

Prevalence of Significant Bacteriuria in Asymptomatic Pregnant Women Visiting the Antenatal Care Out Patient Department of a Tertiary Care Hospital

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ABSTRACT

Urinary tract infection (UTI) is the extension of microbial invasion anywhere between renal cortex of the kidney to the urethral meatus. Anatomically UTI can be classified into lower urinary tract infection involving the bladder and urethra and upper urinary tract infection involving the kidney, pelvis, and ureter. The high prevalence of asymptomatic bacteriuria during pregnancy, the significant consequences for women and for pregnancy along with the ability to avoid sequelae with treatment justifies screening of pregnant women for bacteriuria

The Study was undertaken with the following objectives:

1. To determine the trimester wise prevalence of asymptomatic bacteriuria in pregnant women attending the Antenatal Care Out Patient Department of Jorhat Medical College and Hospital.

2. To determine the antibiotic sensitivity of the isolated organism.

A total of 113 participants were included in the study population belonging to all the three trimesters of pregnancy, attending the Antenatal Care OPD of Jorhat Medical College Hospital. Information on socio-demographic profile and personal habits were obtained using pre-tested and pre-formed questionnaires. Urine culture and

antimicrobial susceptibility testing was done for all samples.

The overall prevalence of asymptomatic bacteriuria was found to be 17.69%. Also, it was found that prevalence was higher in primigravidas (70%) and during second trimester (50%). The antibiotic susceptibility testing revealed that 100% of isolates were sensitive to Ciprofloxacin and Ceftriaxone followed by Cefotaxime (90%) and Gentamicin (80%).

Keywords: Significant bacteriuria, Pregnant Women, UTI

INTRODUCTION

Urinary tract infection (UTI) can be defined as the extension of microbial invasion anywhere between renal cortex of the kidney to the urethral meatus^[1]. Anatomically UTI can be classified into lower urinary tract infection involving the bladder and urethra and upper urinary tract infection involving the kidney, pelvis, and ureter. The majority of Urinary tract infection occurs due to ascending infection^[2,3]. Also, urinary tract infection may be divided into symptomatic and asymptomatic. Kass in 1956 defined asymptomatic bacteriuria (ASB) as “a condition characterized by the absence of symptoms of acute UTI at a time when true

bacteriuria exists. Quantitative estimation should show 100,000 or more bacteria/ml of urine, from freshly voided, aseptically collected mid stream urine^[4].

The disease burden of UTI is estimated to be 150 million cases annually worldwide^[5]. The global prevalence of ASB during pregnancy varies from 2% to 10%^[6]. The same for India is reported to be as high as 8%^[7,8,9]. However, no published data was found for Assam or Jorhat in PubMed and Google scholar.

Although pregnancy does not predispose a women to the acquisition of asymptomatic bacteriuria, it does predispose her to acute upper urinary tract infection or pyelonephritis^[10]. The pregnant women are two times more commonly affected than age matched non pregnant women. The reason behind this increased risk are certain factors such as 'hydronephrosis of pregnancy' and the increase in progesterone and estrogen levels leading to decreased urethral and bladder tone. All these factors lead to urinary stasis and uretero-vesical reflux^[11]. Also, there is reduction in the immunity during pregnancy which facilitate growth of both commensal and non-commensal microorganism.^[12]

In healthy non-pregnant women, asymptomatic bacteriuria may not require any special attention or care. However, in pregnancy if asymptomatic bacteriuria is not promptly treated it may lead to adverse outcomes. Maternal and foetal complications attributed to it are symptomatic urinary tract infection, pyelonephritis, preeclampsic toxemia, anaemia, low birth weight, intrauterine growth retardation, preterm labour, preterm premature rupture of membrane and post-partum endometritis^[13,14]. Asymptomatic bacteriuria is a more serious problem compared to symptomatic bacteriuria because asymptomatic bacteriuria is difficult to diagnose since people do not seek medical attention.

The high prevalence of asymptomatic bacteriuria during pregnancy, the significant consequences for women and for pregnancy

along with the ability to avoid sequelae with treatment justifies screening of pregnant women for bacteriuria. Early detection and treatment of ASB is of considerable importance not only to prevent acute pyelonephritis and chronic renal failure in the mother, but also to reduce prematurity and fetal mortality^[15,16].

In spite of universal recommendations for screening of asymptomatic bacteriuria and the fact that most antenatal guidelines have included routine screening for asymptomatic bacteriuria, these guidelines have largely been ignored^[17]. Hence, the rationale behind conducting the study is to find the prevalence of asymptomatic bacteriuria encountered in women attending the Antenatal Care Out Patient Department of Jorhat Medical College Hospital. The study also attempts to find the common pathogens involved, with their antibiotic sensitivity pattern so that the burden of the disease can be highlighted. The aim of the study is to generate data that gives an insight into the status of asymptomatic bacteriuria in pregnant women of the region and guide the health care professionals in formulating guidelines and policies for the hospital to reduce the consequences of the condition.

