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Incidence of Asymptomatic Bacteriuria among Pregnant Women Attending Federal Medical Center, Katsina

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Abstract
Asymptomatic bacteriuria is common among pregnant women and it is frequently associated with adverse pregnancy outcomes leading to maternal and fetal morbidity and mortality. The burden of asymptomatic bacteria in pregnancy has not been previously evaluated in this environment. Therefore, the study aimed to determine the prevalence of asymptomatic bacteriuria and its clinical correlate among pregnant women attending Federal Medical Center, Katsina. The study was a prospective study conducted among 126 antenatal attendees from 19th September – 4th November 2017. Urine microscopy and culture technique were conducted for each participant. The prevalence of asymptomatic bacteriuria among pregnant women was 19.8% and only gestational age and tribe had significant association with asymptomatic bacteriuria (p = 0.02) respectively however age (p = 0.66), educational status (p = 0.19) and settlement (p = 0.91) showed no significant association. *Staphylococcus aureus* was the most prevalent organism (40%), followed by coagulase negative *Staphylococcus* (32%) while *Eschericia coli* was least prevalent organism (4%). Asymptomatic bacteriuria is not uncommon among pregnant women in this environment; as such urine culture should be routinely carried out as part of antenatal care package for early detection and prevention of possible complications of urinary tract infections in pregnancy.
Key Words: Asymptomatic bacteriuria, urinary tract infection, pregnant women, antenatal care

INTRODUCTION

Asymptomatic bacteriuria is characterized by the presence of actively multiplying bacteria in the urinary tract excluding the distal urethra without any obvious sign or symptom and its laboratory confirmation require isolation of at least10^5 colony forming units of bacteria per milliliter of properly collected and transported midstream urine.(Kenneth *et al.*, 2017;Hagos *et al.*, 2014;Akinlola *et al.*,2012).The prevalence of asymptomatic bacteriuria in general population is 2% but increased among pregnant women (Clare *et al.*, 2017;Kisanet*et al.*, 2014). This high prevalence of asymptomatic bacteriuria during pregnancy is due to both hormonal, physiological and mechanical changes that occur in pregnancy such as increased level of hormones and alkalinisation of urine and compression of ureters by the enlarging uterus (Ebele *et al.*, 2017). Collectively these changes facilitate colonization of the urinary tract by microorganisms such as *Staphylococcus aureus*, *Eschericia coli*, *Klebsiella* and *Proteus* species and presence of these organisms in the urinary tract predisposes the pregnant women to contraction and chorioamnionitis (Ebele *et al.*, 2017;Salman *et al.*, 2013;Lawani *et al.*, 2015).However, in spite the high rate of asymptomatic bacteriuria in pregnancy and its attendant complication, there is no study that previously determined the prevalence of asymptomatic bacteriuria among pregnant women in this environment. This study was carried out to determine the prevalence of asymptomatic bacteriuria and its clinical correlate among pregnant women assessing antenatal care at the Federal Medical Center, Katsina.

MATERIAL AND METHODS

This was a prospective cross sectional conducted among 126 antenatal care attendees at Federal Medical Centre, Katsina from September to November, 2017. All pregnant women on admission in the hospital wards and those with in-dwelling urinary catheter, diabetes mellitus and human immunodeficiency virus infection were excluded from other pregnant women with symptoms of bacterial infections.

Bio- demographic data and medical history of the participants were obtained by structured interviewer administered questionnaire. Informed consent was obtained from each participant and study was approved by the Research Ethics Committee of Federal Medical Centre Katsina with protocol number FMCNHREC.REG.N003/082012.

