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KNOWLEDGE OF PROSTATE HEALTH AND FOOD CHOICE INFLUENCE ON THE RISK OF PROSTATE DISORDERS AMONG GHANAIAN MEN

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ABSTRACT

Understanding prostate health is vital for preventing, managing, and treating prostate disorders. Prostate disorder is a significant health challenge among men, and if not detected early, could lead to complications like cancer and death. Thus, knowledge of prostate health is essential for defining critical areas of intervention among men. This was a cross-sectional survey conducted among 894 Ghanaian men aged 40 to 70+ to assess their knowledge of prostate health and its influence on their food choices. The study was conducted in Greater Accra, Bono, and Northern Regions of Ghana. A structured questionnaire was employed to collect data on socio-demographics, knowledge of prostate health and consumption of foods related to prostate health. Two categories of foods, relating to prostate health were considered for the study: *protective foods* (fruits and vegetables) and *high-risk foods* (alcohol, meat, and meat products). Knowledge level scores were computed from the marks scored by participants on prostate health risk factors, causes, signs, symptoms and treatment, and nutrition and prostate health. Food choices were assessed based on the frequency of *protective foods* and *high-risk foods* intake. Associations between socio-demographic characteristics, knowledge level of prostate health, and food choices were examined using bivariate analysis, and multivariate regression analysis was conducted for possible predictors. The mean age of participants was 51.44 ±7.98. More than half of the participants (62.5%, n=559) had a high knowledge of prostate health. Participants with a family history of prostate disorders were approximately two times [OR (odds ratio) =1.973, p=0.041] more likely to have a high knowledge level of prostate health than those with no family history. Similarly, those diagnosed with prostate disorders were three times (OR = 2.736, p<0.001) more likely to have a high knowledge level of prostate health than those who have never been diagnosed of any prostate disorder. Generally, participants consumed *protective* and *high-risk foods* related to prostate health. Participants with increased knowledge of prostate health were three times (OR=2.531, p<0.001) more likely to consume *protective foods.* Knowledge about prostate health through experience positively impacts the consumption of fruits and vegetables. Efforts in Ghana to improve prostate health should include education on protective food choices to promote prostate health.

Key words: Food choice, Knowledge, Men, Nutrition knowledge, Prostate health, Protective foods

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INTRODUCTION

The prostate gland plays a significant role in human reproduction, facilitating fertilisation, sperm transit and survival. Therefore, a good understanding of prostate health is vital for preventing, controlling, and treating prostate disorders, which are the most common diseases in men worldwide. Being black, old age and having a family history of prostate disorders qualify as risk factors for prostate health [1–4]. Other risk factors include a poor diet, obesity, excessive smoking, excessive alcohol consumption, and a vasectomy history [5,6].

Prostate cancer , benign prostate hyperplasia and prostatitis are the common disorders that affect prostate health [7]. Prostate cancer accounted for 1.4 million new cases and 375,000 deaths worldwide in 2020 [8]. In Ghana, prostate cancer is relatively high, with an incidence of about 200 cases per 100, 000 of the population per year [9]. Benign prostate hyperplasia affects approximately one-quarter of men at 50 years, a third at age 60 and about half of all men at 80 years or older [1,2].

Adequate nutrition is essential for general wellbeing, including prostate health. Studies on nutrition and prostate health have provided insight into how appropriate food prevents or delays the onset of prostate problems [10–13]. Intake of fruits and vegetables is highly recommended for their preventive effects, while the intake of red meat, processed meat and excessive alcohol intake are unhealthy for prostate health [10,14,15]. General intake of micronutrients such as vitamins A, B, C, D and E, as well as selenium and zinc, are related to prostate health [10,16]. Ginseng, pumpkin seed, and red clover contain beneficial phytoestrogens that reduce the prostate gland's size. For example, genistein, the primary phytoestrogen in soybean, has been proven to reduce the incidence of prostate cancer when added to the diet by inhibiting the cells from becoming metastatic [17]. Lycopene, mostly found in tomatoes, pink grapefruit, and watermelon, plays a crucial role in benign prostate hyperplasia, prostatitis, and prostate cancer prevention and reduction [11,18,19].

