# Prevalence of *Helicobacter pylori*, *Mycobacterium tuberculosis*, Malaria Infections, and High Serum Prostate Specific Antigen Levels among Individuals at the Rivers State University: Findings of a Free Medical Outreach


**Abstract**

**Background:** Co-morbidity of infections and non-infectious diseases is increasing in developing societies with little effort in identifying these trends. The study aimed to estimate the prevalence of *Helicobacter pylori*, *Mycobacterium tuberculosis*, malaria infections, and high serum prostate-specific antigen levels among individuals and residents at Rivers State University, Port Harcourt, Nigeria.
**Experimental Design:** The study is a cross-sectional descriptive study, which consisted of 501 participants in a free medical outreach organized by the Association of Medical Laboratory Scientists of Nigeria, Rivers State University Chapter, Rivers State, Nigeria, in commemoration of the 2022 International Biomedical Day. The test subjects consisted of males and females, who were students, staff, and residents at the Rivers State University, Port Harcourt, Nigeria. The age range of the test subjects was 18-64 years.
**Method:** The cross-sectional descriptive study encompassed 501 adults (males and females) who gave consent for their blood screening during our free medical outreach. As a procedure, venous blood specimens were collected at the antecubital fossa from the attendees by venipuncture technique and were screened for *H. pylori* antibody, *Mycobacterium tuberculosis*, malaria parasite, and prostate-specific antigen with the use of Accu-Tell rapid diagnostic test kits. Each test was read within 10 minutes. Red lines on the test zone and control zones of the test kits were read and recorded as positive cases, while a red line on the control zone and the absence of a red line on the test zone of the test kit were read, and recorded as negative case, in line with the rapid diagnostic manufacturer's instructions.
**Results:** Out of a total of 501 participants, the prevalence of *H. pylori*, *M. tuberculosis*, *Plasmodium falciparum*, and prostate-specific antigen were 9 (1.79 %), 3 (0.6 %), 12 (2.40 %), 6 (4.65 %%) respectively. The sex-based comparison showed that males have the same prevalence for all infectious diseases (*H. pylori, M. tuberculosis,* and *P. falciparum*) of 3 (2.32 %), and 6 (4.65 %) for a prostate-specific antigen. For the females, the prevalence of *H. pylori, M. tuberculosis* and *P. falciparum* were 6 (2.20 %), 0 (0.00 %), and 9 (2.42 %) respectively.
**Conclusion:** *M. tuberculosis* prevalence was observed to be greater in the males than in the females of the studied population while that of *H. pylori* was observed to be higher in the females than the male participants. So continuous screening of the public to monitor and prepare them against the insurgence of these diseases which are of public health concern is important.



**Keywords:** *H. pylori*, Malaria parasite, *Mycobacterium tuberculosis*, prostate specific antigen, Rivers State, Prevalence


## 1. INTRODUCTION

Peptic ulcer, malaria, tuberculosis and prostate cancer are co-morbidities in Nigeria and are of public health concern [1]. The causes of these various diseases vary, as do the signs and symptoms. Infections with *Helicobacter pylori* (*H. pylori*) occur when the bacteria infect the stomach [2]. The majority of *H. pylori*-positive cases have no symptoms [3]. A prolonged infection, on the other hand, might induce stomach inflammation, which can lead to the formation of peptic ulcers. Chronic inflammation has also been linked to cancers such as gastric mucosa-associated lymphoid tissue lymphoma and other stomach cancers, oesophagus, colon, rectum, or tissues around the eye (termed extranodal marginal zone B-cell lymphoma) [4, 5]. The prevalence of *H. pylori* infection is higher in underdeveloped nations [6]. However, due to antibiotic eradication therapies, the prevalence of *H. pylori* colonization has decreased in various regions.

Despite the widespread use of many antibiotics and a live attenuated vaccine, tuberculosis (TB) remains one of the deadliest infectious diseases and one of the oldest human ailments in the world especially in sub-Saharan Africa [7]. *Mycobacterium tuberculosis* (MTB) is the causative agent of tuberculosis, a communicable disease that primarily affects the lungs but can also affect the kidneys, spine, and brain [8]. Active tuberculosis is commonly characterized by fever, chills, sweating at night, persistent coughing up blood-filled mucus, and weight loss. According to reports, Nigeria accounts for almost 8% of the 4.3 million tuberculosis cases worldwide [9]. Regrettably, a high prevalence of HIV/AIDS and the emergence and spread of drug-resistant TB have worsened the TB problem in Nigeria [10]. Therefore, to lower the disease burden in the nation by 2030, the Federal Government, the World Health Organisation (WHO), and its partners must continuously implement targeted interventions [11].

