-risk foods* than higher amounts. This is in contrast with that of Wardle *et al.*, (2000) where intake of more fruit and vegetables and less fat was significantly associated with women instead of men. However, results of the current study may be the way it is because it was focused on a particular type of health outcome (prostate health) as compared to the earlier study where a general knowledge was assessed.

In this study knowledge on prostate health was found to be significantly associated with food choices. However, knowledge on prostate health was



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confounded with ethnicity, education, religion, average socio-economic status which were also found to be significant determinants of food choices among the study population. This is consistent with the opinion of Worsley (2002) who reported that knowledge on health or nutrition, although necessary is not enough to influence food choice because there are other environmental and intra-individual factors that influences food choices.

Though there was a significant association between marital status and respondents' choice of *protective foods*, suggesting that marital status might have influenced the choice of *protective food* significantly, this association however lost at the multivariate level of analysis.

#### **5.1.5.1 Knowledge on prostate health and food choices.**

This study also showed that generally, respondents with high knowledge on prostate health had an increased likelihood of consuming *protective foods* (fruits and vegetables) (AOR=1.436, CI=1.004 – 2.054,  $p=0.047$ ) and decreased likelihood of consuming *high-risk foods* (alcohol, meat and meat products) (AOR=0.513, CI=0.339 – 0.778,  $p=0.002$ ) compared to those with low knowledge. Thus, the study confirms the notion that provision of nutrition education plays a pivotal role in food choices of individuals (Worsley, 2002). It is also consistent with the report by Wardle *et al.* (2000), where respondents with high nutrition knowledge were almost 25 times more likely to consume fruit and vegetables and less likely to consume more fatty foods than those of low knowledge.

This result of the study was not surprising because a greater majority of respondents had some form of formal education and more than half of the respondents had high knowledge on prostate health. Increased prostate product



advertisement and [www.udsspace.uds.edu.gh](http://www.udsspace.uds.edu.gh) prostate health education on media platforms (Kyei *et al.*, 2017) coupled with health advice from family and friends as observed in the study might have influenced the awareness level of respondents to search for more information about prostate health and therefore made right food choices. It could also be that the study respondents resided in urban settings (elite areas) where access to health information was easier than rural settings.

It could be suggested from the study that, increasing knowledge on prostate health may help increase intakes of *protective foods* and reduce excessive intakes of *high-risk foods* which may in turn help reduce the risk of prostate disorders among men.

#### **5.1.5.2 Ethnicity and food choices**

This study has shown that ethnic origin of an individual has significant influence on food choices he makes. This agrees with the observation of Devine *et al.* (1999), that food choice made by any individual is determined by the ethnic affiliation and is influenced by induced interactions of ideals, identity and the roles of that individual in the environment. Studies have shown the involvement of the environment in defining the food choices made by people in any locality (Brug, 2009; Committee on Examination of the Adequacy of Food Resources & Allotments, 2013).

The vegetation and climatic conditions of an area may determine the food that is largely consumed. This explained the observation that animal and meats are a major source of livelihood for people in Northern Ghana because their arable land, Savannah vegetation and climatic conditions support rearing of cattle and small ruminants (Adzitey, 2013; Bukari *et al.*, 2014). Thus, food consumption pattern in northern Ghana will presumably be towards higher intakes of *high-*





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*risk foods* than Akans (forest belt) where consumption of fruits and vegetables will be higher because of the type of vegetation.