The Study was undertaken with the following objectives:

1. To determine the trimester wise prevalence of asymptomatic bacteriuria in pregnant women attending the Antenatal Care Out Patient Department of Jorhat Medical College and Hospital.
2. To determine the antibiotic sensitivity of the isolated organism.

LITERATURE REVIEW

Till date a number of works have been carried forward regarding prevalence of significant bacteriuria in different states of India, however there is a very limited publication on this in Assam and other North Eastern states of India.

A study done by Mukherjee K et al. in West Bengal, showed the overall prevalence of asymptomatic bacteriuria of 8.4%. It was also found that gram negative organisms

were predominant (80.95%) causative organism while *E. coli* was found to be the most common organism isolated (57.14%). Age and gestational characteristics of pregnant women showed that 61.9% of them were between 26-30 years. Higher percentage of asymptomatic bacteriuria was seen in 2nd trimester (42.86%) and in primigravidas (52.38%) [18].

In another study done by Kerure RD et al. in West Bengal it was found that out of 300 asymptomatic patients, 11% had significant bacteriuria. The highest number of culture positive cases, among pregnant women were in the age group of 26-35 years (57.57%) and in the second trimester (54.54%). The commonest isolated organism was *E. coli* (72.72%) [19].

Also, in a prospective cohort study conducted at a tertiary care hospital in North India by Jain V et al. asymptomatic bacteriuria was found in 17% pregnant women till 20 weeks and in 16% between 32-34 weeks of gestation [20].

Lakshmipriya R et al. studied a population belonging to the second trimester of pregnancy and found that 11.2% had significant bacteriuria. Maximum percentage of women were secundigravida (47.2%). The study emphasized on increased frequency of asymptomatic bacteriuria with increase in parity [21].

A study was done by Parveen K et al. in two Tertiary Medical College Hospitals of Dhaka. It was found that the prevalence of ASB was 26%. The incidence was high in 21-25 years of age group (44.61%) and in 3rd trimester of pregnancy (78.46%). The most frequent isolated organism was *E coli* (88.15%) [22].

In another study done by Goyal A et al. in Agra, it was found that out of 431 pregnant females, 38 women (8.8%) were positive for cultures. 16.66% of women were in the first trimester of pregnancy while 52.63% of positive cases were multiparous. The most common organism was *E coli* (39.47%) followed by *Staphylococcus aureus* (23.68%) [23].

As per work by Neupane MS et al. among 392 participants with mean age of 29.76±6.71, it was found that 26% showed significant bacteriuria. The commonest organism causing bacteriuria was *E coli*. The sensitivity pattern of the isolated organism revealed that all were sensitive to ciprofloxacin and gentamycin at high percentage. They also found that women with higher number of pus cells in the urine specimen had higher ASB ($p < 0.0001$) [24].

According to the study conducted by Girishbabu RJ et al. it was found that out of 1000 pregnant women 10% were positive for significant bacteriuria. *E. coli* was the most predominant followed by *K. pneumoniae*. Piperacillin-Tazobactam, amikacin and nitrofurantoin were found to be the most effective antibiotics against the urinary isolates [25].

MATERIALS & METHODS

- STUDY TYPE - Cross Sectional Observational study
- PLACE OF STUDY- Jorhat Medical College and Hospital, Jorhat
- STUDY DURATION- 2 months (from 20th July-20th September 2018).
- SAMPLE SIZE – It had been calculated to be 113 using the formula, $n = \frac{z^2 pq}{d^2}$, where $z = 1.96$, $p(\text{prevalence}) = 8\%$, $q = 1-p$ and $d(\text{absolute error}) = 5\%$. Prevalence has been taken as 8% as prevalence rate for India was reported to be 8%. [7,8,9]

$$n = \frac{z^2 pq}{d^2}$$
$$= \frac{1.96^2 \times 0.08 \times 0.92}{0.05^2}$$

=113

- SAMPLING TECHNIQUE– Systematic random sampling was used where first sample was taken randomly and following which each 32th sample was taken.
- (Records from Medical Records Department, JMCH show that on an average around 60 pregnant women comes daily at ANC OPD which

translates to $60 \times 60 = 3600$ in 2 months.

Hence the interval, $k = \frac{3600}{113} = 31.85$. So, an interval of 32 was considered.)

