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Research Article

Prevalence of Bacteriuria among Pregnant Women Attending Primary Health Care Centers in Rivers State

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ABSTRACT

The prevalence of bacteriuria among 200 pregnant women attending antenatal at three health care centers namely; Bundu, Churchill and Potts Johnson in Port Harcourt, Nigeria was investigated. Socio-demographic and risk factor characteristics were obtained using structured questionnaires. Appropriate microbiological techniques were used to enumerate total coliforms, faecal coliform and staphylococcal population in urine samples. Mean values of bacterial counts in samples from Bundu ranged from $1.02 \pm 0.02 \times 10^6$CFU/ml to $2.21 \pm 0.51 \times 10^6$CFU/ml; from $0.83 \pm 0.62 \times 10^6$CFU/ml to $2.55 \pm 0.32 \times 10^6$CFU/ml for Churchill and from $0.84 \pm 0.17 \times 10^6$CFU/ml to $2.36 \pm 0.37 \times 10^6$CFU/ml for Potts Johnson. Generally, coliform and faecal coliform counts in the health centers were high; while faecal coliform counts showed significant difference ($P<0.05$). A total of 248 isolates belonging to species of 8 genera including *Escherichia coli* (18%), *Staphylococcus aureus* (15%), *Enterobacter cloacae* (14%), *Enterococcus faecalis* (15%), *Klebsiella pneumoniae* (14%), *Pseudomonas aeruginosa* (13%), *Bacillus cereus* (5%) and *Streptococcus constellatus* (6%) were isolated. Prevalence of bacteriuria among the pregnant women in an ascending order is; Bundu (90%) < Churchill (93.8%) < Potts Johnson 94%. Furthermore, the prevalence of bacteriuria was significantly higher in pregnant women aged 26-30 years compared to those aged 0-20 years and 36-40 years ($p<0.05$). The 2nd and 3rd trimesters both had higher prevalence of bacteriuria. High prevalence of bacteriuria among pregnant women in this study highlights the need for awareness campaigns for good hygiene and sanitary practices as to reduce the incidence of bacteriuria.

Keywords: Bacteriuria, Primary health care centers, pregnant women, urine, faecal coliforms

Introduction

Bacteriuria is the presence of bacteria in the urine and can be classified as either asymptomatic or symptomatic. Urine is normally considered as sterile. It is usually free of bacteria, viruses, and fungi but does contain fluids, salts, and waste products (Srinath *et al.,* 2018). The major defense against urinary tract infection (UTI) is entire emptying of the bladder during urination. Supplementary mechanisms which keep the tract's sterility include urine acidity, vesicoureteral valve, and various immunologic and mucosal barriers (Abelson *et al.*, 2018). An infection occurs when microorganisms, frequently bacteria from the vaginal, perineal and fecal flora cling to the opening of the urethra and start to multiply (Wilson, 2019).

Urinary tract infection (UTI) is caused by microbial colonization, tissue invasion of structures, and the growth of pathogens in the urinary tract (Obiogbolu *et al*., 2009). According to Haddad (2020), bacteria which reside in the digestive tract, vagina, or around the urethra are most commonly responsible for UTI. However, yeast and viruses are also causative agents (Manandha *et al.,* 2020). The most common pathogen involved in bacteriuria is *Escherichia coli* accounting for 60 to 90% of infections in women. Other bacteria involved include *Klebsiella pneumoniae*, *Proteus mirabilis*, and *Pseudomonas aeruginosa*. These are all Gram-negative organisms and account for about 71.5% of all cases of bacteriuria (Mohammed, *et al.*, 2016). Gram-positive organisms like *Staphylococcus saprophyticus* and *Staphylococcus aureus* also cause bacteriuria (Sunday, 2009).

Pregnancy causes many changes in the female's body. Factors like structural and hormonal changes raise the risk of UTI in pregnancy (Guglietta, 2017). Urinary tract infections in pregnancy are classified as either asymptomatic or symptomatic. Asymptomatic bacteriuria is defined as the presence of significant bacteria in urine without the symptoms of an acute urinary tract infection (Schnarr and Smaili, 2008).

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The organisms that cause UTI affect all age groups, and are not only found in pregnant women but also non-pregnant women and men. However, women particularly pregnant women are more susceptible than men, due to their short urethra and easy contamination of urinary tract with fecal flora (Tadesse *et al*., 2018).

In addition, lower socioeconomic status such as those leaving in shanty areas with poor health facilities and low-income earners who are unable to foot medical bills, sickle cell traits, diabetes mellitus, history of catheterization, multiparity, and history of urinary tract infection may contribute to the development of UTI in pregnancy (Ali *et al.*, 2018; Georgette *et al.*, 2022).

There is dearth of information on the prevalence of bacteriuria amongst pregnant women attending primary health care in informal settlement. Thus, the significance of the present study.

Materials and Methods

Description of the study Site

The study areas were three (3) Primary Health Care Centers namely; Bundu Primary Health Care Center, Potts Johnson Primary Health Care Centers and Churchill Primary Health Care center. The three study sites are located within the major informal settlements (slum) in Port Harcourt. A Map of the study area in Port Harcourt, Rivers State is as shown in Figure 1.