### 5.1.5.3 Education and food choices

Studies show that level of education increases people's understanding of health issues and influences their food choices (Kearney *et al.*, 2000). People with higher education tend to consume foods that will improve their health status as discussed earlier (Pollard *et al.*, 2002). This report is consistent with the findings of the present study which showed that respondents' level of education was a strong determinant of the choice of foods that are considered as *high-risk-foods* or protective against prostate disorders. The study also revealed that respondents with some form of education were more likely to consume *protective foods* and less likely to consume *high-risk foods* compared with those who did not have any form of education. Respondents with tertiary (AOR=4.927, CI=2.223–10.919,  $p<0.001$ ) and secondary (AOR=4.911, CI=2.852 – 8.457,  $p<0.001$ ) education were five times more likely to consume foods that are protective against prostate disorders than respondents with basic level of education (AOR=2.023, CI=1.159 – 3.532,  $p=0.013$ ) and those with no formal education. Similarly, respondents with secondary and tertiary level of education were more than 70% less likely to consume *high risk foods* compared to those with no education whilst those with basic education, only 11.5% were less likely to consume high-risk-foods compared to those with no formal education. These findings suggest that as an individual's educational status increases, there is a greater tendency of adopting food habits or lifestyles aimed at improving health. As explained by Wardle *et al.* (2000), the decision to increase fruit and vegetable intake and reduce consumption of fatty foods by



respondents was influenced by higher level of education [fruit (3,996) = 3.68,  $p=0.01$ ; vegetables (3,996) = 5.94,  $p<0.001$ ; fat score (3,981) = 4.20,  $p = 0.006$ ].

#### 5.1.5.4 Religion and food choices

The patterns of food behavior varies among followers of different religions which influences their food choices (Heiman *et al.*, 2004). The findings of the present study showed that religion was a strong determinant of food choices made by people and being a Muslim or a Traditionalist offered a greater likelihood to consume protective foods than being a Christian. This influence of religion might be due to the impact of individual's religious beliefs as a way of life in accordance with religious commandments (Giorda, Bossi, & Messina, 2014; Sibal, 2018). For instance, Just *et al.* (2007), opined that religious observance is a factor that mostly could directly influence food choice decision to alter food consumption through perspective rules.

#### 5.1.5.5 Socio-economic status and food choices

The socio-economic position of the respondents as measured by wealth index proxy in the present study was an independent contributor to food choices in relation to prostate health. Respondents of average socio-economic status had a high probability of consuming *protective foods* compared to those with low socio-economic status. These results support the findings of Turrell *et al.* (2002) that people of low socio-economic status were less likely to purchase fewer types of fruits and vegetables as well as grocery items (including meat and chicken) compared to those of higher socio-economic status.



### 5.1.6 Application of the Health Belief Model of knowledge on prostate health and food choices among Ghanaian men

The Health Belief Model (HBM) looks at behavioural changes based on factors that influence susceptibility and severity of developing a disease condition (Glanz *et al.*, 2008; Hayden, 2003). HBM highlights the idea that a person takes an action when he perceives to be at risk of a disease condition which may lead to a severe condition and perceives that there is a cause of action that can be taken which will be beneficial if all barriers are outweighed. In relation to this study, prostate disorders were the disease conditions looked at, food choices were the main behavioural change and knowledge on prostate health was the action that influences the main behaviour. Modifying factors included socio-demographic factors (ethnicity, age, educational level, socio-economic status, occupation and religious affiliation) that may serve as barriers or benefits for performing the behaviour in this study. Family history of prostate disorders, access to health information from family and friends, the media, nutritional status of respondents and being diagnosed of prostate disorders served as the cues which may prompt a person to take an action, in this case, seeking prostate health information.

The study showed that the media served as the main prompt in accessing prostate health information which reflected in the respondents' level of knowledge on prostate health. This suggests that in order to influence men's knowledge on prostate health to make healthy food choices, nutrition and health educators may consider using the media as a major channel to reach respondents.



In addition, the study revealed that knowledge was associated with food choices, and higher level of knowledge had a positive association with increased intake of *protective foods* and a negative association with *high-risk foods*. This means that for a change in behaviour (making appropriate food choices) in relation to prostate health, nutrition information on prostate health should be increased amidst socio-demographic factors which need to be taken into consideration. The findings of the current study, therefore, support the constructs of the HBM.



## CONCLUSION AND RECOMMENDATIONS

### 6.1 Conclusion

The current study assessed knowledge on prostate health among Ghanaian men and explored its influence on their food choices.