- CONSENT- A written informed consent was obtained after explaining the purpose and the scope of the study.
- INSTITUTIONAL PERMISSION – Permission from the administration was obtained before conducting the study.
- ETHICS CLEARANCE- Clearance was obtained from the Institutional Ethics Committee (IEC), Jorhat Medical College as the study involves research on human participants.
- INCLUSION CRITERIA- All pregnant women according to the sampling design who are willing to participate were included.
- EXCLUSION CRITERIA- Women excluded shall be:
 - a) The women with symptomatic urinary tract infection.
 - b) The women with history of antibiotic therapy for past two weeks for reasons other than urinary tract infection.
 - c) Pyrexia

COLLECTION OF URINE

The participants were given urine collection pots to collect early morning urine. They were instructed on how to collect the specimens. Midstream clean catch urine was collected in sterile, wide mouthed, screw capped container after very thorough preliminary cleaning of external genitalia. On receiving the sample was immediately transported to the laboratory and processed. In case of delay, the specimen was refrigerated at 4°C.

PROCESSING OF SPECIMEN

The samples were processed in the bacteriology laboratory of the Microbiology Department of Jorhat Medical College using standard microbiological methods. For each sample direct microscopy and culture was done.

Direct Microscopy:

Smear: One drop of un-centrifuged urine was placed on a clean glass slide. It was allowed to dry, heat fixed and stained by gram stain.

Examination of wet smear of un-centrifuged urine: To quantify the presence of pus cells and microorganisms.

Culture:

The sample was cultured on MacConkey, Blood and CLED agar simultaneously. For inoculation calibrated loop that delivers 0.01 ml of urine was used. The plates were inoculated for 18 to 24 hours at 37°C and were examined for growth of colonies after the incubation. The types of colonies formed were presumptively identified using morphological characteristics and biochemical tests. Culture plates with 10^5 cfu/ml or more bacteria per ml were recorded as showing significant bacteriuria. Colony counting was done using calibrated loop method.

Antimicrobial Susceptibility testing: Testing was done by using Kirby-Bauer disc diffusion method on Muller Hinton agar plate. The antibiotics were tested separately for Gram positive cocci and gram negative bacilli. The antibiotics used were Ciprofloxacin, Cefotaxime, Ceftriaxone, Gentamicin, Amoxicillin-clavulanic acid, Nitrofurantoin, Co-trimoxazole, Nalidixic acid, Cephalexin and Amoxicillin.

DATA ANALYSIS- The collected data was noted in a systematic tabular form. The calculations were done using Epi Info Version 7 for Windows downloaded free from CDC, Atlanta Website.

RESULT

A total of 113 participants were included in the study population belonging to all the three trimesters of pregnancy, attending the Antenatal Care OPD of Jorhat Medical College Hospital. Information on socio-demographic profile and personal habits were obtained using pre-tested and pre-formed questionnaires. Urine culture and

antimicrobial susceptibility testing was done for all samples.

SOCIODEMOGRAPHIC PROFILE OF THE PARTICIPANTS

Out of 113 pregnant women included in the study 41.59% were in the age group 18-25 [Figure-1], 55.57% were primigravidae [Figure-2] and 38.05% were in second

trimester of pregnancy [Figure-3]. Also, majority of the women were from rural background (80.53%) [Figure-4] and hindu by religion (54.86%) [Figure-5]. Majority of the participants had educational qualification up to primary school (38.05%) followed by illiterate cases (24.77%) [Figure-6].