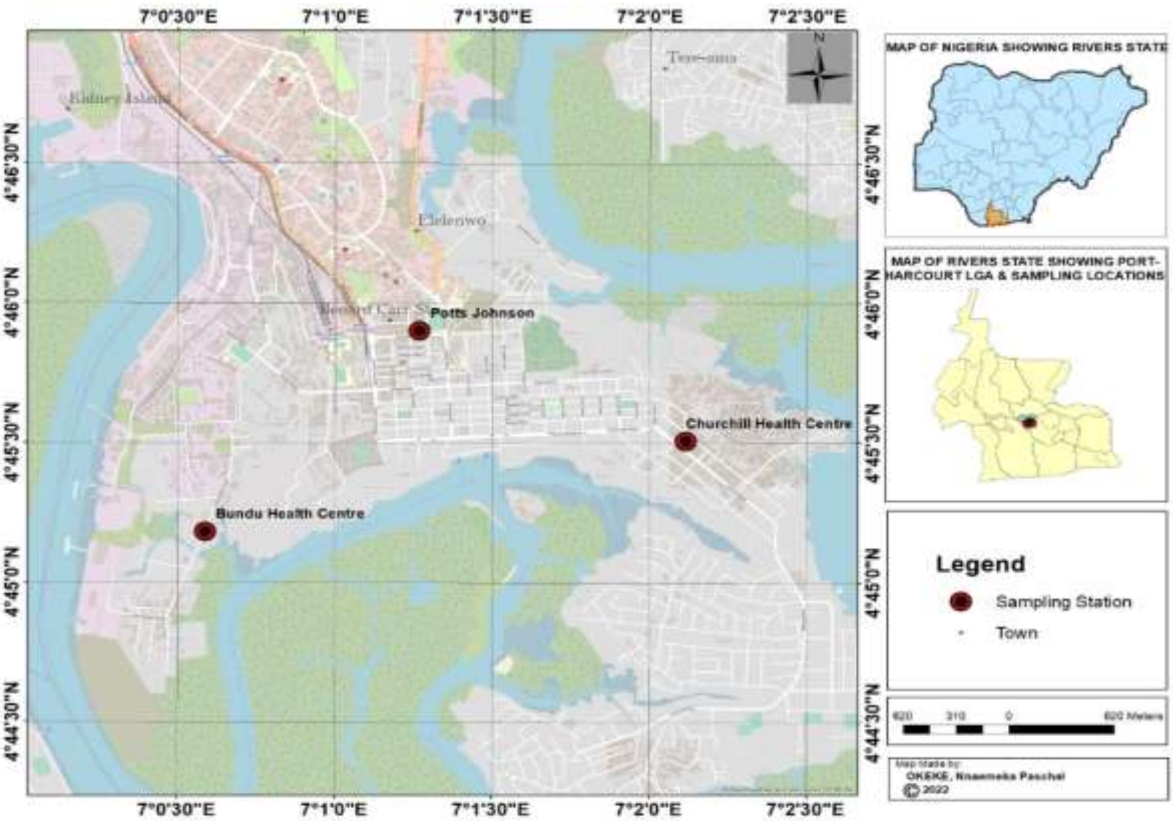

Fig.1: Map of the study area in Port Harcourt, Rivers State

Study Design and Sample Collection

The study was a descriptive cross-sectional study. A total number of two hundred (200) urine specimens from pregnant women were collected from the participants after adequate counselling and education at the different health care facilities. A total number of thirty (30) samples from non-pregnant women was also collected which served as control samples for the study.

The samples were collected using sterile universal bottles and were transported to microbiology laboratory of the Rivers State University, Port Harcourt for analysis. Questionnaire was administered to obtain the socio-demographic information. Thus, total number of 200 questionnaires was used to collect primary data from the pregnant women in the three major primary health care centers in the informal settlements of the slum waterfronts.

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Microbiological Analysis

One milliliter (1ml) of the urine sample was separately added to 9 ml of 0.1% peptone water diluent. After thorough shaking, further tenfold (v/v) serial dilutions were made by transferring 1 ml of the original solution to freshly prepared peptone water diluent to a range of 10^{-4} dilutions (Prescott *et al.*, 2005). An aliquot (0.1 ml) of the serially diluted urine sample from 10^{-4} dilutions were inoculated on surface dried nutrient agar in duplicates for enumeration of total heterotrophic bacterial population, while aliquot (0.1 ml) of the 10^{-1} dilution was inoculated on surface dried plates of MacConkey agar for total coliform population, Eosin Methylene Blue agar for *Escherichia coli*, and Mannitol salt agar for *Staphylococcal* population all in duplicates. The plates were spread evenly with flamed bent glass spreader and were incubated at 37ºC for 24 hours except for EMB plate that were incubated at 44.5ºC. Bacteria colonies that grew on the respective plates were enumerated as described by Prescott *et al* (2005). Bacterial colonies were counted and the mean expressed as cfu/ml using the formula below

$$\text{CFU/g} = \frac{\text{number of colonies}}{\text{Dilution x volume plated}}$$

Equation 1

Pure Culture Isolation and Maintenance

The discrete bacterial colonies that grew on the respective media were sub cultured using streak plate method onto freshly prepared nutrient agar and incubated at 37°C for 24 hours in order to obtain pure cultures. The pure bacteria cultures were then maintained according to the method adopted by Amadi *et al.* (2014) using ten percent (v/v) glycerol suspension and stored at -4°C.

Identification of the Isolates

Pure bacterial isolates were identified using standard microbiological methods (Cheesbrough, 2005). Biochemical tests: oxidase test, Catalase test, Indole test, methyl red test, Voges Proskauer test, Starch hydrolysis test, Urease test, Citrate test, Sugars fermentation test and Triple sugar iron agar test were adopted while gram-stained slides were used to identify the morphology of the isolate.