Generally, there was high knowledge on prostate health among Ghanaian men. This was significantly influenced respondent's education level, family history of prostate health and ever been diagnosed of prostate disorder

Consumption of *protective* foods was high among respondents whilst consumption of *high-risk* foods was low. Food choices among respondents were significantly influenced by their knowledge on prostate health, ethnicity, at least secondary level education, religion and socio-economic status

High knowledge on prostate health was significantly associated with increased consumption of *protective* foods and reduced intake of *high-risk* foods

The strong influence of knowledge on nutrition habits suggests that exposing men to more health and nutrition behaviour change programmes may improve their knowledge on prostate health and reduce the incidence of the disease.

### 6.2 Recommendations

#### 6.2.1 Health Education

Interventions by various health institutions such as Ghana Health Services and other health-related Organizations to encourage healthy food choices should include strategies that focus on prostate health.

Also, knowledge about prostate health through experience have positive impact on the choice of consuming protective foods. Tailored-made messages on



experience sharing [www.udsspace.uds.edu.gh](http://www.udsspace.uds.edu.gh) could be designed to improve prostate health among Ghanaian men. This could have positive impact on food choices to reduce the risk and possibly, severity of the prostate disorders.

Furthermore, men who are 40 years and above should cultivate the habit of continuous healthy eating to improve their prostate health.

Lastly, men who are 40 years and above should cultivate the habit of going for periodic screening for prostate disorders.

### **6.2.3 Further research**

This is a quantitative study and was limited in exploring reasons of respondents' food choices in relation to prostate health. Further research in this area may employ a qualitative approach and decision process studies to explore further, knowledge on prostate health and its influence on food choices.



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## **Appendix 1: Information sheet**

**Title of research:** Knowledge on Prostate Health and Food Choices among Ghanaian Men.

### **Introduction**

My name is Victoria Awuni, an MPhil Public Health Nutrition student from University for Development Studies, School of Allied Health Sciences, Department of Nutritional Sciences in Tamale. My mobile phone number is +233 (0)20 406 3445 and e-mail is [victoria.awuni@uds.edu.gh](mailto:victoria.awuni@uds.edu.gh).

### **Background of research**

I am working on the topic ‘Knowledge on Prostate Health and Food Choices among Ghanaian Men’ as part of my requirement to obtain a master’s degree in Public Health Nutrition. This study seeks to assess knowledge on prostate health among Ghanaian men and how it affects their food choices in relation to the health of the prostate. This is because healthy diet has been found as key in maintaining prostate health.

### **Nature of research**

The study is a cross-sectional survey which seeks to understand men’s knowledge on prostate health and whether they are aware of certain activities that put them at higher or lower risk of prostate disorders such as lower urinary infections, prostate enlargement, prostate inflammation or prostate cancer. The study will also seek to know certain foods men eat frequently over a period of one month.



**Duration/What is involved**

The study will be a one-on-one interview between you and the interviewer. The interviewer will use a questionnaire to seek answers from you. Your waist and hip measurements will be taken as well. You are free to choose an interpreter if need be. The entire session for both the interview and measurements will take at most 20 minutes of your time.

**Potential risks**

The questions that will be asked may seem sensitive to your emotions. However, if you feel the questions asked are making you uncomfortable, you can prompt the interviewer and your final decision will be taken on whether to stop the interview.

**Benefits**

This study will help increase prostate health awareness among men to seek preventive measures in reducing their risk of having prostate disorders. It will also serve as a promptness for you to seek help if necessary, concerning your prostate.

**Costs**

You will not be asked to pay any fee before, during and after the interview.

**Compensation**

There will not be any compensation for your participation.

**Confidentiality**

Data collected will solely be for academic purposes and private. Your identity will be indicated with a code and will not be disclosed for any purpose.



**Voluntary participation/Withdrawal**

The study is solely for research purposes and participation is voluntary and refusal to participate does not involve any penalty or your reasons for dropping out.

**Outcome and Feedback**

The outcome of the study will be published in scientific journals and may be discussed on radio if need be. You can however contact the principal investigator of the study if you would like a copy of the outcome of the study. You can also request for a verbal discussion with principal investigator on the outcome of the study whether through physical contact or through any of the information technology devices such as phone call or electronic mail.

**Funding Information**

This study is a self-sponsored study with funds solely from the principal investigator.