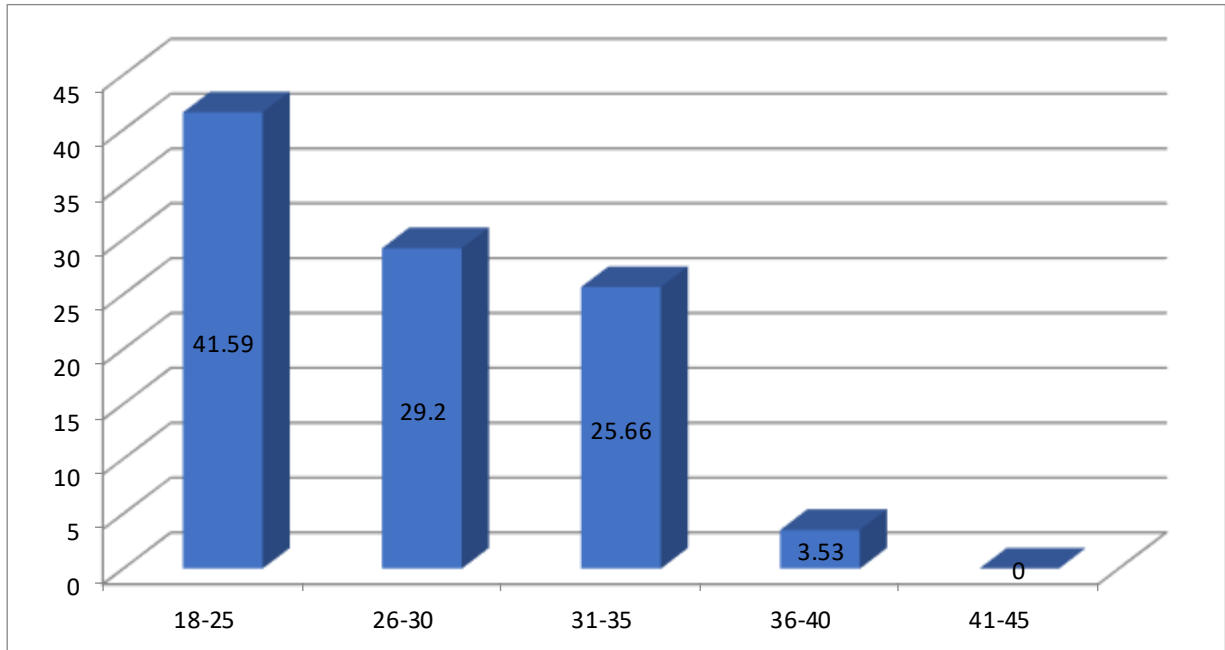


Figure 1: Age distribution of pregnant women screened for asymptomatic bacteriuria (%)

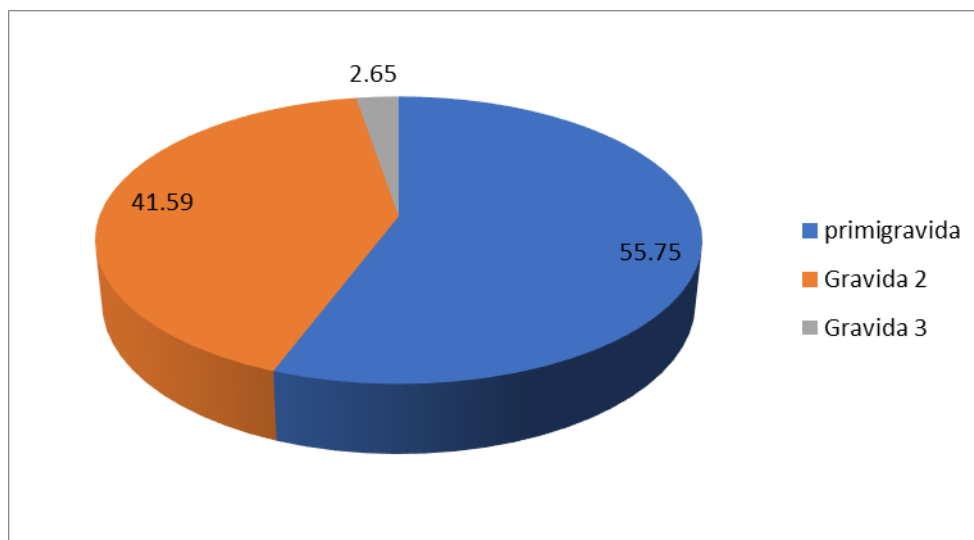


Figure-2: Gestation wise distribution of the participants (%)

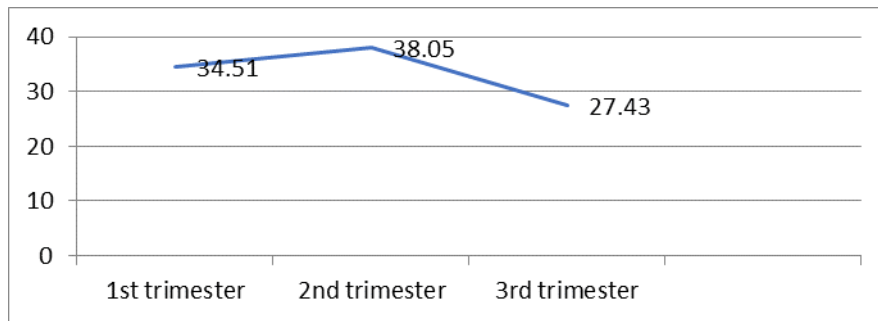


Figure-3: Trimester wise distribution of the participants (%)