Few studies conducted on prostate health have centred mainly on assessing knowledge, early screening, and treatment, particularly of prostate cancer [20–23]. Thus, there is a paucity of scientific data on the knowledge of prostate health and appropriate nutrition against prostate disorders. This study, therefore, aimed to investigate the knowledge level of prostate health and associated food choices among Ghanaian men.

MATERIALS AND METHODS

Study area, participants and design

A household analytical cross-sectional survey design was conducted in three (3) randomly selected regions of Ghana: Greater Accra, Bono, and Northern, between January and February 2019. The target population consisted of all men 40 years and above, irrespective of their prostate health status. A total of 894 men participated in the study. The sample size was determined using the formula for one-point sample estimation [24].

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The study employed a multi-stage cluster sampling method to identify data collection points and to select the participants for interviews. This method was adopted from the 2014 Ghana Demographic and Health Survey sample design [25] and modified for this study.

Stage one concentrated on the random selection of three (3) regions of Ghana based on certain common environmental factors to represent coastal (Greater Accra), forest (Bono) and savannah (Northern) [26]. However, the capitals of selected regions were conveniently chosen as study sites because they are the main business centres with diverse populations due to migration. Therefore, Accra Metropolis, Sunyani Municipal and Tamale Metropolis were selected to represent Greater Accra, Bono, and Northern Regions, respectively.

The second stage involved selecting sampling points (clusters) consisting of communities in chosen districts. 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 [27]. A total of 30 clusters (communities) were therefore randomly selected from the three (3) study areas, 24 from Accra Metropolis, two (2) from Sunyani Municipal and four (4) from Tamale Metropolis.

The third stage involved the systematic sampling of households. A household listing operation was conducted in all the chosen clusters to randomly select homes to be included in the study [28]. Approximately 30 households were selected from each cluster for the study.

Any male from each household visited who met the selection criteria was interviewed for the study. In the case of more than one qualified participants in a family, the oldest was interviewed as described by Chokkalingam [29].

Data collection procedure

A structured questionnaire for the study was administered to participants in a face-to-face interview. The questionnaire had sections on sociodemographic characteristics, assessment of knowledge level of prostate health, and prostate health status (reported family history of prostate disorders and ever been diagnosed with prostate disorders). Enumerators accepted hospital diagnosis and laboratory reports as proof of illness or family history of prostate disorders. A non-quantifiable food frequency questionnaire (FFQ) was developed to assess the usual intake of foods related to prostate health [10,14,15]. The foods included watermelon, carrot, pumpkin, tomato, and tomato-based products (juice, ketchup, soup, and stew), papaya and guava, peanuts and soy, collectively defined in the study as *protective foods.* Also, alcohol, beef, pork, chevron, mutton, cooked fat from meat, meat sausage, and corned beef are classified as *high-risk foods*. These foods were chosen because they are common in Ghana. Information on ownership of 14 household items: television, bicycle, mobile phone, sewing machine, DVD player, satellite dish, radio, mattress, refrigerator, computer, electric fan, vehicle, motorcycle/tricycle, and animal-drawn cart was collected. This information was collected because it reflects household socio-economic status [30].

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Enumerators were health and nutrition personnel working with the Ghana Health Service. A medical officer was consulted to join investigators in training enumerators for the study.

Data analysis procedure

Data analysis was conducted with IBM SPSS statistical software version 25 (SPSS Inc., Chicago, IL, USA). Preliminary analysis was conducted to summarise the data on socio-demographic characteristics of participants, family history of prostate disorders, ever been diagnosed with prostate disorder and food choices related to prostate health into percentages and frequencies.

Concerning participants' socio-economic status, the household wealth index was used as a proxy, as suggested in the 2014 Ghana Demographic and Health Survey reports [25]. Possession of each household item previously listed attracted a score of 1; otherwise, a score of 0. Categorical Principal Component Analysis (PCA) was used to generate household wealth scores. The household wealth scores were then classified into tertiles to reflect socio-economic status: low for the first, average for the middle, and highest for the third.