A serious threat to public health is malaria [12]. According to Gething et al. [13], *P. falciparum* is thought to be the most harmful of all the malaria parasites, and it is most common in Africa. According to the WHO, [14], malaria is a disease that is widespread and causes a high rate of mortality and morbidity worldwide. Most hospitals in Nigeria and other countries where the disease is endemic see a higher proportion of their outpatient visits from malaria [15]. Nigeria has made impressive progress in the fight against malaria by using integrated vector management and timely, efficient case treatments. Despite these advancements, malaria still poses a threat to 97% of Nigerians [16]. In 2021, the disease was expected to have affected 68 million people with 194,000 deaths [12]. Environmental, socioeconomic, and interventional factors are risk factors that increase an individual's likelihood of contracting malaria [17].

According to Siegel *et al.* (2020), prostate cancer is the second most frequent disease in men worldwide and the most common cause of cancer-related deaths in men. The age of a male has been known as a risk factor for higher plasma levels of prostate-specific antigen (PSA) indicating benign prostate hyperplasia or prostate cancer [19]. Since PSA testing became widely available in the early 1990s, there has been a 44% decrease in prostate cancer-specific mortality, according to data from the National Institute of Health (NIH) [20]. Presently, the most widely used screening test for prostate cancer is the serum prostate-specific antigen (PSA) test [21].

As these diseases are a burden to society, individuals must be regularly screened to curtail the dangers they can cause. The main purpose of the free medical outreach was to create awareness Hence, this study aimed to assess the level of the burden of these diseases using a medical outreach programme.

## 2. Materials and Methods

### 2.1. Description of Demographic and Clinical Characteristics of Participants

Participants recruited and tested consisted of 129 males and 372 females, who were students, staff members, and residents at the Rivers State University, Port Harcourt, Nigeria. The age range of the test subjects was 18-64 years. All of the participants appeared apparently healthy and there were no clinical presentations of signs suggestive of infection. The males that were screened for prostate hyperplasia also did not present any clinical signs or symptoms of benign prostate hyperplasia (BPH). However, some of the participants complained of headaches (mild, moderate, and severe), gastrointestinal disturbances, tiredness, and fatigue at the point of consultation handled by qualified and licensed Medical Doctors.

### 2.2. Materials

Materials used in this study were vacutainer needles and tubes, plain bottles, cotton wool, 70% alcohol, Pasteur pipette, centrifuge, Accu-Tell *H. pylori* IgG test cassettes, Accu-tell rapid malaria test cassettes, Accu-Tell TB rapid diagnostic test cassettes and Accu-Tell PSA Semi-quantitative cassettes.

### 2.3. Study Area and Sampling

The study was carried out at Rivers State University in Port Harcourt, Nigeria. Rivers State University, Port Harcourt, Nigeria, is a public educational institution for Arts and Science majors. It was established in 1972 and gained independent status in 1980. The university is situated and occupies a large land mass in Nkpolu-Oroworukwo, Mile 3 Diobu, Port Harcourt. The testing involved a total of 501 participants,

comprising staff relatives, students, and staff members from Rivers State University, Port Harcourt. The sample size was not predetermined but was determined by those who consented and participated in the medical outreach program and voluntarily provided consent to be part of the study. A convenience sampling strategy was engaged for participant recruitment. This method involved selecting individuals who were readily accessible and expressed a willingness to participate. Participants were drawn from the pool of those engaged in the medical outreach program, ensuring that the sample reflected the diversity of the university community.

### *2.4.* Experimental Design

The study is a cross-sectional descriptive study, which consisted of 501 participants of a free medical outreach organized by the Association of Medical Laboratory Scientists of Nigeria, Rivers State University Chapter (AMLSN-RSU) Rivers State, Nigeria, in commemoration of the 2022 International Biomedical Scientists Day. The test subjects consist of 129 males and 372 females, who were students, staff, and residents at the Rivers State University, Port Harcourt, Nigeria. The age range of the test subjects was 18-64 years. Informed consent was obtained from each participant based on their agreement and willingness to participate in the free medical outreach. The outreach was organized by the Association of Medical Laboratory Scientists of Nigeria, Rivers State University Chapter (AMLSN-RSU) between the 19$^{th}$ to 21$^{st}$ of April 2022, in commemoration of the 2022 International Biomedical Scientists Day. The medical outreach program evaluation comprised testing of participants after consenting, the uptake of counselling services, and the subsequent linkage to care for those identified with infections as the core of its design.