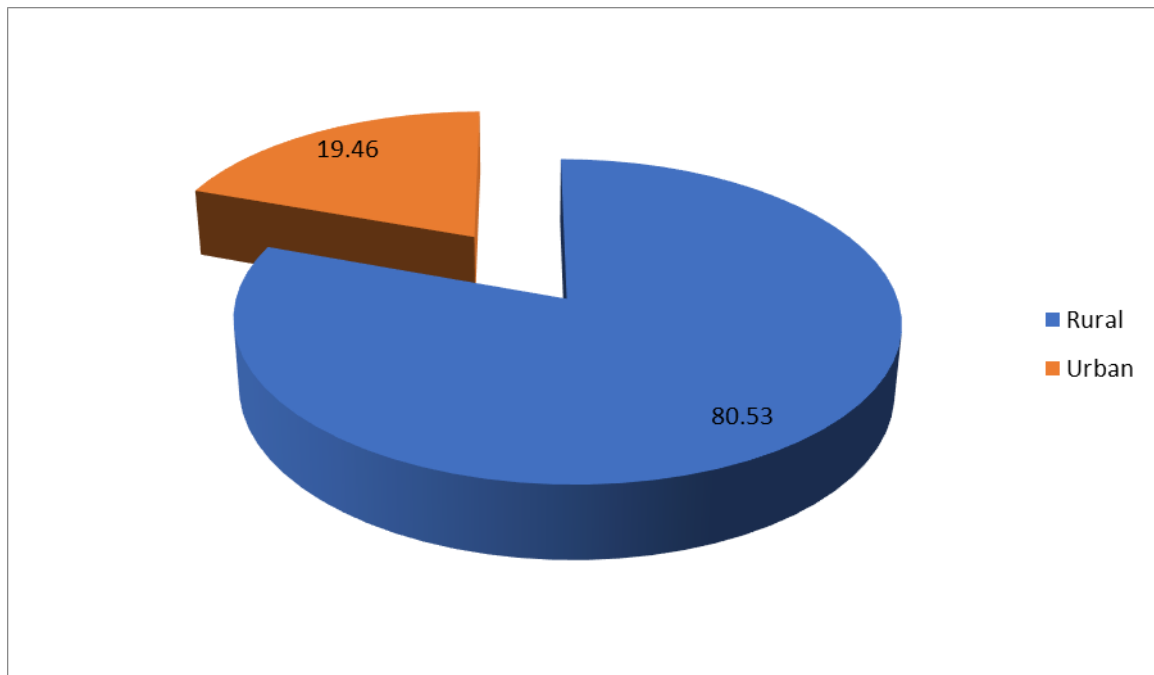


Figure-4: Distribution on the basis of sociodemographic profile (%)

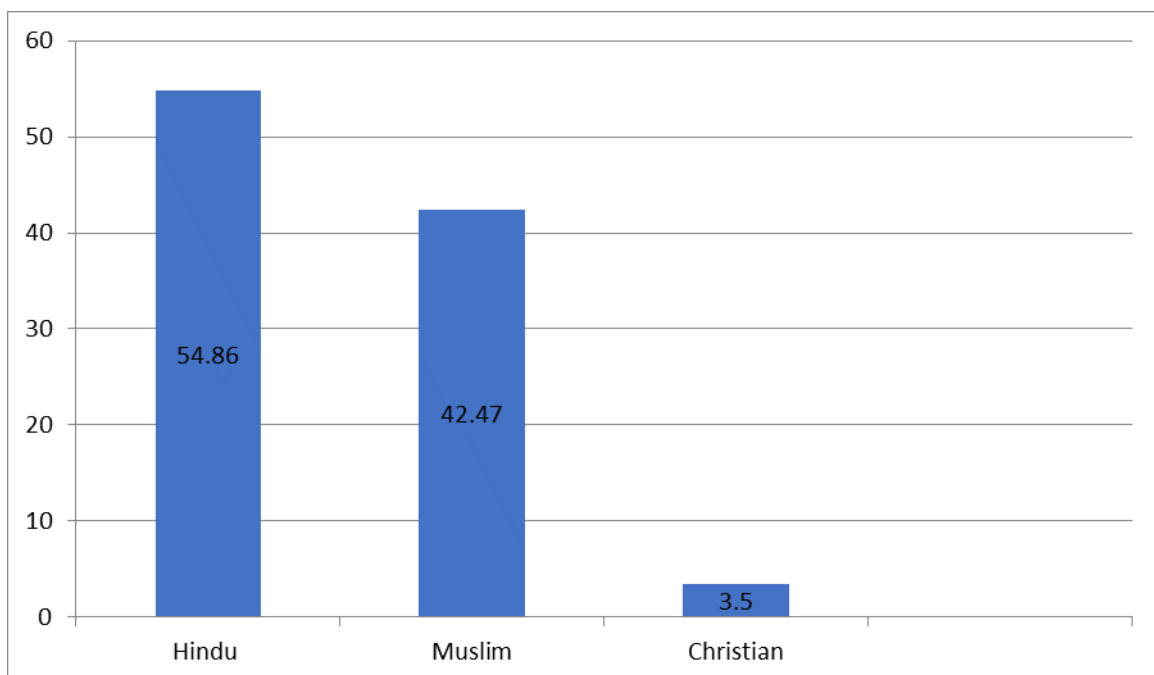


Figure-5: Distribution on the basis of religion (%)