Knowledge of prostate health was measured using 20 statement sentences on the risk factors, signs, symptoms and treatment of prostate disorders, and nutrition and prostate health. The scale was scored as 1-Agree and 0-Disagree. The scores were summed to give the marks scored by participants on their knowledge level of prostate health. With a median score of 10, participants who had a score of 10 and above were classified as having a high knowledge level, and scores less than 10, a low knowledge level. The internal consistency in the knowledge level questionnaire was evaluated (Cronbach's alpha = 0.907).

Concerning the frequency of intake of foods related to prostate health, 11 items for *protective foods*, and 9 for *high-risk foods* were used to assess the frequency of intake of foods related to prostate health. Intake of each item at least once a day was given a score of one (1); and zero, if at most, once a week. Categorical PCA was used to generate scores for each participant, and all the scores were ranked and divided into halves: low consumption and high consumption.

Pearson's Chi-square test (x^2) was used to examine the associations between socio-demographic characteristics, family history on prostate health and ever been diagnosed with prostate disorder against the knowledge of prostate health. Also, multivariate binary logistic regression analysis was conducted for possible predictors of the knowledge level of prostate health. Similarly, Pearson's Chi-square test (x^2) was used to examine the associations between socio-demographic characteristics, and knowledge level of prostate health against food choices related to prostate health. However, Fisher's exact test was used to investigate the associations between religious affiliation and food choices regarding prostate health. Also, a multivariate binary logistic regression analysis was conducted for possible predictors of food choices related to prostate health. A significant level of 5% was set for all statistical tests.

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Ethical consideration
Ethical approval was obtained from the Ghana Health Service Ethics Review Committee in Adabraka, Greater Accra, with Protocol Identity Number: GHS-ERC 007/12/18.

Consent to participate
The participants signed or thumb-printed a written consent form upon acceptance to participate in the study. Translator and witness forms were signed in the case where the translation of questions into the preferred local dialect of the respondent was necessary. The participants were assured of anonymity and confidentiality of the study data and codes were used to represent their identities. The study was non-invasive, and only male enumerators were employed to collect the data due to the nature of the study. Participants were also informed that participating in the survey was voluntary and that they could withdraw at any time during the process if they felt uncomfortable.

RESULTS AND DISCUSSION

Demographic Characteristics of participants
The demographic characteristics of participants are presented in Table 1. Most participants belonged to the Akan ethnic group (63.3%). The mean age of the participants was 51.44 years (SD = ±7.98) with the majority (44.5%) in the 40 – 49 age group. Most participants (82.1%) were married, and 53.4% had attained secondary or technical education. The most dominant religious group was Christianity (68%). About 96% of the participants were either employees or self-employed. A small proportion (7.2%) of the participants reported having a family history of prostate disorders, either a father or an uncle. Also, 7.3% of the participants reported being diagnosed with prostate disorders including benign prostate hyperplasia, and prostate cancer.

Determinants of knowledge level on prostate health
Data presented in Tables 2 and 3 indicate the association and determinants of demographic characteristics of participants and knowledge level of prostate health, respectively. Study participants showed a high knowledge level of prostate health (62.5%). Results from a bivariate analysis of possible predictors of the knowledge level of prostate health among participants showed that education (χ^2=15.19; p=0.002), religion (χ^2=14.03; p=0.001), socio-economic status (χ^2=22.06; p<0.001), family history of prostate disorders (χ^2=8.67; p=0.003) and ever been diagnosed with prostate disorders (χ^2=10.84; p=0.001) had significant associations (Table 2). In addition, multivariate analysis showed that participants with a family history of prostate disorders and those who were ever diagnosed with prostate disorder were 2 times (OR = 1.973, p=0.041) and 3 times (OR = 2.736, p <0.001) more likely to have higher knowledge level of prostate health than those with no family history or have never been diagnosed with prostate disorder respectively (Table 3).