Early morning clean catch mid-stream urine sample was collected in to a dry, wide-necked leak proof sterile universal container and processed within 1 hour at Microbiology Laboratory of Federal Medical Centre, Katsina. A method of Cheesbrough (2009) was adopted in carrying out the analysis of the urine sample. The 10mls of well mixed urine was aseptically transferred into a centrifuge tube and centrifuged for 5 minutes. After being centrifuged, the supernatant was poured away and the pellet was remixed by tapping. A drop of the pellet was placed on a clean grease-free glass slide, covered with a cover slip and viewed under 10x and 40x objective lenses for the presence of casts, pus cells and epithelial cells which signifies urinary tract infections. Culturing of the Urine Sample was done after preparation of the following media according to manufacturer's instructions: Blood Agar, Cystein Lactose Electrolyte Deficient (CLED) Agar, MacConkey Agar and Mannitol Salt Agar (MSA). Each medium was prepared and poured into a sterile petri dishes aseptically and allowed to cool. A loop full of the urine was inoculated into the culture media by the use of a sterile wire-loop. The inoculated culture media was incubated at 37°C in the incubator for 24hours in an inverted format. After 24hours of incubation, the culture plates were examined macroscopically for growth of the microorganisms and the characteristics of each colony was noted for further analysis. Grams reaction and Biochemical tests were conducted accordingly. The biochemical tests conducted include Indole test, Methyl red tests, Vogesproskauer's test, Citrate utilization test, Coagulase test, Catalase test and Urease test.

The data obtained was analysed at 95% confidence interval using Graph Pad Prism statistical software version 5.02 and a *p*-value < 0.05 was considered statistically significant.

RESULTS

The Table (1) shows the total number of pregnant women examined for asymptomatic bacteriuria (126). Out of which 25 (19.8%) emerged positive and 101 (80.2%) emerged negative. Therefore the incidence of asymptomatic bacteriuria within the study area was 19.8%.

The Table (2) shows the relationship between asymptomatic bacteriuria and the age group during the cohort study. The group which falls between 26 -30 recorded the highest (7.94%) during the study followed by the age group of 21-25 (5.56%) and the least was among age group 36 -40 (0.79%). Despite the high percentage of asymptomatic bacteriuria seen at age group 26-30 and the least with 0.79%, there was no statistical difference between the groups. (P value = 0.66)

The Table (3) shows the relationship between asymptomatic bacteriuria and educational status. Those with secondary and tertiary level of education among pregnant women had the highest occurrence of asymptomatic bacteriuria (11.90% and 6.39%) respectively. While those with lower level of education had the least occurrence. Therefore asymptomatic bacteriuria in relation to educational status was not statistically significant (P value= 0.19)

The Table (4) shows the percentage of asymptomatic bacteriuria in relation to Settlement. Those in the urban area had the highest percentage of occurrence in both positive and negative results (18.25% and 76.19%) respectively. Followed by the Semi-Urban which had the positive result of (1.59%) and negative result (3.97%). None were examined among the rural area. Therefore asymptomatic bacteriuria in relation to settlement was not statistically significant (P value= 0.91).

The Table (5) shows the percentage of asymptomatic bacteriuria in relation to tribe. The Hausa tribe had the highest occurrence of positive and negative asymptomatic bacteriuria (14.29% and 57.14%) respectively. Followed by the Igbo tribe who had a high positive prevalence (3.17%) and the least negative prevalence (1.59%). Other tribes and the Yoruba's had the least positive result (1.59% and 0.79%) respectively but have high negative result (14.29% and 7.14%) respectively. Therefore asymptomatic bacteriuria among ethnic groups was significant (P value= 0.02)

The Table (6) shows the percentage of asymptomatic bacteriuria in relation to gestational age (Trimester). There was a high positive prevalence in the third trimester followed by the second and lastly the first trimester (12.70%, 6.35% and 0.79%) respectively. On the other hand, the second trimester had the highest negative prevalence followed by the thirst and first (45.24%, 27% and 7.94%) respectively. Asymptomatic bacteriuria in relation to trimester was statistically significant (P value= 0.02).