**Conflict of Interest**

Data generated from this study will solely be for the principal investigator, supervisor of the principal investigator (Dr Humphrey Garti) and the school in which the principal investigator is affiliated to (University for Development Studies).

**Provision of Information and Consent for Participants**

You are required to sign a consent form in agreement to participate in this study before the beginning of the interview. Copies of this information sheet and consent form will be given to you to send home. Thank you.



[www.udsspace.uds.edu.gh](http://www.udsspace.uds.edu.gh)

**For further clarification:**

**Contact the principal investigator for further questions regarding the research;**

Victoria Awuni  
Principal Investigator  
University for Development Studies  
Department of Nutritional Sciences  
School of Allied Health Sciences  
c/o Prof Francis Kweku Amagloh  
University for Development Studies  
P.O. Box TL 1882, Nyankpala Campus  
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**Contact the Ghana Health Service Ethics Review Committee**

**Administrator for any ethical issues;**

Hannah Frimpong  
Administrator  
GHS-Ethics Review Committee  
Research and Development Division  
GHS-Accra  
+233 (0)50 704 1223



Appendix 2: [www.udsspace.uds.edu.gh](http://www.udsspace.uds.edu.gh)  
**CONSENT FORM**

**Title of research: Knowledge on Prostate Health and Food Choices among  
 Ghanaian Men**

I have had the details of the study explained to me. My questions have been answered to my satisfaction, and I understand and may ask further questions anytime.

I certify that I voluntarily agree to be part of the study and agree to answer survey questions on condition that under no circumstances should any reference to my actual identity in relation to my contribution or participation or any be made known to other persons outside this study as promised by the researcher.

I understand that I will be given copies of the participant's information and signed or thumb printed consent form for my personal records before administration of the research questionnaires.

Respondent's signature/Thumbprint .....

Date.....

**TRANSLATOR'S CONSENT**

I have had the details of the study explained to me. I therefore consent to voluntarily be the translator for the participant and agree to explain thoroughly questions and answers from both interviewer and participant to their satisfaction.

Translator's signature/Thumbprint .....

Date.....



**WITNESS STATEMENT**

I bear witness that I was present when the participant was informed about the details of the study and procedures clearly explained to him and all his questions and doubts were clearly addressed. I also bear witness that I was present when the participant agreed to take part in the study.

Witness' signature/Thumbprint .....

Investigator's signature.....

Date.....

**INVESTIGATOR STATEMENT AND SIGNATURE**

I certify that the participant has been given ample time to understand the procedures of the study and agreed to take part. All questions and clarifications raised by the participant have been addressed as well.

Signature of person who sought consent .....

Date.....





**Appendix 4: Questionnaire**

**Knowledge on Prostate Health and Food Choices among Ghanaian Men**

<i>Respondent's contact:</i>			
<i>Respondent's code:</i>			
<b>Question number</b>	<b>Question</b>	<b>Response</b>	<b>Code</b>
<b>SECTION A: SOCIO-DEMOGRAPHIC CHARACTERISTICS</b>			
<i>Please tick the appropriate answer</i>			
001	Location:	Greater Accra Bono Northern	1 2 3
002	Ethnicity		
003	Marital status:	Single Married Widowed Separated/Divorce	1 2 3 4
004	Date of birth:		
005	Level of education:	Primary JHS/JSS Middle SSS/SHS Vocational/Technical Tertiary Never attended	1 2 3 4 5 6 7
006	Religious affiliation:	Christianity Muslim Traditionalist Others (Specify)	1 2 3 4
007	What type of house do members of the household dwell in?	Blockhouse Brickhouse	1 2





		Mud house	3
		Others (Specify)	4
008	What kind of toilet facility do members of the household usually use?	Own flush toilet	1
		Own pit toilet	2
		Public or shared pit toilet	3
		No facility	4
009	What is the source of lighting for the household?	Electricity	1
		Gas	2
		Kerosene	3
		Others (Specify)	4
010	What type of fuel does your household mainly use for cooking	Electricity	1
		LPG	2
		Charcoal	3
		Kerosene	4
		Firewood	5
		Others (Specify)	6
011	What is the main source of drinking water for members of the household?	Pipe water	1
		Borehole	2
		Dug well	3
		Bottle/Sachet water	4
		Others (Specify)	5
012	Does your household have any of these assets?		
	Radio	Yes	1
		No	2
	Clock or watch	Yes	1
		No	2
	Colour TV	Yes	1
		No	2
	Black and white TV	Yes	1