The higher knowledge level of prostate health among participants may be due to the higher level of literacy, where almost 90% had some form of education. The knowledge data from this study is similar to other studies conducted in Ghana about prostate

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cancer [21] and elsewhere in Africa [22]. This suggests a high level of enlightenment that might have influenced participants to seek health information from different sources such as hospital visits and the media. However, this does not dispute the fact that some men still have insufficient knowledge of prostate health as this study's outcome disagrees with the results of others [23] who found low knowledge levels in their study participants. Also, the high knowledge level of prostate health by participants who have had a family history or have ever been diagnosed with prostate disorders could be attributed to their personal experience of the disorders or through caring for affected relatives. Caretakers of cases may have led them to treatment centres where they could have had health information on prostate awareness.

Consumption pattern of foods related to prostate health

Generally, the study participants consumed *protective* and *high-risk foods* related to prostate health. Across all ethnic groups, the consumption of *protective foods* was high (Figure 1); on average, there was low consumption of *high-risk foods* (Figure 2) related to prostate health among participants. This confirms the assertion of a report by Sibal [31], who proposed that food choices made by any individual are influenced by induced interactions of ideas, identity and the roles of that individual in the society. Also, the findings may be attribute to the nature of the Ghanaian diet due to the diversity of crops grown in Ghana.

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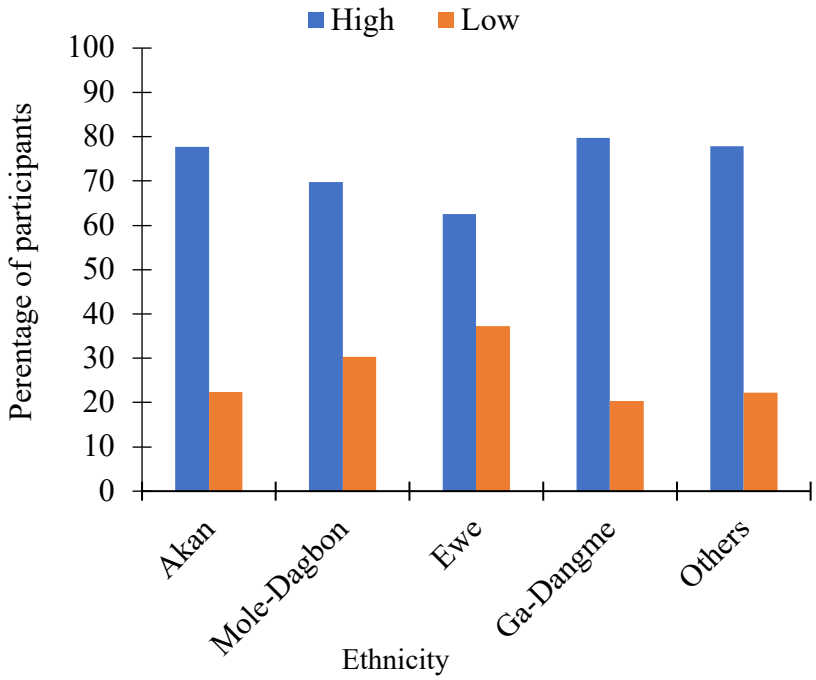

Figure 1: Frequency of consumption of protective foods among various ethnic groups in Ghana