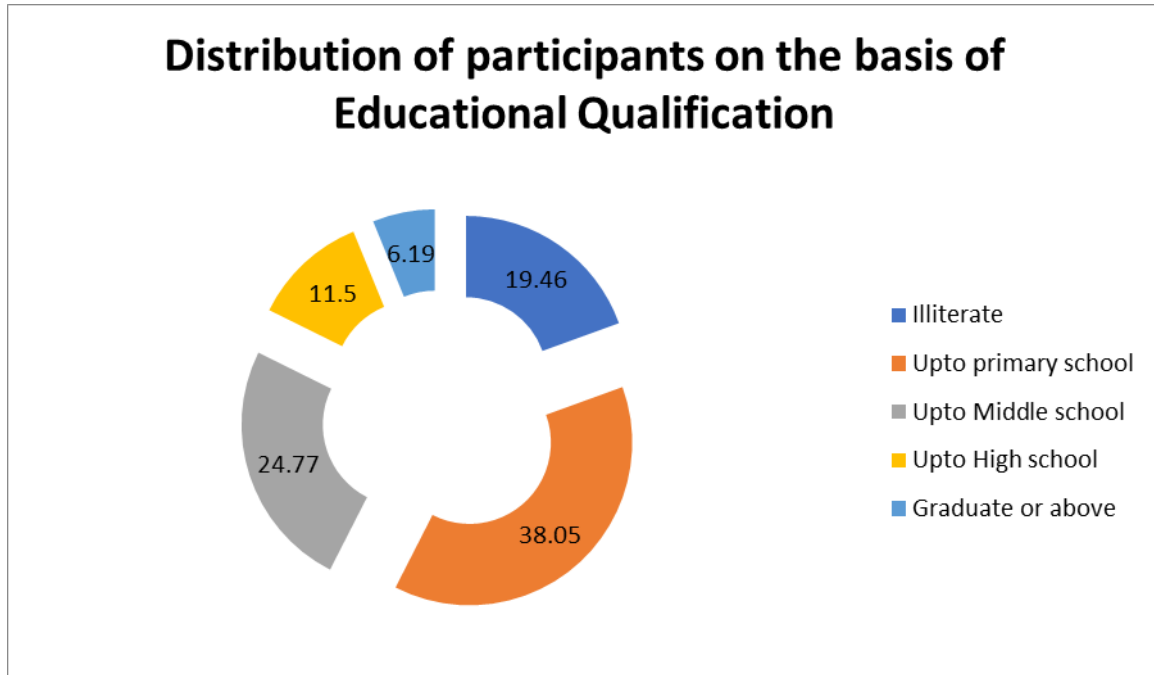


Figure 6: Distribution on the basis of Educational Qualification (%)

RESULTS OF THE PERFORMED CULTURE

Table 1: Results of the culture

Results of culture	No. of cases	Percentage positive (%)
Significant bacteriuria	20	17.69
Insignificant bacteriuria	51	45.13
Contamination	14	12.38
Sterile	28	24.77
Total	113	100

Comments: Out of 113 cultures that were performed, only 20 (17.69%) had significant bacteriuria.

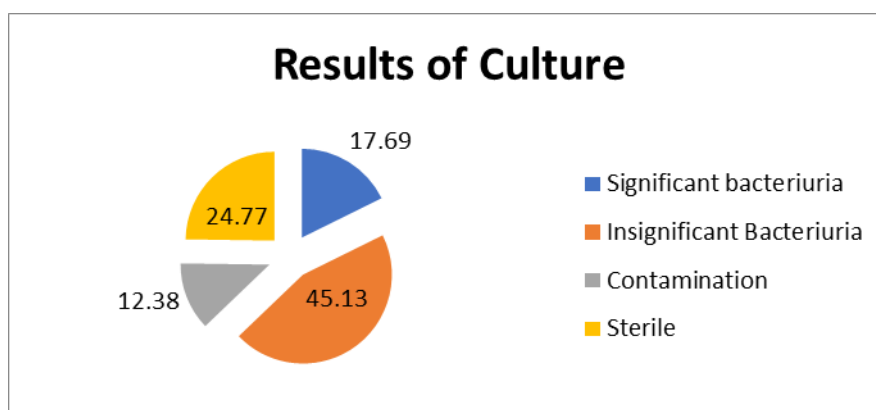


Figure 7: Results of performed culture (%)

Highest percentage of asymptomatic bacteriuria was found in the second trimester of pregnancy (50%) followed by third (35%) and first trimester (15%) [Table 2, Figure-7]. Also, maximum number of

culture positive females were primigravida (70%). High percentage belonged to the age group of 26-30 years (45%) followed by the age group of 18- 25 years and 31-35 years both, having 20% of the cases [Table-2,

Figure-8]. 85% of the culture positive subjects hailed from rural areas while 15% of them were from urban areas [Table-2]. 60% of the cases were Hindu by religion

[Table-2]. Majority of the culture positive cases had educational qualification up to primary school (40%) followed by illiterate cases (30%).