Results

The results of the mean variation of total heterotrophic bacterial counts (x10^6CFU/ml) of the urine samples for the different age group of the health care centers within Port Harcourt are presented in tables 1. Counts for samples from Bundu settlement ranged from 1.02 ± 0.02 x 10^6 cfu/ml (26 – 30 years) to 2.21 ± 0.51 x 10^6 cfu/ml (20 – 25 years) while the control was 0.25 ± 0.85 x 10^6 cfu/ml. Among the urine samples collected from Churchill settlement, the highest count (2.55 ± 0.32 x 10^6 cfu/ml) was obtained from the age group less than 20 years old while the lowest count (0.83 ± 0.62 x 10^6 cfu/ml) was obtained from the age group of 31 to 35 years old. The counts of the control (0.42 ± 0.21 x 10^6 cfu/ml) were the least counts of total heterotrophic bacteria obtained for this settlement was. Meanwhile, from Potts Johnson, the highest count (2.36 ± 0.37 x 10^6 cfu/ml) was obtained from the age group 20 to 25 years old while the lowest count (0.84 ± 0.17 x 10^6 cfu/ml) was obtained from the age group of 31 to 35 years old in the settlement. Despite the low counts, results showed that the control had the least count of 0.25 ± 0.17 x 10^6 cfu/ml (Table 1).

Table 1: Mean variation of total heterotrophic bacterial counts (x10^6 CFU/ml) of different Age group of the health care centers

Age Group	Total heterotrophic bacterial count (x 10^6CFU/ml) of the health care center			P-value
	Bundu	Churchill	Potts Johnson	
<20	1.79±0.16^a	2.55±0.32^b	1.58±0.75^a	0.0001
20 -25	2.21±0.51^a	1.97±0.74^a	2.36±0.37^a	0.3017
26 -30	1.02±0.02^b	2.27±0.63^a	1.33±0.79^{ab}	0.0302
31-35	1.03±0.85^a	0.83±0.62^a	0.84±0.17^a	0.7348
36-40	1.09±0.66^{ab}	1.02±0.92^a	1.8±0.23^b	0.0275
Control	0.25±0.12^a	0.42±0.21^a	0.25±0.17^a	0.1399

Means with different superscript showed Significant Difference along rows (p≤0.05)

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The result of the mean variation of total coliform counts (x10^{3}CFU/ml) of different age groups of the health care centers is as presented in Table 2. The results showed that at P<0.05 there were no significant differences between the count obtained from the different age groups except for those within the age group of 20 to 25 years old and 31 to 35 years old (Table 2).

The result of the variations in mean faecal coliform counts (x10^{3}CFU/ml) of different Age group of the health care centers is presented in Table 3. The faecal coliform counts of samples from the various the health care centers varied significantly (P<0.05) and the highest faecal coliform counts was recorded in Bundu (31-35 years) and Pott Johnson (< 20years) (Table 3).

Table 2: Mean variation of total coliform count of different age group of the health care centers

Age Group	Total coliform count (x 10^3 CFU/ml) of the health care center			P-value
	Bundu	Churchill	Potts Johnson	
<20	8.2±4.75 ^{a}	6.6±3.59 ^{a}	5.1±1.46 ^{a}	0.1817
20 -25	6.7±4.22 ^{a}	6.8±2.02 ^{c}	3.4±1.98 ^{b}	0.0219
26 -30	6.5±1.31 ^{a}	6.9±2.02 ^{a}	5.7±0.86 ^{a}	0.1877
31-35	3.2±0.99 ^{b}	5.8±1.96 ^{a}	3.6±2.16 ^{b}	0.0056
36-40	8.2±0.58 ^{b}	9.9±3.71b	3.9±1.6 ^{a}	<0.0001
Control	4.0±2.35 ^{b}	1.3±0.37 ^{a}	5.1±1.84 ^{b}	0.0001

Means with different superscript showed Significant Difference along rows (p≤0.05)

Table 3: Variations in mean faecal coliform counts of different age group of the health care centers

Age Group	Faecal coliform counts (x10^3 CFU/ml) of the health care center			P-value
	Bundu	Churchill	Potts Johnson	
<20	4.7±1.34 ^{a}	0.6±0.4 ^{a}	1.5±1.13 ^{b}	0.0001
20 -25	2.2±0.412 ^{a}	2.2±0.07 ^{a}	2.5±1.55 ^{a}	0.1000
26 -30	2.8±1.14 ^{a}	1.8±0.14 ^{a}	1.6±0.51 ^{a}	0.31
31-35	2.8±1.13 ^{ab}	3.9±0.4 ^{a}	0.7±0.68 ^{b}	0.0303
36-40	3.1±0.90 ^{a}	4.0±3.13 ^{a}	2.6±0.61 ^{a}	0.7502
Control	0.5±0.13 ^{a}	0.4±0.34 ^{a}	0.6±0.08 ^{a}	0.8371

*Means with different superscript showed Significant Difference along rows (p≤0.05)

The result of the percentage occurrences of bacteria isolated from urine samples of pregnant women from the different health care centers is shown in Table 4. The phenotypic characterization of the isolates showed that a total of eight genera were identified: *Bacillus*, *Enterobacter*, *Enterococcus*, *Escherichia*, *Klebsiella*, *Pseudomonas*, *Staphylococcus*, and *Streptococcus* spp. The overall percentage occurrences of the bacterial isolates were *Escherichia coli* (18%), *Staphylococcus aureus* (15%), *Enterobacter cloacae* (14%), *Enterococcus faecalis* (15%), *Klebsiella pneumoniae* (14%), *Pseudomonas aeruginosa* (13%), *Bacillus cereus* (5%) and *Streptococcus constellatus* (6%). The percentage occurrences of isolated bacteria from each primary health care centers are: Bundu, *Enterococcus faecalis* 17(22.97%), *Staphylococcus aureus* 14(18.92%), *Pseudomonas aeruginosa* 13(17.57%), *E. coli* 12(16.22%), *Enterobacter cloacae* 9(12.16%), *Klebsiella pneumoniae* 5(6.7%), *Streptococcus constellatus* 3(4.05%) and *Bacillus cereus* 1(1.35%) respectively; while Churchill, *E. coli* 23(23.47%), *Klebsiella pneumoniae* 14(14.29%), *Pseudomonas aeruginosa* 14(14.29%), *Staphylococcus aureus* 12(12.24%), *Enterococcus faecalis* 10(10.20%), *Streptococcus constellatus* 8(8.16%) and *Bacillus cereus* 5(5.10%) respectively; whereas Potts Johnson, *Enterobacter cloacae* 14(18.42%), *Staphylococcus aureus* 11(14.47%), *Enterococcus faecalis* 10(13.16%), *E. coli* 9(11.84%), *Pseudomonas aeruginosa* 6(7.89%), *Bacillus cereus* 6(7.89%) and *Streptococcus constellatus* 5(6.58%) respectively.