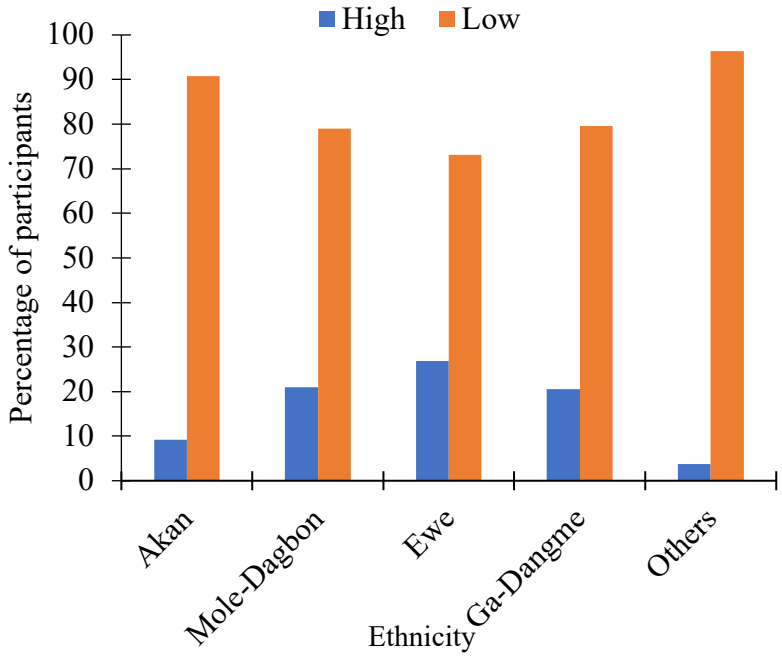

Figure 2: Frequency of consumption of *high-risk* foods among various ethnic groups in Ghana

Others: minority ethnic groups in Ghana (Frafra, Grusi, Dagaaba, Guang, Kokomba, Sisala, Basare, Builsa, Busanga, Gruma, Hausa, Mampurusi, Mossi)

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Determinants of food choices among participants

Bivariate analysis showed that there was a significant association between participants education level (χ^2= 44.70; p<0.001) and consumption of *protective foods* related to prostate health (Table 4). Further multivariate analysis showed that participants with basic education were 55.2% (OR=0.448, p=0.012) less likely to frequently consume *protective foods* related to prostate health (Table 5). Also, there was a significant association between participants' education level (χ^2= 46.27; p<0.001) and consumption of *high-risk foods* related to prostate health (Table 6). Participants with primary level of education compared with tertiary education were four (4) times (OR=4.321, p=0.003) more likely to frequently consume *high-risk foods* related to prostate health (Table 7). The results from this study show that high education level may have influenced participants' positive attitude toward the right food choices compared with *high-risk* ones. This agrees with an earlier study that the level of education increases people's understanding of health issues and influences their food choices [32]. Thus, as an individual's educational status increases, there is a greater tendency to adopt food habits or lifestyles aimed at improving health.

Results from Fisher's exact test conducted showed that participants' religious affiliation (p<0.001) was significantly associated with the consumption of *protective foods* related to prostate health (Table 4). Traditionalists were about three (3) times (OR=2.967, p=0.002) more likely to consume protective foods than Christians. However, this is not so for Muslims, who were 78.2% (OR = 0.218, p<0.001) less likely to frequently consume protective foods related to prostate health than the Christian religious group. Fisher's exact test also revealed an association between participants' religious affiliation (p=0.009) and consumption of *high-risk foods* related to prostate health but did not have any significant influence at the multivariate level. The influence of religion might have created the variation on the participants' food choices as it shapes them on what to eat and what not to eat.

Also, the study found a significant association between participants' occupation (χ^2= 5.60; p=0.018) and consumption of *protective foods* related to prostate health (Table 4). However, occupation did not have any statistically significant influence on the consumption of *protective foods* related to prostate health after the multivariate analysis.

Additionally, a significant association was established between participants' socio-economic status (χ^2= 32.90; p<0.001) and consumption of *protective foods* related to prostate health. Participants who were within the average and low socio-economic class were 54.4% (OR=0.456; p<0.001) and 38.3% (OR=0.617; p=0.036) less likely to frequently consume *protective foods* related to prostate health than those in the high socio-economic class. However, no significant association was established between participants' socio-economic status and consumption of *high-risk foods* related to prostate health. The relatively low probability of participants of average and low socio-economic status consuming *protective foods* than those of the high bracket status supports the findings of Turrell and colleagues [33]. People of low socio-economic status were more likely to purchase fewer types of fruits and vegetables [33], probably due to this food class's prohibitive cost. Furthermore, income influences purchasing

power, so it is not surprising that participants found within the lower and middle categories of the socio-economic status made lower protective food choices.