The Figure (1) shows the comparison of asymptomatic bacteriuria between age and trimester. Asymptomatic bacteriuria in the first trimester was not observed in all ages except for age group 31- 35. However, asymptomatic bacteriuria in the second trimester was observed in age groups 21-25, 26-30 and 31-35 with a percentage of (16%, 8% and 8%) respectively. Moreover, asymptomatic bacteriuria in the third trimester was observed in all age groups in which age group 26-30 recorded the highest prevalence (32%).

The Table (7) shows the results of urine culture analysis in which 19.8% were recorded with significant growth, 48.4% with insignificant growth and 31.7% with no growth.

The Table (8) shows the profile of bacteria isolated from cases of significant bacteriuria. *Staphylococcus aureus* was found to be the most prevalent organism (40%) followed by Coagulase negative *Staphylococcus* (32%) and the least was *Escherichia coli* (4%).

Results of the Odd Ratio and Relative Risks Analysis

Table10 shows the odd ratios and relative risks of the age groups at 95% confidence interval observed with respect to asymptomatic bacteria in Federal Medical Centre Katsina. Age groups 15-20 and 21-25 have an odd ratio and relative risk of 1.1 each. Age groups of 26-30 and 31-35 have odd ratio of 2.0 and relative risk of 1.7.Age groups 31-35 and 36-70 have odd ratio of 1.7 and relative risk of 1.6. The least odd ratio and relative risk was observed in age group15-20 and 21-25.

Table 11 shows the odd ratios and relative risks of the educational levels of samples observed at 95% confidence interval with respect to asymptomatic bacteria in Federal Medical Centre Katsina. Comparison between primary and tertiary levels of education gives an odd ratio and relative risk of 3.27 and 2.13.Tertiary and secondary educations resulted in odd ratio of 0.58 and relative risk of 0.64 which was the least.

The odd ratio and relative risk of samples observed during the study with respect to settlement was less than 1 (Table 12). The odd ratio was 0.59 while the relative risk was 0.67.

Table 13 shows the odd ratios and relative risks of the type of settlement of the samples observed at 95% confidence interval with respect to asymptomatic bacteria in Federal Medical Centre Katsina. Comparing Hausa and Igbo tribes resulted to 0.13 odd ratios and 0.30 relative risks. Comparing Hausa and Yoruba resulted to odd ratio of 2.3 and 2.0 relative risk.

Table 1: Incidence of Asymptomatic Bacteriuria among Pregnant Women Attending Federal Medical Center Katsina

Total Number Examined	Number of Positive result	(%)	Number of Negative result	(%)
126	25	19.8	101	80.2

Table 2: Percentage of Asymptomatic Bacteriuria among Age groups of Pregnant Women at Federal Medical Center Katsina

Age-range	Total number examined	Number of positive result	(%)	Number of negative result	(%)
15-20	10	2	1.59	8	6.35
21-25	39	7	5.56	32	25.40
26-30	36	10	7.94	26	20.60
31-35	31	5	3.99	26	20.60
36-40	10	1	0.79	9	7.14
Total	**126**	**25**	**19.87**	**101**	**80.09**

- x^2 = 2.391 , df = 4 , P value = 0.66

Table 3: Percentage of Asymptomatic Bacteriuria in relation to Educational Status of Pregnant Women at Federal Medical Center Katsina

Educational Status	Number examined	Number of positive result	(%)	Number of negative result	(%)
Primary	4	2	1.59	2	1.59
Secondary	64	15	11.90	49	38.89
Tertiary	53	8	6.35	45	35.71
None	5	0	0	5	3.97
Total	**126**	**25**	**19.84**	**101**	**80.16**

- x^2 = 4.796,df = 3,Pvalue = 0.19

Table 4: Percentage of Asymptomatic Bacteriuria in relation to Place of Settlement of Pregnant Women at Federal Medical Center Katsina

Settlement	Number examined	Number of positive result	(%)	Number of negative result	(%)
Urban	119	23	18.25	96	76.19
Semi-urban	7	2	1.59	5	3.97
Rural	0	0	0	0	0
Total	**126**	**25**	**19. 84**	**101**	**80.16**