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Table 4: Occurrences (%) of the bacteria in urine of pregnant women from the different health care centers

Bacterial Isolate	Occurrence(%) of bacteria in urine of pregnant women from the health care centre			Cumulative occurrence (%)
	Bundu	Churchill	Potts Johnson	
Bacillus cereus	1(1.35)	5(5.10)	6(7.89)	12 (4.8)
Enterobacter cloacae	9(12.16)	12(12.24)	14(18.42)	35 (14.1)
Enterococcus faecalis	17(22.97)	10(10.20)	10(13.16)	37 (14.9)
Escherichia coli	12(16.22)	23(23.47)	9(11.84)	44 (17.7)
Klebsiella pneumoniae	5(6.70)	14(14.29)	15(19.74)	34 (13.7)
Pseudomonas aeruginosa	13(17.57)	14(14.29)	6(7.89)	33 (13.3)
Staphylococcus aureus	14(18.92)	12(12.24)	11(14.47)	37 (14.9)
Streptococcus constellatus	3(4.05)	8(8.16)	5(6.58)	16 (6.5)
Total	**74(100)**	**98(100)**	**76(100)**	**248(100)**

Legend: BUN = Bundu; CHC = Churchill; PJS = Potts Johnson, Number in parenthesis = percentages

The result of the prevalence of bacteriuria in pregnant women from the health care centers is presented in Figure 2. Out of the 70 urine samples analysed from Bundu primary health care center, 63 were positive giving a prevalence of 90%, of the 80 urine samples analysed from Churchill primary health care center, 75 were positive giving a prevalence of 93.8% while of the 50 urine samples analysed from Potts Johnson, 47 were positive giving a prevalence of 94% although there was no significant difference between the various location and bacteriuria ($p \leq 0.05$).

The result of the prevalence of bacteriuria in relation to age group is shown in Figure 3. The result showed a varied significance between the age groups and bacteriuria ($p \leq 0.05$). Bundu primary health care center had the highest bacteriuria prevalence among the age group 26 - 30 years (38.6%), Churchill primary health care center had the highest bacteriuria prevalence among the age group 31 - 35 years (28.7%) while Potts Johnson primary health care center had the highest bacteriuria prevalence among the age group 26 - 30 years (44%).