Results also showed that, there was a significant association between knowledge level of prostate health (χ^2= 5.41; p=0.020) and consumption of *protective foods* related to prostate health (Table 4). Participants with a high knowledge level of prostate health were about three (3) times (OR=2.531, p<0.001) more likely to frequently consume *protective foods* related to prostate health than those with low knowledge level (Table 5). There was also a statistically significant association observed between the knowledge level of prostate health (χ^2= 5.16; p=0.023) and the consumption of *high-risk foods* related to prostate health (Table 6). Expectedly, participants with a high knowledge level of prostate health were 46% (OR=0.539, p<0.003) less likely to frequently consume *high-risk foods* related to prostate health than those with low knowledge level (Table 6). Studies have shown that health and nutrition knowledge positively affect food choices and eating habits that promote good health and wellbeing of people [31–35]. This increased probability of consuming *protective foods* with improved knowledge on prostate health agrees with a study in England [35], where participants with high nutrition knowledge were more likely to eat fruit and vegetables compared with fatty foods. With the current study, it was possible that prostate health information may include nutrition education, which plays a pivotal role in individuals' food choices [36]. Therefore, the study suggests that increasing knowledge level on prostate health may help increase intakes of *protective foods,* which may help reduce the risk of prostate disorders among men. Moreover, nutrition information is not mostly channelled to men compared to women and children because they are not seen as vulnerable [37]. The rise of prostate screening and disorder treatment [20–23], however, may as well be a key factor for men to consume *protective foods* because of health.

As other significant competing factors such as socio-economic status influenced food choices rather than only knowledge level on prostate health, this study has created the need for further research on the importance of diet to prostate health in Ghana. However, access to *protective foods* related to prostate health will depend on continuous prostate health education coupled with nutrition education and access to *protective foods* all year round. This can be achieved through various health programmes and interventions.

To the best of our knowledge, this paper is the first study considering a larger population irrespective of socio-demographic backgrounds compared to previous studies that concentrated on specific cohorts [20,21]. The use of an analytical cross-sectional study for the current research was worth it because exposure to knowledge of prostate health and the food choices outcome was able to be measured simultaneously, meeting the study's man objective.

Unless there is a concise policy on nutrition and prostate health and increased health and nutrition-seeking behaviours of men, especially those 40 years and above, prevention of prostate disorders through dietary approaches could be challenging. It could, therefore, be suggested that there is the need to continuously increase the

knowledge level of prostate health to help increase intakes of *protective foods*, which may help reduce the risk of prostate disorders among men.

The current study is, however, limited by the fact that the participants were sought from urban areas where a majority have had some form of education compared to the rural folks.

CONCLUSION

The study findings showed a high knowledge level of prostate health among Ghanaian men. However, in addition to the knowledge level of prostate health, demographic characteristics of participants such as religion, education level and socio-economic status significantly influenced the food choices related to prostate health.
Designing programmes to prioritise consumption of *protective foods* related to prostate health is highly recommended. This current study is a good start in prostate health, especially in Ghana, and may be a reference point for other studies. Further studies can, however, delve into weighted intakes of the protective foods related to prostate health.

CONFLICT OF INTEREST

Authors declare no conflict of interest.

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Table 1: Demographic characteristics of participants

Characteristics	Frequency
Ethnicity	
Akan	566
Mole-Dagbon	119
Ewe	104
Ga-Dangme	78
Others*	27
Age (years)	
40-49	398
50-59	223
60-69	192
70+	81
Marital Status	
No partner	160
Have a partner	734
Level of education	
Basic	346
Secondary/Technical	477
Tertiary	71
Religious affiliation	
Christianity	608
Muslim	244
Traditionalist	42
Occupation	
Employed	861
Not employed	33
Socio-economic status	
Low	223
Average	485
High	186
Family history of prostate disorders	
Yes	64
No	830
Have you been diagnosed with any prostate disorder?	
Yes	65
No	829