- x^2 = 0.0117, df = 1, P value =0.91

Table 5: Percentage of Asymptomatic Bacteriuria in relation to Tribe of Pregnant Women at Federal Medical Center Katsina

Tribe	Number examined	Number of positive result	(%)	Number of negative result	(%)
Hausa	90	18	14.29	72	57.14
Igbo	6	4	3.17	2	1.59
Yoruba	10	1	0.79	9	7.14
Others	20	2	1.59	18	14.29
Total	**126**	**25**	**19.84**	**101**	**80.16**

- x^2 =10, df = 3, P value = 0.02

Table 6: Percentage of Asymptomatic Bacteriuria in relation to Gestational Age (Trimester) of Pregnant Women at Federal Medical Center Katsina

Trimester	Number examined	Number of positive result	(%)	Number of negative result	(%)
First	11	1	0.79	10	7.94
Second	65	8	6.35	57	45.24
Third	50	16	12.70	34	27.00
Total	**126**	**25**	**19.84**	**101**	**80.18**

- x^2 =7.8, df = 2, P value = 0.02

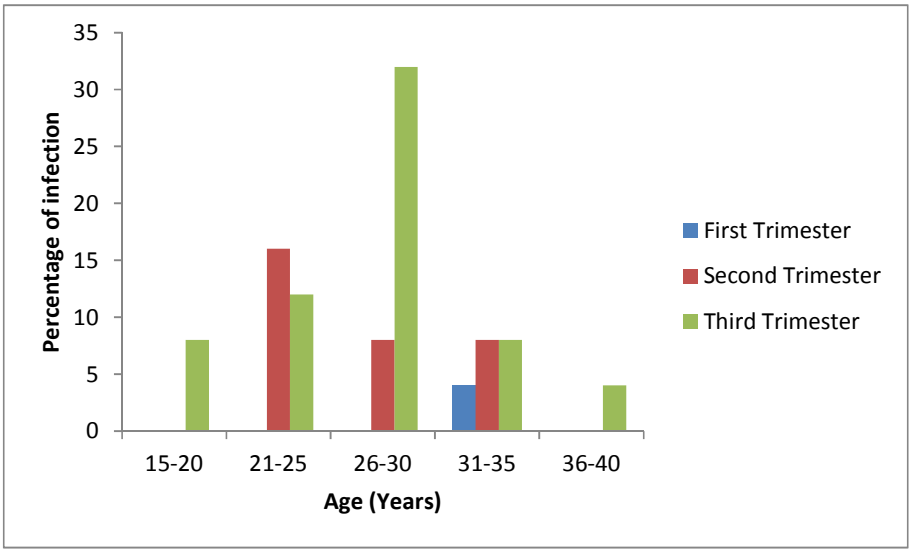

Figure 1: Comparison of Asymptomatic Bacteriuria between Age and Gestational Age (trimester) of Pregnant Women at Federal Medical Center Katsina

Table 7: Results of Urine Culture analysis of Pregnant Women at Federal Medical Center Katsina.

Cases	Number	(%)
Significant growth	25	19.8
Insignificant growth	61	48.4
No growth	40	31.7
Total	**126**	**99.99**

Key: Significant growth = Production of 100 colonies by 0.001ml loop full of urine.

Table 8: Profile of Bacteria isolated from cases of significant bacteriuria

Type of microorganisms	Number	(%)
Staphylococcus aureus	10	40
Coagulase negative *Staphylococcus*	8	32
Klebsiella species	4	16
Eschericia coli	1	4
Streptococcus species	2	8
Total	**25**	**100**

Table 9: Biochemical, Gram reaction and morphological characteristics of the microorganisms