### 2.5. Selection Criteria

Those included in the study were persons belonging to the University community, students, and staff members of Rivers State University who voluntarily consented to participate. Persons excluded from the study include those who were mentally challenged, did not have an official affiliation with the university, and did not give their consent for the testing and subsequently for research purposes.

### 2.6. Sample Collection and Processing

Approximately 5 ml of venous blood specimens were collected from the attendees by venipuncture technique at the antecubital fossa into appropriately labeled plain bottles. The skin surface at the site of collection was swabbed with alcohol pads, followed by a tourniquet application to aid the virtualization of the vein. The 5 ml syringes were used on all of the participants. The blood specimens were allowed for 30 minutes to clot and later spun at 2500 rpm for 5 minutes. Plasma samples were collected into other appropriately labeled specimen containers. Serum samples obtained after the separation were used immediately for the testing. The testing and screening for *Helicobacter pylori*, *Mycobacterium tuberculosis*, *Plasmodium falciparum*, and Prostate Specific Antigen (PSA) assays were performed using Rapid Test Strips. The serological protocol is based on the principle of qualitative immunoassay that detects the presence of antigens from these infectious organisms as well as that from the prostate in the serum sample .Participants included in the study were those within the University community, students, and staff members only.

### 2.7. Blood Testing/screening of Participants

With the help of Pasteur pipette, 2 drops of plasma were transferred into the individual rapid diagnostic test kits: Accu-Tell *H. pylori* IgG test cassette, Accu-tell rapid malaria test cassette, Accu-Tell TB rapid diagnostic test cassette and Accu-Tell PSA Semi-quantitative cassette. The results were read in 10 minutes. The presence of red lines on the test and control zones were read, recorded, and counted as positive cases, while a red line on the control zone and the absence of a red line on the test zone were read, recorded, and counted as negative cases, according to the manufacturers' instructions. The readings were made and interpreted by qualified licensed Biomedical Scientists manning their benches. All positive cases and negative cases were collated and expressed in percentages.

### 2.8. Statistical Analyses

Data were collated using Microsoft Excel Sheets. The prevalence of positive cases and negative cases were expressed as a percentage of each category (male, female and total).

## 3. RESULTS

### 3.1. Results of Participants' compliance in the medical outreach programme

Results of the summary of the medical outreach indicated the presence of co-infection or co-existence **of** TB-Malaria, H.pylori-Malaria, and PSA-Malaria to be 27.3%, 54.5%, and 18.2% respectively. A total of 94.1% used the counseling and after-testing-care services made available (Table 1). The medical outreach program demonstrated promising participation rates, with 80.5% of the participants opting to undergo testing for infections. Of the participants identified with infections, 27.3% had TB-Malaria co-infections while *H. pylori*-Malaria and PSA-Malaria had 54.5% and 18.2% as the prevalence of co-infections and co-existence respectively. More so, 94.1% identified with infections, utilized the counselling services made available and also linked for care (Table 1).

**Table 1.** Participants' compliance in the medical outreach programme

| Variables | Frequency | Percentage |
|---|---|---|
| **Consenting Records** | | |
| Participated | 501 | 80.5 |
| Declined | 121 | 19.5 |
| Total | 622 | 100 |
| **Sex of Participants** | | |
| Male | 129 | 25.7 |
| Female | 372 | 74.3 |
| Total | 501 | |
| **Co-infection/co-existence** | | |
| TB-Malaria | 3 | 27.3 |
| *H. pylori*-Malaria | 6 | 54.5 |
| *H. pylori*-TB | 0 | 0.0 |
| PSA-TB | 0 | 0.0 |
| PSA- *H. pylori* | 0 | 0.0 |
| PSA-Malaria | 2 | 18.2 |
| Total | 11 | |
| **Counselling Services** | | |
| Utilised | 16 | 94.1 |
| Declined | 1 | 5.9 |
| Total | 17 | 100 |
| **Linkage to Care** | | |
| Successfully linked | 16 | 94.1 |
| Unsuccessful linked | 1 | 5.9 |
| Total | 17 | 100 |

### 3.2. Result of Positive and Negative Cases for Male Participants

In the male category, the test results showed that out of the 129 male attendees, 3 males tested positive for *P. falciparum*, 3 males tested positive for *M. tuberculosis*, 3 males tested positive for *H. pylori* and 6 males tested positive for PSA (Table 2).