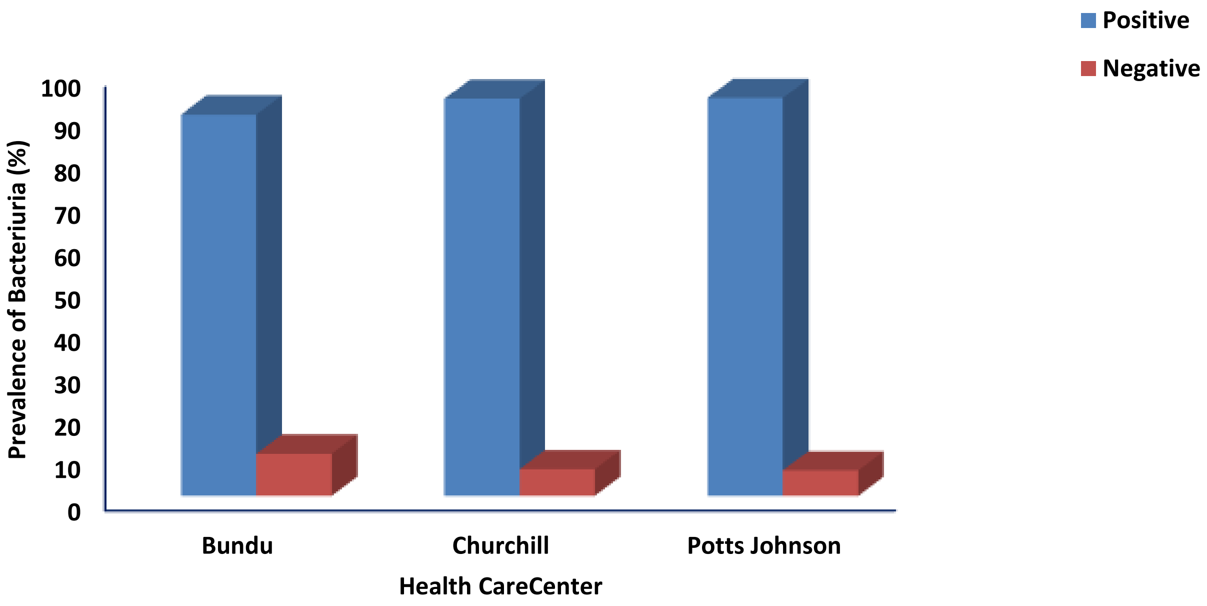

Fig. 2: Prevalence of Bacteriuria in pregnant women from the Health care centers

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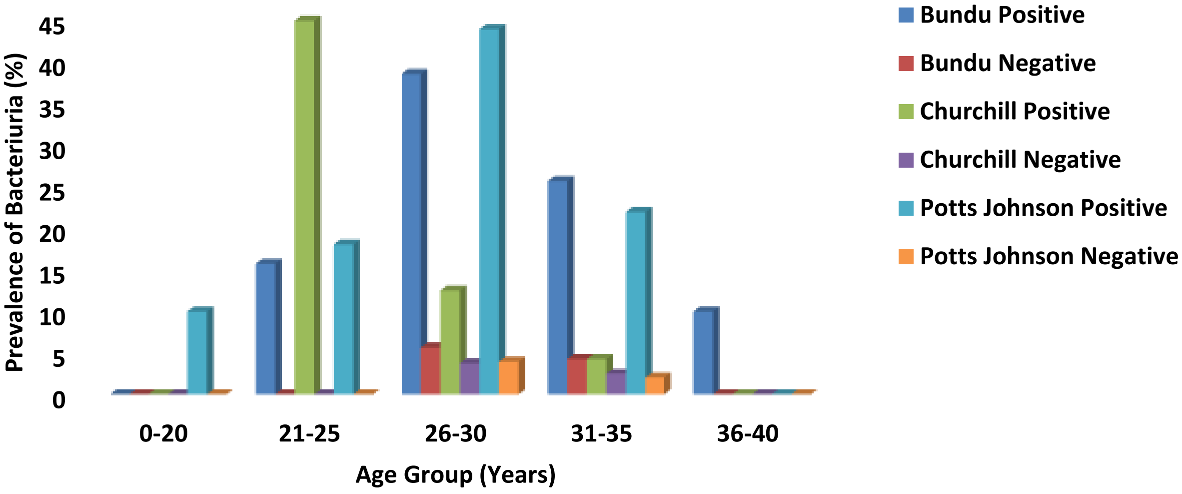

Fig. 3: Prevalence of Bacteriuria among the different Age group in the different locations

The result of the prevalence of bacteriuria in relation to marital status of the pregnant women is as shown in Figure 4. Results showed no significant difference between the marital status of the different health care centers and bacteriuria ($p \leq 0.05$). The highest prevalence of bacteriuria was recorded in married women in all primary health care centers of Bundu, Churchill as well as Potts Johnson with a prevalence rate of 44%, 43% and 37% respectively.

The result of the prevalence of bacteriuria in relation to educational status of the pregnant women is as shown in Figure 5.

Although, there was no significance between level of education and bacteriuria ($p \leq 0.05$), the result showed that the pregnant women with secondary level of education in Bundu, Churchill and Potts Johnson had the highest bacteriuria prevalence of 44.29%, 51.25% and 50% respectively. The prevalence of bacteriuria in relation to occupation of the pregnant women is as shown in Figure 6. Result showed no significant difference between occupation and bacteriuria ($p \leq 0.05$). Pregnant women who were self-employed in Bundu, Churchill and Potts Johnson had the highest bacteriuria prevalence of 40%, 45% and 32% respectively.

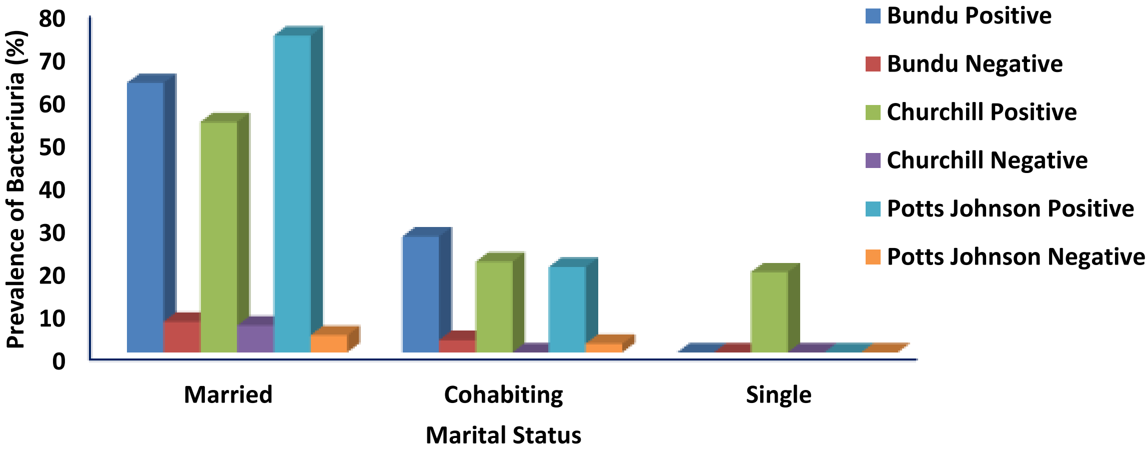

Fig. 4: Prevalence of bacteriuria in relation to the marital status of the pregnant women