		No	2
	Sewing Machine	Yes	1
		No	2
	Mattress	Yes	1
		No	2
	Bed	Yes	1
		No	2
	Table	Yes	1
		No	2
	Chair	Yes	1
		No	2
	Refrigerator	Yes	1
		No	2
	Computer	Yes	1
		No	2
	DVD/VCD player	Yes	1
		No	2
	Electric Fan	Yes	1
		No	2
	Telephone/mobile	Yes	1
		No	2
	Bicycle	Yes	1
		No	2
	Motorcycle	Yes	1
		No	2
	Animal-drawn cart	Yes	1
		No	2
	Car/truck	Yes	1
		No	2
	Ownership of livestock	Yes	1



		No	2
	Radio	Yes	1
		No	2
013	Occupation:	Managers	1
		Professionals	2
		Technicians and associate professionals	
		Clerical support workers	3
		Service and sales workers	4
		Skilled agricultural, forestry and fishery workers	5
		Craft and related trade Workers	6
		Plant and machine operators and assemblers	
		Elementary occupation	7
		Others, specify.....	8
014	Family history of prostate disorder:	None	1
		Grandfather	2
		Father	3
		Uncle	4
		Brother	5
<b><i>NUTRITIONAL STATUS</i></b>			
015	Waist measurement (cm)		
016	Hip measurement (cm)		
	Waist-to-hip ratio:		
<b><i>SECTION B: KNOWLEDGE ON PROSTATE HEALTH</i></b>			
<b><i>Please tick the appropriate answer</i></b>			
<i>For each item indicate with a check mark the frequency with which you have access to health information</i>			



017	Never	6 or more times per day	4-5 times per days	2-3 times per day	One time per day	5-6 times per week	3-4 times per week	1-2 times per week
Television								
Radio								
News paper								
Internet								
Church/mos que								
Health professional s								
Health books and journals								
Family								
Friends								
Others specify..... .....								
018	Which of these disorders have you heard about the prostate?			Urinary disorders				1
				Inflammation				2
				Prostate enlargement				3
				Prostate cancer				4
019	Prostate disorders affect			Only men				1
				Only women				2
				Both				3
				Don't know				4
020	Prostate gland is in the			Abdomen				1
				Scrotum				2
				Upper part of the urethra				3



		In the bladder	4
		Don't know	5
021	A man should start screening for prostate disorders at age 40	Agree	1
		Don't know	2
		Disagree	3
022	Frequent, painful or burning urination is a sign of prostate disorder?	Agree	1
		Don't know	2
		Disagree	3
023	Weight loss is a sign of prostate disorder?	Agree	1
		Don't know	2
		Disagree	3
024	Loss of appetite is a sign of prostate disorder?	Agree	1
		Don't know	2
		Disagree	3
025	Black men are at a higher risk of developing prostate disorders than white men.	Agree	1
		Don't know	2
		Disagree	3
026	A man is at risk of prostate disorders as he ages.	Agree	1
		Don't know	2
		Disagree	3
027	Eating a lot of red meat and fatty foods may increase a man's risk of developing prostate disorders.	Agree	1
		Don't know	2
		Disagree	3
028	Low intake of fruits and vegetables increases a man's risk of developing prostate disorders.	Agree	1
		Don't know	2
		Disagree	3

029	Excessive alcohol intake increases a man's chance of developing prostate disorders.	Agree Don't know Disagree	1 2 3
030	A man is at higher risk of developing prostate disorder if a family member has prostate disorder.	Agree Don't know Disagree	1 2 3
031	Being obese/overweight increases a man's risk of prostate disorders.	Agree Don't know Disagree	1 2 3
032	Lack of physical activity increases a man's risk for prostate disorders.	Agree Don't know Disagree	1 2 3
033	Stress can predispose a man to prostate disorders.	Agree Don't know Disagree	1 2 3
034	Occupational factors may increase a man's risk for prostate disorders.	Agree Don't know Disagree	1 2 3
035	Prostate disorders are curable when detected early.	Agree Don't know Disagree	1 2 3
036	Herbal medicine can be used to treat prostate disorders.	Agree Don't know Disagree	1 2 3
037	Blood test can be used to diagnose prostate disorders	Agree Don't know Disagree	1 2 3