**Table 2. Prevalence of Disease Burden among Male Participants**

| Disease | Number of Samples | Positive cases n(%) | Negative cases n(%) |
|---|---|---|---|
| *H. pylori* | 129 | 3 (2.32) | 97.68 |
| *M. tuberculosis* | 129 | 3(2.32) | 97.68 |
| *P. falciparum* | 129 | 3(2.32) | 97.68 |
| Prostate specific antigen | 129 | 6(4.65) | 95.35 |

### 3.3 Results of Positive and Negative Cases for Female Participants

In the female category, out of the 372 female attendees tested, the test results showed 9 (2.42%) females, positive for *P. falciparum*, and 6 (2.20 %) females, positive for *H. pylori*. No *M. tuberculosis* was detected in the females (Table 3).

**Table 3. Prevalence of Disease Burden among Female Participants**

| Disease | Number of Samples | Positive cases n(%) | Negative cases n(%) |
|---|---|---|---|
| *H. pylori* | 372 | 6 (2.20) | 97.80 |
| *M. tuberculosis* | 372 | 0(0.00) | 100.00 |
| *P. falciparum* | 372 | 9(2.42) | 97.58 |

### 3.4. Result of Positive and Negative Cases of Screening Test amongst Participants

In total, out of 501 attendees (both males and females) tested, 12 (2.40%) attendees tested positive for *P. falciparum,* 3 (0.6%) tested positive for *M. tuberculosis,* 9 (1.79%) attendees tested positive for *H. pylori,* and 6 (1.20%) tested positive for PSA (Table 4).

**Table 4. Prevalence of Disease Burden among Participants**

| Disease | Number of Samples | Positive cases n(%) | Negative cases n(%) |
|---|---|---|---|
| *H. pylori* | 501 | 9 (1.79) | 98.21 |
| *M. tuberculosis* | 501 | 3 (0.60) | 99.40 |
| *P. falciparum* | 501 | 12 (2.40) | 97.60 |

## 4. DISCUSSION

In attempts to monitor and control the prevalence or incidence of diseases that pose threats to society, a free medical outreach was organized at the Rivers State University, Port Harcourt, Nigeria to support the society in its awareness and fight against the spread of infectious diseases. The study allowed the participants to be screened for *H. pylori*, *M. tuberculosis*, and malaria, and the plasma PSA Level in men was measured. Our results from the screening showed the prevalence of malaria among males, females, and in the total participants as 2.32 %, 2.42 %, and 2.40 % respectively. Although lower prevalence rates of malaria had been reported in other studies across several parts of the country, the one reported by Abah & Udoidang [22] was higher than that of our findings. This could be the difference in location and environmental hygiene. Our place of study, Rivers State University, has an advanced drainage system that prevents water stagnation for mosquito breeding and is distant from vegetation, hence, the reason for low prevalence compared to other studies in other locations in Port Harcourt. Furthermore, the difference in prevalence of malaria in the male (2.32 %), and female (2.42 %) participants was not significantly different. This finding aligned with the reports of Abah & Udoidang [22] and Abah et al. [23].

The prevalence of *M. tuberculosis* was observed to be 2.32 % among males, 0.0 % among females, and 0.6 % in the total participants. Previous studies done by Ogbo et al. [24] reported a reduced incidence of tuberculosis. In this study, the prevalence of tuberculosis in the total participants (0.6 %) was less than the previous observations of Otokunefor et al. [25], in Port Harcourt. The reduction in prevalence could be due to awareness and control measures practised, and the fight against HIV/AIDS infections over time. Also, we observed the ratio of male to female tuberculosis infections in Nigeria to be 2:1. This present study showed similarity to previous studies done by Obioma & Wokem [26].

The prevalence of *H. Pylori* was observed to be 2.32 % among the males, 2.20 % among the females, and 1.79 % in the total participants. There was no observable difference in the prevalence of *H. pylori* between the male and female participants. We found our result similar to the work of Ayodele et al.

carried out in 2017 [27] but different from the study done in 2018 by Ayodele et al. [28], who reported a prevalence of 19.5% of *H. Pylori* infection in 2018 in their study.