Characteristics	Microorganisms				
	S. aureus	***E. coli***	**Coag.neg. *Staph***	***Kleb spp.***	***Strep. spp***
Biochemical reaction					
Catalase test	+	-	+	-	-
Coagulase test	+	-	-	-	-
Indole test	-	+	-	-	-
Methylred test	-	+	-	-	
Voges-proskauer test	-	-	-	-	-
Citrate test	-	-	-	+	-
Urease test	-	-	-	+	-
Gram reaction					
Gram positive	+		+		+
Gram negative		-		-	
Morphological characteristics					
M.S.A	Yellow C				
C.L.E.D	Golden Y C	Large Y C	Golden Y C	Mucoid C	
MacConkey		Pinkish C		Pinkish M C	
Blood	Beta H				Alpha H

Key

+ =Positive reaction
- = Negative reaction
M = Mucoid
C = Colonies
H = Haemolysis
Y = Yellow

Table 10: Odd ratio and relative risks of the age groups with respect to asymptomatic bacteria in Federal Medical Centre Katsina.

Age group (s)	Odd ratio	Relative risk
15-20		
21-25	1.1	1.1
26-30		
31-35	2.0	1.7
31-35		
36-70	1.7	1.6

Table 11: Odd ratio and relative risks of educational level with respect to asymptomatic bacteria in Federal Medical Centre Katsina.

Educational Level (s)	Odd ratio	Relative risk
Primary Tertiary	3.27	2.13
Tertiary Secondary	0.58	0.64

Table 12: Odd ratio and relative risks of settlement with respect to asymptomatic bacteria in Federal Medical Centre Katsina.

Settlement (s)	Odd ratio	Relative risk
Urban Semi urban	0.59	0.67

Table 13: Odd ratio and relative risks of tribes with respect to asymptomatic bacteria in Federal Medical Centre Katsina.

Tribe (s)	Odd ratio	Relative risk
Hausa Igbo	0.13	0.30
Hausa Yoruba	2.3	2.0

RR = 1 indicates equal rate of infection between the two groups
RR > 1indicates increased risk of infection for grp in numerator
RR < 1indicates decreased risk of infection for grp in numerator

DISCUSSION

The prevalence of asymptomatic bacteriuria among pregnant women in this study was 19.8% (Table 1). The prevalence in this study have agreed with the previous studies which reported the prevalence of 21.5% in Kenya and 21.0% in Ibadan(Adelaide *et al.,* 2017). This was higher than the study conducted in Kano that found prevalence at 9% (Aminu and Aliyu 2015). There are however other studies that reported higher prevalence of 40% at Ilorin(Akinlola *et al.*, 2012) and 45.3% at Benin city (Erhunmwunse *et al.*, 2010).

There was no statistical difference among age group (P = 0.66) and educational status (P = 0.19) which agreed with the findings in Kenya (Adelaide *et al.*, 2017) in relation to asymptomatic bacteriuria. Also there was no statistical significance between asymptomatic bacteriuria and settlements (P = 0.91) in this study.

The age range between 26– 30 had the highest prevalence of 7.94% and the least was 36-40 at 0.79% (Table 2) this may be as a result of sexually activity which increases the risk of urinary tract infections in such unlike the age group between 36-40. This report is similar to that of (Afroza *et al., 2012).*

Those with secondary education had the highest prevalence of 11.90% followed by tertiary at 6.35%, primary 1.59% and none was recorded in those that didn't attend school (Table 3). This is because of the use of soaps and perfumes in the vaginal area which prone the region to urinary tract infections.

Those in the Urban had the highest prevalence of 18.25% followed by semi- urban at 1.59% none came from the rural region (Table 4). This is because the hospital is located in the urban region, it is quite far from the semi- urban and rural regions and also quite expensive.

However tribe (P = 0.02) is shown to be statistically significant. Hausa tribe had the highest prevalence 14.29%, followed by Igbo 3.17%, others 1.59% and Yoruba 0.79% (Table 5). This is because majority of the tribes examined were Hausa as the study was undertaken in the Northern part of the country.