Table 2: Describing the relationship of different sociodemographic factors with the culture positive cases.

Variable	Number Positive(n=20)	Percentage Positive (%)
Trimester		
1 st Trimester	3	15
2 nd Trimester	10	50
3 rd Trimester	7	35
Age (years)		
18-35	4	20
26-30	9	45
31-35	4	20
36-40	3	15
41-45	0	0
Parity		
Primigravida	14	70
Gravida 2	6	30
Gravida 3	0	0
Gravida 4+	0	0
Religion		
Hindu	12	60
Muslim	8	40
Christian	0	0
Place of residence		
Rural	17	85
Urban	3	15
Educational Status		
Illiterate	6	30
Upto Primary School	8	40
Upto Middle school	4	20
Upto high School	0	0
Graduate or above	2	10

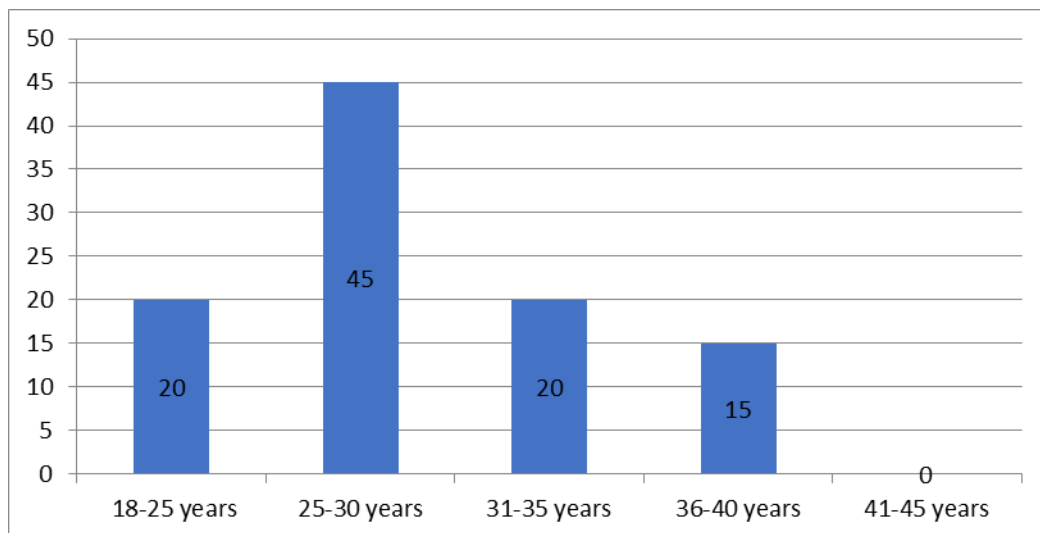


Figure 7- Showing the age distribution of culture positive cases (%)

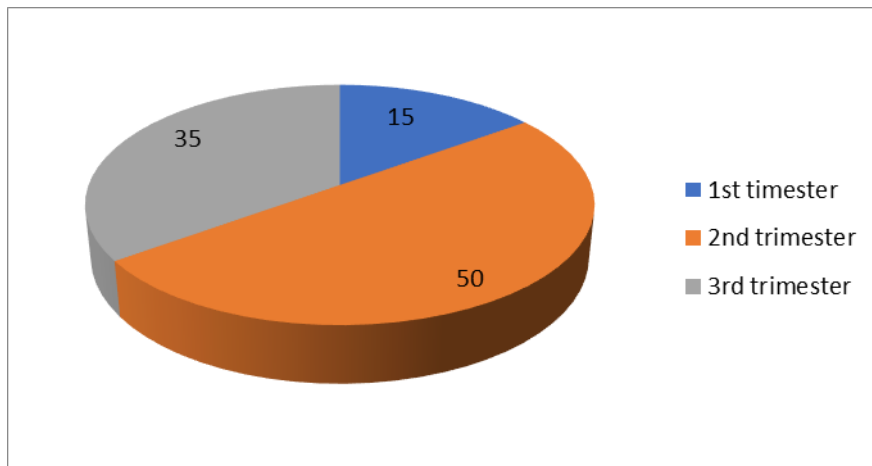


Figure 8- Showing Trimester wise distribution of culture positive case

ANTIBIOTIC SENSITIVITY PATTERN OF ISOLATED ORGANISM

Table 3: Distribution of Culture Positive cases according to bacterial isolates

Name of Isolate	No. of cases (n=20)	Percentage (%)
E.coli	11	55
S.aureus	5	25
Coagulase negative staphylococcus	2	10
Klebsiella pneumonia	1	5
Pseudomonas aeruginosa	1	5
Total	20	100

Comments: The most common isolate was E.coli (55%) followed by S.aureus (25%) and Coagulase negative staphylococcus (10%).