The prevalence of PSA was observed to be 4.65 % among the screened men. Our result was less than the findings of Maarten et al. [29]. Our findings were also less than 11.72% found in the Northern and 7.77 % found in the Southern parts of Nigeria as reported by Ntekim et al. [30]. To create proper awareness of prostate enlargement (benign prostate hyperplasia) and prostate cancer, more testing, and awareness campaigns need to be organised geared towards having a detailed epidemiologic and other associated risk factors that can assist in understanding the prevalence and mitigation approaches of this disease.

## 5. Conclusions

*M. tuberculosis* prevalence was observed to be greater in the males than in the females of the studied population while that of *H. pylori* was observed to be higher in the females than the male participants. So continuous screening of the public to monitor and prepare them against the insurgence of these diseases which are of public health concern is important. More so, there is a dire need for an intense and robust campaign against transmissible infections as a means of educating the populace and controlling their spread.

## Author Contributions

Authors IE, BSM, and OTP designed the work, wrote the first draft, and performed the statistical analysyes. Authors CAA, OCM, EGN, and OU managed the literature searches, while authors VNA, I-OBA, Oi-DC, OAO, HW, IG-O, AB-C, and TPM further worked on the first draft and managed the literature searches. All the authors were involved in the testing and collection of data.


## Funding:

This research received no external funding.


## Ethical Approval and Informed Consent

Ethical clearance was given by the Rivers State University's Ethical and Research Committee. Informed consent was obtained from all subjects involved in the study following their willingness to partake in the free medical screening and counseling.


## Acknowledgments

We would like to appreciate the effort of the Association of Medical Laboratory Scientists of Nigeria, Rivers State University Chapter (AMLSN-RSU) led by Dr. Elekima, Ibioku for organizing such an impactful free medical outreach. We also extend our deep appreciation to the Management and Governing Council of the Rivers State University, Port Harcourt, for giving the platform for free medical outreach.


## Conflicts of Interest

The authors declare no conflict of interest. The organizers of the free medical programme had no role in the study design.

## References


1. Mac PA, Asheadzi HF, Gideon A, Thaker P, Airiohuodion P. Prevalence of *Plasmodium falciparum* among Nigerians in Abuja and Central States: A comparative analysis of sensitivity and specificity using rapid diagnostic test and microscopy as tools in management of malaria. International Journal of Tropical Disease. 2019; 1,14.

2. Mayo Clinic. *Helicobacter pylori* infection. 2022; https://www.mayoclinic.org/diseases-conditions/h-pylori/symptoms-causes/syc-20356171.
3. de Brito BB, da Silva FA, Soares AS, Pereira VA, Santos ML, Sampaio MM, Neves PH, de Melo FF. (2019). Pathogenesis and clinical management of *Helicobacter pylori* gastric infection". *World* Journal of Gastroenterology. 2019; 25 (37): 5578–5589.
4. Abbas H, Niazi M, Makker J (2017). Mucosa-Associated Lymphoid Tissue (MALT) Lymphoma of the Colon: A Case Report and a Literature Review. The American Journal of Case Reports, 2017; 18: 491–497.
5. Nocturne G, Pontarini E, Bombardieri M, Mariette X. (2019). Lymphomas complicating primary Sjögren's syndrome: from autoimmunity to lymphoma. Rheumatology, Oxford, UK. 2019; 60 (8): 3513–3521.
6. Hooi JK, Lai WY, Ng WK, Suen MM, Underwood FE, Tanyingoh D. Global prevalence of *Helicobacter pylori* Infection: systematic review and meta-analysis. Gastroenterology. 2017; 153 (2), 420–429.
7. WHO. Global tuberculosis control: surveillance, planning, Finance. WHO/CDS/2002.295. World Health Organization, Geneva. 2022
8. Barberis I, Bragazzi NL, Galluzzo L, Martini M (2017). The history of tuberculosis: from the first historical records to the isolation of Koch's bacillus. 2017; Available at:https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5432783/pdf/2421-4248-58-E9.pdf
9. Ugwu KO, Agbo MC, Ezeonu IM. (2021). Prevalence of tuberculosis, drug-resistant tuberculosis and Hiv/Tb co-Infection in Enugu, Nigeria. African Journal of Infectious Disease, 2021; 15 (2), 24-30.
10. WHO. World Malaria Report 2018. https://www.who.int/malaria/publications/world-malaria-report-2018/en/.
11. WHO. Gearing towards a TB free Nigeria- WHO and partners scale up action. 2021: https://www.afro.who.int/news/gearing-towards-tb-free-nigeria-who-and-partners-scale-action
12. WHO. Report on malaria in Nigeria. 2022; https://www.afro.who.int/countries/nigeria/publication/report-malaria-nigeria-2022.
13. Gething PW, Elyazar IR, Moyes CL, Smith DL, Battle KE, Guerra CA. (2010). A long-neglected world malaria map: Plasmodium vivax endemicity in 2010. Plos Neglected Tropical Diseases. 6(9): e1814. Doi:10.137/journal.pntd.0001814
14. WHO. *World malaria report fact sheet*. 2014; www.who.int/malaria/pubication/world-malaria-report-2014/en/.
15. WHO. *A global strategy for malaria control, Geneva*. 2010: www.who.int/malaria/publication/media/world-malaria-report-2010/en.
16. Nwaneli EI, Eguonu I, Ebenebe JC, Osuorah CD, Ofiaeli OC, Nri-Ezedi CA. Malaria prevalence and its sociodemographic determinants in febrile children - a hospital-based study in a developing community in South-East Nigeria. Journal of Preventive Medicine and Hygiene. 2020; 61 (2): 173 - 180.
17. Breman JG. Ears of the hippopotamus: manifestations, determinants, and estimates of the malaria Burden. American Journal of Tropical Medicine and Hygiene. 2001; 64: 1-11.
18. Siegel RL, Miller KD, Jemal A. (2020). Cancer statistics. CA Cancer Journal of Clinics. 2020; 70(1): 7-30.
19. Collins A, Ehimen PO. Age-specific serum prostate-specific antigen references range among healthy men in Port Harcourt, Nigeria: a retrospective hospital-based study. International Journal of Research in Medical Sciences. 2018; 6 (2): 417.
20. Michael KD, Stephen WL. Prostate Specific Antigen. Treasure Island (FL):2023; Stat Pearls Publishing.