038	Antibiotics can be used to treat prostate disorders	Agree Don't know Disagree	1 2 3
039	Abnormal digital rectal examination (DRE) can be used to diagnose prostate disorders.	Agree Don't know Disagree	1 2 3
040	Watchful waiting can be used to diagnose prostate disorders.	Agree Don't know Disagree	1 2 3
041	Antibiotics can used to treat prostate disorders	Agree Don't know Disagree	1 2 3
042	Have you been diagnosed of any prostate disorder?	Yes No	1 2
043	If yes, which of the disorders were you diagnosed of?	Urinary disorders Inflammation Prostate enlargement Prostate cancer	1 2 3 4
044	Do you take anything for treatment/management / prevention of prostate disorder?	Yes No	1 2
045	If yes, specify	Antibiotics Extract cannabis Uro 500® UR-Quick mixture® Prostacure® Prostat® 60 Lycopene supplements Slimming tea	1 2 3 4 5 6 7 8



		Others (Specify)	9
046	Have you been diagnosed of diabetes?	Yes No	1 2




**SECTION D: FOOD CHOICES IN RELATION TO PROSTATE HEALTH**

*For each item indicate with a check mark the category that best describes averagely the frequency with which you usually consume that food.*

047	Never (1)	6 or more times per day (2)	4-5 times per day (3)	2-3 times per day (4)	One time per day (5)	5-6 times per week (6)	3-4 times per week (7)	1-2 times per week (8)	2-3 times per month (9)	Once in a month (10)
Alcohol										
Watermelon										
Tomato juice										
Carrot										
Pumpkin										
Beef										
Chevron										
Pork										
Mutton										
Coffee										
Tea										
Chicken										
Papaya										



Guava										
Milk										
Cooked fat from meat										
Soybeans										
Fish										
Tomato ketchup										
Light soup										
Tomato stew										
Coffee										
Pea nuts										
Beef Sausage										
Pork sausage										
Corned beef										
Others (specify): .....										

**GHANA HEALTH SERVICE ETHICS REVIEW COMMITTEE**

*In case of reply the number and date of this Letter should be quoted.*



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8<sup>th</sup> January, 2019

MyRef. GHS/RDD/ERC/Admin/App 19/1005  
Your Ref. No.

Victoria Awuni  
C/o Dr Francis Kweku Amagloh  
University of Development Studies  
NYankpala Campus  
P.O. Box TL 1882  
Tamale-Ghana

The Ghana Health Service Ethics Review Committee has reviewed and given approval for the implementation of your Study Protocol.

GHS-ERC Number	<b>GHS-ERC007/12/18</b>
Project Title	<b>Nutrition Knowledge on Prostrate Health among Ghanaian Men</b>
Approval Date	8 <sup>th</sup> January, 2019
Expiry Date	7 <sup>th</sup> January, 2020
GHS-ERC Decision	<b>Approved</b>

**This approval requires the following from the Principal Investigator**

Submission of yearly progress report of the study to the Ethics Review Committee (ERC)

Renewal of ethical approval if the study lasts for more than 12 months,

Reporting of all serious adverse events related to this study to the ERC within three days verbally and seven days in writing.

Submission of a final report after completion of the study

Informing ERC if study cannot be implemented or is discontinued and reasons why

Informing the ERC and your sponsor (where applicable) before any publication of the research findings.

Please note that any modification of the study without ERC approval of the amendment is invalid.

The ERC may observe or cause to be observed procedures and records of the study during and after implementation.

Kindly quote the protocol identification number in all future correspondence in relation to this approved protocol

SIGNED.....

DR. CYNTHIA BANNERMAN  
(GHS-ERC CHAIRPERSON)