*Minority ethnic groups in Ghana (Frafra, Grusi, Dagaaba, Guang, Kokomba, Sisala, Basare, Builsa, Busanga, Gruma, Hausa, Mampurusi, Mossi)

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Table 2: Associations between demographic characteristics and knowledge level of prostate health

	Knowledge of prostate health		
	Low	High	
Exposure variable	**n (%)**	**n (%)**	***χ^2 (p-value)***
Ethnicity			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)	
Age (years)			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+	27 (8.1)	54 (9.7)	
Marital Status			1.612 (0.204)
Have a partner	268 (80.0)	466 (83.4)	
No partner	67 (20.0)	93 (16.6)	
Level of education			15.187 **(0.002)**
Tertiary	24 (7.2)	47 (8.4)	
Secondary	202 (60.3)	275 (49.2)	
Basic	84 (25.1)	154 (27.5)	
No formal education	25 (7.5)	83 (14.8)	
Religious affiliation			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)	
Occupation			1.521 (0.217)
Employed	326 (97.3)	535 (95.7)	
Not employed	9 (2.7)	24 (4.3)	
Socio-economic status			22.057 **(<0.001)**
High	87 (26.0)	99 (17.7)	
Average	148 (44.2)	337 (60.3)	
Low	100 (29.9)	123 (22.0)	
Family history of prostate disorders			8.663 **(0.003)**
No	322 (96.1)	508 (90.9)	
Yes	13 (3.9)	51 (9.1)	
Ever been diagnosed with prostate disorders			10.841 **(0.001)**
No	279 (83.3)	507 (90.7)	
Yes	56 (16.7)	52 (9.3)	

*Minority ethnic groups in Ghana (Frafra, Grusi, Dagaaba, Guang, Kokomba, Sisala, Basare, Builsa, Busanga, Gruma, Hausa, Mampurusi, Mossi)

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Table 3: Determinants of knowledge level of prostate health

Variable	Knowledge level of prostate health	
	OR (95% CI)	***P*-value**
Level of education		
Tertiary*	1	
Secondary/Technical	1.044 (0.587 – 1.856)	0.884
Basic	1.435 (0.838 – 2.458)	0.189
No formal education	0.873 (0.436– 1.746)	0.700
Religious affiliation		
Christians*	1	
Muslims	0.706 (0.496 – 1.004)	0.053
Traditionalists	1.244 (0.654 – 2.368)	0.506
Socio-economic status		
High*	1	
Average	0.529 (0.370 – 0.0.757)	0.531
Low	0.891 (0.591 – 1.343)	0.580
Family history of prostate disorders		
No*	1	
Yes	1.973 (1.028 – 3.784)	**0.041**
Ever diagnosed with prostate disorders		
No*	1	
Yes	2.736 (1.604 – 4.669)	**<0.001**

*Reference groups. OR: Odds ratio. CI: 95% Confidence interval. Emboldened *p*-value: $p<0.05$

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Table 4: Associations between demographic characteristics, knowledge level of prostate health and consumption of *protective foods* related to prostate health

	Consumption of *protective foods*		
	Low	High	
Variable	**n (%)**	**n (%)**	***χ^2 (P-value)***
Age (years)			3.542 (0.315)
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)	
Marital Status			2.044 (0.153)
Have a partner	176 (78.9)	558 (83.2)	
No partner	47 (21.1)	113 (16.8)	
Level of education			44.693 **(<0.001)**
Tertiary	14 (6.3)	57 (8.5)	
Secondary/Technical	81 (36.3)	396 (59.0)	
Basic	85 (38.1)	153 (22.8)	
No education	43 (19.3)	65 (9.7)	
Religious affiliation			****<0.001**
Christians	187 (83.9)	421 (62.7)	
Muslims	32 (14.3)	212 (31.6)	
Traditionalists	4 (1.8)	38 (5.7)	
Occupation			5.592 **(0.018)**
Employed	209 (93.7)	652 (97.2)	
Not employed	14 (6.3)	19 (2.8)	
Socio-economic status			32.895 **(<0.001)**
High	19 (8.5)	167 (24.9)	
Average	127 (57.0)	358 (53.4)	
Low	77 (34.5)	146 (21.8)	
Knowledge level of prostate health			5.408 **(0.020)**
Low	69 (30.9)	266 (39.6)	
High	154 (69.1)	405 (60.4)	