21. Aisuodionoe-Shadrach OI, Eniola SB, Nwegbu MM, Kolade-Yunusa, HO, Okereke OO, Yunusa, T. Determination of Serum Prostate Specific Antigen Levels Amongst Apparently Healthy Nigerian Males in a University and University Hospital Community in the Federal Capital Territory. Cancer Control. 2022; 10732748221081366. doi: 10.1177/10732748221081366.
22. Abah AE, Udoidang IN. Co-Infection of Malaria and Hepatitis B Virus in Port Harcourt, Rivers State, Nigeria. International Journal of Infection, 2019; 6(4):e97033.
23. Abah AE, Awi-Waadu GD, Nduka FO, Richard A. Malaria infection and socioeconomic status of some residents of Port Harcourt metropolis, Rivers State, Nigeria. Applied Science and Environmental Management. 2017; 21 (2): 299-304.
24. Ogbo FA, Ogeleka P, Okoro A. Tuberculosis disease burden and attributable risk factors in Nigeria, 1990–2016. Tropical Medicine and Health. 2018; 46, 34.
25. Otokunefor K, Otokunefor TV, Omakwele G. Multi-drug resistant *Mycobacterium tuberculosis* in Port Harcourt, Nigeria. African Journal of Laboratory Medicine. 2018; 7 (2), 805.
26. Obioma A, Ngozika WG. Investigation of Prevalence of Tuberculosis Infection Outcome in Two Government Owned Hospitals in Port Harcourt, Niger Delta. Journal of Tuberculosis Therapy. 2018; 3, 114.
27. Ayodele MB, Aaron UU, Oluwatayo GA, Wariso KT. Prevalence of *Helicobacter pylori* infection among suspected peptic ulcer patients in Port Harcourt, South-South, Nigeria. Gazette Medicine. 2017; 6 (1): 601 - 606
28. Ayodele MB, Aaron UU, Oluwatayo GA, Wariso KT. Prevalence of *Helicobacter pylori* Infection in Port Harcourt using antibody diagnostic technique. International Journal of Innovative Healthcare Research. 2018; 6 (1), 24-28.
29. Maarten CB, Oluwarotimi SN, Adekoyejo AP, Charles CA, Oluyemi A, Ima-Obong, A. E, Ima-Abasi EB, Vikas M, Virgilia M, Theodorus H, Adam, B. M. Prevalence of prostate cancer at autopsy in Nigeria—A preliminary report. The Prostate, 81 (9), 553-559.
30. Ntekim A, Folasire A, Odukoya OA. The prevalence of prostate cancer among young men below 55 years of age in Nigeria. *Cancer Control*, 2023; 30.
31.