Table 7: Pattern of antibiotic sensitivity of bacterial isolates.

Antibiotics	Total sensitive isolates (n=20)	Total (%) sensitive
Ciprofloxacin	20	100
Cefotaxime	18	90
Ceftriaxone	20	100
Gentamicin	16	80
Amoxicillin-clavulanic acid	14	70
Nitrofurantoin	15	75
Co-trimoxazole	14	70
Nalidixic acid	10	50
Cephalexin	10	50
Amoxicillin	09	45
Total	10	50

Comments: The antibiotic sensitivity testing revealed that 100% of isolates were sensitive to Ciprofloxacin and Ceftriaxone followed by Cefotaxime (90%) and Gentamicin (80%).

DISCUSSION

The study was conducted at Jorhat Medical College Hospital to find the prevalence of asymptomatic bacteriuria among the

pregnant women attending the Antenatal Out Patient Department. The study aimed to find the common pathogens involved with their antibiotic sensitivity pattern so that the burden of the disease can be highlighted.

The overall prevalence of asymptomatic bacteriuria was found to be 17.69%. Similar results were found in a study done in Lucknow (16.9%) [20]. But, studies done in West-Bengal had lower prevalence of 8.4%

[18] and 11% [19] respectively. The higher prevalence may be attributed to lower educational qualifications and low living standards as found in the study. Another reason could be poor genital practices by pregnant women who may find it difficult to clean their anus properly after defecating or to clean their genitals after passing urine [19, 25].

Our study showed that the prevalence was higher in women belonging to 26-30 years of age (45%) followed by age groups of 18-25(20%) and 30-35(20%). Similar results were found by a study done in Kolkata, West Bengal where 57.57% of cases belonged to 26-35 years of age [19]. In another study done in West Bengal the prevalence in 26-30 years of age went as high as 61.90% [18]. The reason for higher prevalence in this age group is because women of this age group are likely to be multiparous, which is a risk factor for acquiring asymptomatic bacteriuria in pregnancy [26].

Also, we found that prevalence was higher in primigravidas (70%) and during second trimester (50%). Similar results were found by a study done in Kolkata, West Bengal where 59% of cases were primigravidas and 54.54% of them were in second trimester respectively [19]. The increased frequency of urinary tract infection in the second trimester compared to the first and third trimester of pregnancy may be attributed as result of either change in urinary stasis and vesicoureteral reflux or decrease in urinary progesterones and estrogens in the various trimester of pregnancy [27].

E.coli was found to be the most predominant organism isolated (55%). Most of the other studies done in West Bengal [18, 19], Agra [23], Nepal [24] and Tumkur [25] also reported *E.coli* as the most common organism.

The antibiotic susceptibility testing revealed that 100% of isolates were sensitive to Ciprofloxacin and Ceftriaxone followed by Cefotaxime (90%) and Gentamicin (80%). Another study done in West Bengal also found Ciprofloxacin, Cefotaxime and

Ceftriaxone to be the most effective antibiotics [18]. These drugs can be routinely used for treatment of bacteriuria helping in reducing the incidence of resistance.

Due to lack of symptoms and its adverse effects on pregnancy, asymptomatic bacteriuria needs special attention and should never be ignored during pregnancy [19].

CONCLUSION

In conclusion, the present study showed high occurrence of asymptomatic bacteriuria in pregnant women. 113 subjects were screened for asymptomatic bacteriuria out of which 17.69% were found to have asymptomatic bacteriuria, which is much higher than national as well as the global prevalence of asymptomatic bacteriuria during pregnancy. Also, the study brings into light that with increase in parity, the prevalence of asymptomatic bacteriuria increases. Also, the living conditions and the personal hygiene of the subjects had impact on the prevalence of bacteriuria of the pregnant women. The most commonly isolated organism was *E.coli* followed by *S.aureus*. Asymptomatic bacteriuria has many adverse effects on the health of the mother and the pregnancy. Hence, screening and treatment of asymptomatic bacteriuria as a routine antenatal care is the need of the hour and must be mandatory. Since, early diagnosis and treatment of UTI can prevent complications; screening for asymptomatic bacteriuria can be implemented as an approach to safe motherhood and new born health. It can be an effective way to reduce maternal mortality in a state like Assam where it is highest.

Declaration by Authors

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Conflict of Interest: The authors declare no conflict of interest.

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