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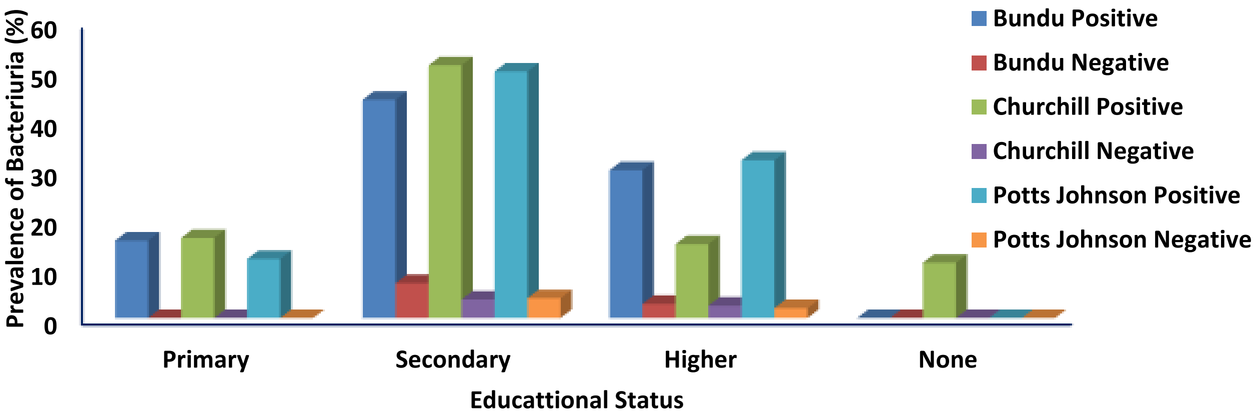

Fig. 5: Prevalence of Bacteriuria and in Educational status of pregnant women in the health centers

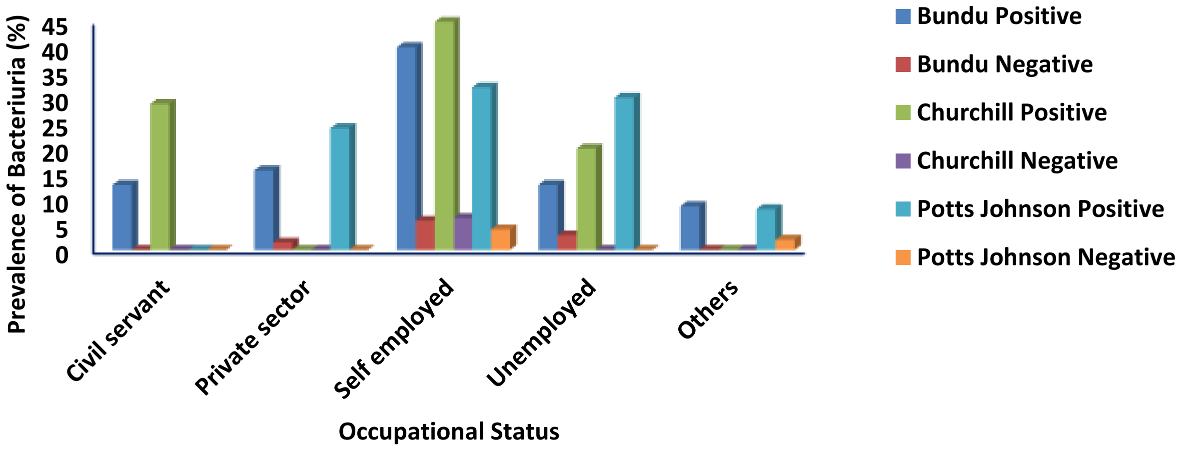

Fig. 6: Prevalence of Bacteriuria and occupational status of pregnant women in the health centers

The result of the prevalence of bacteriuria in relation to average monthly income of the pregnant women is as shown in Figure 7. Although, there was no significance between average monthly income (Naira ₦) and bacteriuria ($p \leq 0.05$), the result showed that the pregnant women earning between 20,000 - 50,000 in Bundu, Churchill and Potts Johnson had the highest bacteriuria prevalence of 60%, 61.25% and 58% respectively.

The result of the prevalence of bacteriuria in relation to trimester of pregnancy is as shown in Figure 8. The result showed that there was no significant difference between the trimester of pregnancy and bacteriuria($p \leq 0.05$). Bundu and Potts Johnson primary health care center had the highest prevalence of bacteriuria in pregnant women in their third trimester (34.29% and 48% respectively) while Churchill primary health care center had the highest bacteriuria prevalence in pregnant women in their second trimester (37.5%). The result of the prevalence of bacteriuria in relation to number of gravidas is as shown in Figure 9. Data showed that there was no significant difference between the number of gravidas and bacteriuria (($p \leq 0.05$). The result showed that Bundu primary health care center had the highest bacteriuria prevalence in pregnant women in their first and third and above gravidas (37.14% respectively), Churchill primary health care center had the highest bacteriuria prevalence in pregnant women in their first and second gravidas (37.75% respectively) while Potts Johnson primary health care center had bacteriuria prevalence in pregnant women in their first gravidae (40%).

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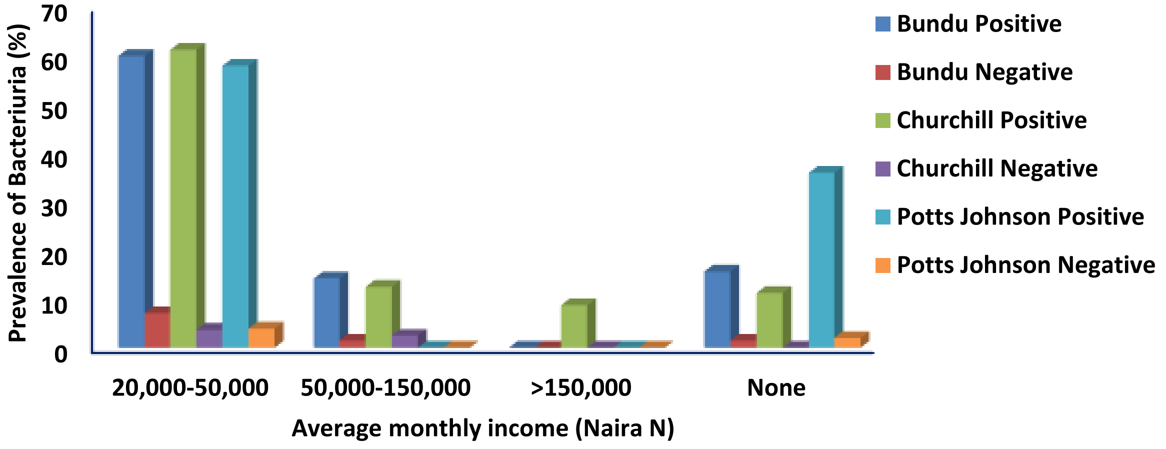