Gestational age of pregnancy (trimester) (P = 0.02) was statistically significant in this study. Third trimester had the highest prevalence of 12.70 % followed by second trimester 6.35% and lastly first trimester 0.79% (Table 6). This is possibly due to the pressure effect of the uterus on the ureter and the increasing pressure on the bladder which may lead to stasis of urine which will encourage bacterial multiplication as well as immunosuppressive effect of pregnancy which is mostly pronounced in the third trimester as reported by (Akinlola *et al.,* 2012).

Furthermore Figure 1 in this study demonstrates the presence of asymptomatic bacteriuria across most of the active productive ages with the increase in gestational ages of the pregnancy. This comply with the previous study as reported(Amadi *et al.*, 2007).

The bacteria isolated from urine cultures were *Staphylococcus aureus*(40%), coagulase negative *Staphylococcus* (32%), *Klebsiella* spp(16%), *Streptococcus* spp(8%) and *Eschericia coli* (4%). *Staphylococcus aureus* was the most common uropathogen isolated in this study (40%) which agreed with the earlier studies conducted at Benin city (Akerele *et al.*,2001), Illorin(Ajayi *et al.*, 2012) and Ebonyi(Amadi *et al.*, 2007). More so, *Eschericia coli* was found to be the least prevalent in our study with 4% which is similar to a study conducted in Kano that indicated low prevalence of *Eschericia coli* among asymptomatic bacteriuria (Aminu and Aliyu 2015). However it is contrary to the recent study conducted at Kenya (Adelaide *et al.*, 2017) and other previous study conducted at South Eastern part of Nigeria (Ibezim *et al.*, 2010) which showed *Eschericia coli* as the most prevalent organism.

The low odd ratio (10) in the age group 15-20 and 21-25 indicated that the two age groups have equal chance of asymptomic bacteriuria infection. Similarly the low relative risk (10) had shown that neither the two groups have increased risk of Asymptomic bacteriuria infection. Odd ratio of 2.0 in the age groups 26-30 and 31-35 indicated that that the age group 26-30 are 2 times higher to get asymptpmic bacteriuria than the age group 31-35. Furthermore, the RR of 1.7 indicated that that the age group 26-30 were 1.7 times as likely to develop asymptomic bacteriuria than the age group 31-35.In other words, the relative risk has shown that age group 26-30 have high risk of getting Asymptomic bacteriuria than the other age group.

The level of education acquired by the samples studied has great effect on the prevalence of Asymptomic bacteriuria. The high value of OR and RR obtained in comparison between primary and tertiary level of education had shown that there is high chance of getting the Asymptomic bacteriuria in primary school than in the tertiary institution. Similarly, the risk associated with getting Asymptomic bacteriuria is higher in primary school than the tertiary institutions such as polytechnics, colleges of education and universities.

The low level of OR obtained in comparison of the samples settlement (urban and semi urban) had shown that both the two groups have equal chance of infection and there is also decreased rate of infection in urban areas due to the low level of relative risk. This may be because of the availability of healthy environment in the urban areas for prevention, as well as proximity to health centres, clinics and hospitals compared with the semi urban or rural areas.

Low levels of OR and RR in comparison between Hausa and Igbo has indicated that both the two tribes have equal chance of getting infected with Asymptomic bacteriuria with risks of getting infected decreased in Hausa tribe. However, comparison between Hausa and Yoruba had shown that that Hausa tribe has more chance of infected with Asymptomic bacteriuria and high risk than Yoruba tribe!

CONCLUSION

The incidence of asymptomatic bacteriuria among pregnant women attending Federal Medical Center Katsina was high (19.8%).Tribes and trimester were found to have statistical influence on asymptomatic bacteriuria. Tribally, Hausa tribe has more chance of infected with Asymptomic bacteriuria and high risk than Yoruba tribe!

Recommendation

Screening and treating asymptomatic bacteriuria should be implemented in antenatal regardless of educational background as asymptomatic bacteriuria might cause pre-eclampsia, premature birth, preterm and fetal growth retardation.

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