n: Sample size. χ^2: Chi-square statistic. Emboldened *p*-value: $p<0.05$. **: *p*-value from fisher's exact test

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Table 5: Determinants of consumption of *protective foods*

Variable	Consumption of *protective foods*	
	OR (95% CI)	*p-value*
Level of education		
Tertiary*	1	
Secondary/Technical	1.333 (0.747 – 2.379)	0.331
Basic	0.448 (0.240 – 0.838)	**0.012**
No education	0.232 (0.107 – 0.501)	**<0.001**
Religious affiliation		
Christianity*	1	
Islam	0.218 (0.137 – 0.348)	**<0.001**
Traditional	2.967 (1.481 – 5.947)	**0.002**
Occupation		
Employed*	1	
Not employed	0.383 (0.126 – 1.66)	0.091
Socio-economic status		
High*	1	
Average	0.456 (0.306 – 0.681)	**<0.001**
Low	0.617 (0.393 – 0.969)	**0.036**
Knowledge level of prostate health		
Low*	1	
High	2.531 (1.840 – 3.480)	**<0.001**

* Reference groups. OR: Odds ratio. CI: 95% Confidence interval. Emboldened *p*-value: $p<0.05$

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Table 6: Associations between demographic characteristics, knowledge level of prostate health and consumption of *high-risk foods*

	Consumption of *high-risk foods*		
	Low	High	
Variable	**n (%)**	**n (%)**	***χ2 (P-value)***
Age (years)			4.081 (0.253)
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)	
Marital Status			2.199 (0.138)
Have a partner	628 (81.3)	106 (86.9)	
No partner	144 (18.7)	16 (13.1)	
Level of education			46.273 **(<0.001)**
Tertiary	66 (8.5)	5 (4.1)	
Secondary/Technical	441 (57.1)	36 (29.5)	
Basic	180 (23.3)	58 (47.5)	
No education	85 (11.0)	23 (18.9)	
Religious affiliation			**0.009
Christianity	514 (66.6)	94 (77.0)	
Muslim	216 (28.0)	28 (23.0)	
Traditionalist	42 (5.4)	0 (0.0)	
Occupation			**0.812
Employed	743 (96.2)	118 (96.7)	
Not employed	29 (3.8)	4 (3.3)	
Socio-economic status			0.446 (0.800)
High	160 (20.7)	26 (21.3)	
Average	422 (54.7)	63 (51.6)	
Low	190 (24.6)	33 (27.0)	
Knowledge level of prostate health			**5.158 (0.023)**
Low	278 (36.0)	57 (46.7)	
High	494 (64.0)	65 (53.3)	

n: Sample size. χ^2: Chi-square statistic. Emboldened *p*-value: $p<0.05$

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Table 7: Determinants of consumption of *high-risk food* choices

Variable	Consumption of *high-risk foods*	
	OR (95% CI)	*p-value*
Level of education		
Tertiary*	1	
Secondary/Technical	1.037 (0.390 – 2.755)	0.943
Basic	4.321 (1.649 – 11.323)	**0.003**
No education	4.371 (1.542 – 12.390)	**0.006**
Religious affiliation		
Christianity*	1	
Islam	0.617 (0.378 – 1.007)	0.053
Traditional	3.458 (1.192 – 10.026)	0.051
Knowledge level of prostate health		
Low*	1	
High	0.539 (0.358 – 0.811)	**0.003**

* Reference groups. OR: Odds ratio. CI: 95% Confidence interval. Emboldened *p*-value: $p<0.05$

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