Fig. 7: Prevalence of bacteriuria and income class of the pregnant women of the health care centers

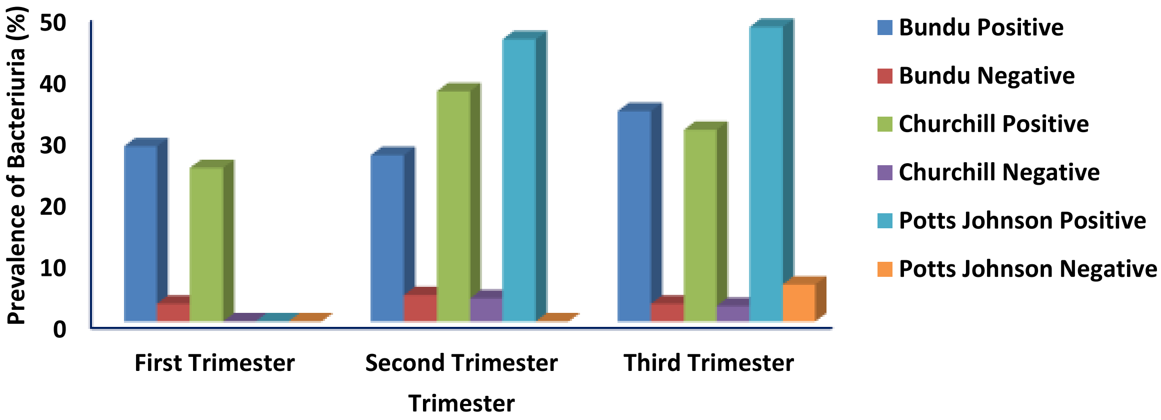

Fig. 8: Prevalence of bacteriuria in relation to the different trimesters

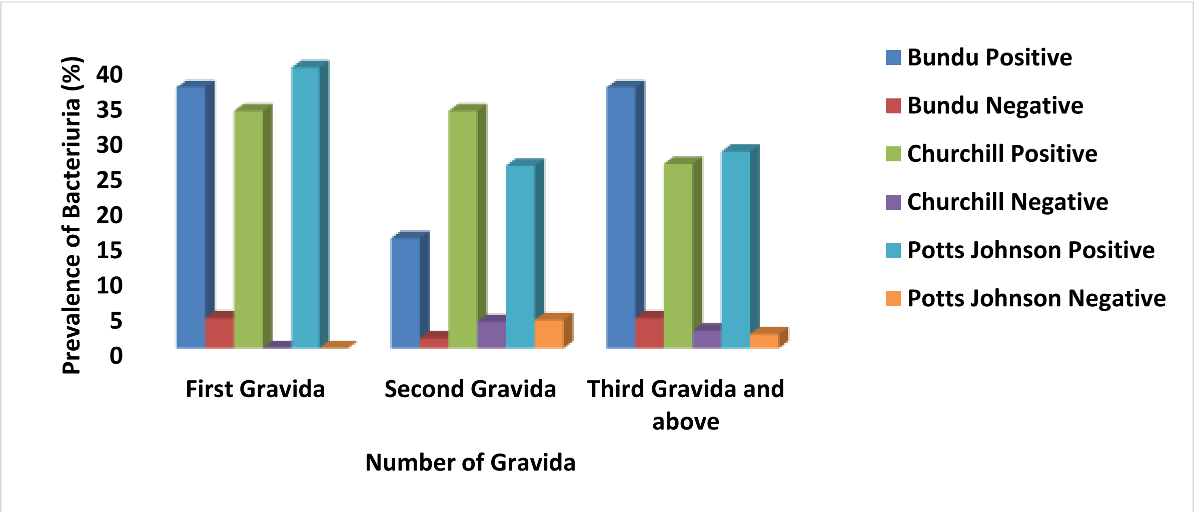

Fig. 9: Prevalence of bacteriuria and number of gravida of pregnant women of the health care centers

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Discussion

The bacteriological analysis of the urine specimens showed that the total heterotrophic bacterial, coliform and faecal coliform counts had significant growth as they exceeded 10^5 CFU/ml (Washington *et al.*, 2006). More so, the findings further showed that the presence of bacteriuria is mostly associated with the ages of 20-25, 26-30 and 31-35 years, respectively with low percentage detected in age of 0-20 years. In agreement with the present study is a report by Jim *et al.* (2020) who reported higher bacteriuria amongst pregnant women within the ages of 24-28 years and opined that the high prevalence amongst this age could be due to their high sexual activities. Also Elzayat *et al.* (2017) reported that bacteriuria seems to be more prevalent in women between the ages of 20 and 30 years due to their intense sexual activity that can introduce microorganisms from the perineum into the bladder and cause mild urethral damages.

The bacterial isolates in the urine specimens of the pregnant women has been reported in previous studies. Okorondu *et al.* (2013) isolated *E. coli, Klebsiella* sp, *Staphylococcus* sp, *Streptococcus* sp and *Pseudomonas* sp from urine of pregnant women which agreed with the present study. Although the bacterial genera in the present study varied from those reported by Mwei *et al*. (2018), both studies are similar in respect to the presence of *E. coli, Streptococcus* sp and *Klebsiella pneumonia* in the urine of the pregnant women. In another study *E. coli, S. aureus, Proteus mirabilis, Enterococcus* sp, *Streptococcus* sp and *Neisseria gonorrhoea* were isolated from asymptomatic bacteriuria of pregnant women (Oko *et al*., 2017). *Escherichia coli* was the most prevalent bacteria isolated, followed by *S. aureus* while *Streptococcus constellatus* was the least prevalent. In a previous study, *E. coli* was reported as the most frequent bacterial isolates responsible for bacteriuria (Nwokah, 2015; Obirikorang *et al.*, 2012). In a similar study, *E. coli* was reported as the most frequent bacterial isolates (Oli *et al.*, 2010). More so, Jim *et al*. (2020) reported that *E. coli* (71.4%) was the most prevalent isolate followed by *S. aureus* (14.3%). Although the prevalence of *E. coli* in their study was higher than the prevalence reported in the present. This disparity could be attributed to the number of infected populations in their study which is higher than the present study. Additionally, the proximity of the anal and urogenital openings in females, which allows faecal contamination of the urinary tract from commensals of the bowel of which *E. coli* is a typical example, and the anatomical and physiological changes that occur during pregnancy may be responsible for the high risk of *E. coli* (Oli *et al.*, 2010) and other bacterial isolates in the urinary tract. The presence of some species of these bacterial isolates in the urine of pregnant women could lead to urinary tract infections. *E. coli, Staphylococcus aureus, Klebsiella aerogenes, Pseudomonas aeruginosa, Proteus* spp. *Streptococcus faecalis* and *Enterobacter* spp have been reported as the major cause of urinary tract infections (Amala *et al.*, 2015; Derbie *et al*., 2017; Obiogbolu *et al.*, 2020; Tadesse *et al.*, 2018; Yasin *et al.*, 2020, Hanson *et al*., 2023).

The demographic information influenced the presence of bacteria in the urine of the pregnant women in all three locations. For instance, the age, sex life, marital status and education all influenced the presence of bacteria in the urine of these pregnant women. This signified that the age has a close relationship between the level of bacteriuria in the population. High bacteriuria was recorded in married pregnant women than unmarried pregnant women in the present study. This could imply that marital status does not influence the presence of bacteria in the urine of pregnant women. This agreed with Jim *et al*. (2020) who reported a high prevalence (10.3%) of bacteriuria in married women compared to the unmarried women.

The presence of bacteria in urine of both married and unmarried pregnant women has been reported in previous study. Essien *et. al.* (2015) in their study reported that 10.7% among the singles had bacteriuria while bacteriuria was detected in only 13.6% of married women. Findings in the level of education amongst the studied population showed that only 15% had primary education while 53% and 28% had secondary and higher education. About 11.25% of the population has no education. Level of education and awareness of bacteriuria is a key part of preventing or controlling bacteriuria. This implied that pregnant women who are exposed to higher form of education and are aware of UTI tend to observe or practice good hygiene. Thus, the reduced level of bacteriuria in educated pregnant women. In a previous study, pregnant women without higher form of education was reported to have the highest incidence (27.5%) of bacteriuria as they have poor knowledge and practice of personal hygiene in pregnancy (Oli *et al.*, 2010). The presence of bacteria in the urine of the respondents could be as a result of the different anatomical changes as well as other activities such as sex, age, exposure to the outside environment during urination and other factors.

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In a previous study, it was reported that the dilatation of urethra, increased bladder volume, decreased bladder tone, along with decreased urethral tone and the presence of glucose in urine were factors that contributed to the chances of bacterial growth in urine (Taye *et al.,* 2018). Findings further showed that the level of education have impact on the presence of bacteria in the urine of the pregnant women. There was a relationship between the presence of bacteria in the urine and the average monthly income. Despite no significant difference (P<0.05) observed, findings showed that a higher percentage of the population of those not earning monthly income, those within the income range of 20,000-50, 000 and 50,000-150,000 had detectable bacteriuria while a very low percentage of the respondents earning above 150,000 had the least bacteria in the urine. This could imply that those earning higher could afford good medical services including the purchase of drugs. Findings of the impact of trimester of pregnancy on bacteriuria showed that there was no significant difference (P<0.05) between the amount of bacteriuria detected in the 1st, 2^{nd} and 3^{rd} trimester of pregnancy despite the disparity observed. More so, it was observed that the 2^{nd} and 3^{rd} trimester had the highest bacteriuria cases than the 1^{st} trimester. In a previous study, increased incidence of infection in pregnant women in the third trimester was reported to be associated decreased polymorphonuclear leukocyte adherence (Brian and Pamela, 2003). Moreover, progesterone's ability to relax smooth muscles and the pressure the expanding uterus puts on the ureters cause relative urine stasis in the upper urinary system, which promotes bacteriuria (Oli *et al*., 2010). The present study is in agreement with previous study which also highlighted that the disparity in bacteriuria amongst the pregnant women could be attributed to differences in research locations, community health status, the standard of living (socio-economic status), level of health education, availability of health care services and poor genital health practices by these pregnant women who find it difficult to clean their anus or genital after defecating or urinating (Oko *et al*., 2017). This study also agreed with Nicole *et al.* (2005) that prevalence of bacteriuria amongst pregnant women in a population is influenced by age, sex, and the presence of genitourinary abnormalities. This present study has revealed a generally high prevalence of bacteriuria and its associated risk factors in pregnant women who accessed the health care facilities in all three studied locations. Therefore, public health education, campaigns and investigation of risk factors associated with such occurrences is recommended.

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