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## Asymptomatic bacteriuria in pregnancy universal screening: The need of the hour

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### Abstract

**Introduction:** Asymptomatic bacteriuria is a common condition occurring due to the physiological changes in the genitourinary tract during pregnancy. If left untreated, it may lead to acute pyelonephritis with adverse fetal and maternal outcome.

**Aim of the study:** To determine prevalence, risk factors, etiological agents, maternal and fetal complications among antenatal women with asymptomatic bacteriuria in our hospital.

**Methodology:** A cross sectional study on 200 antenatal women was conducted, over a period of 3 years. Relevant history was obtained from them and the mid-stream clean catch urine specimen was collected and processed. The isolates from all the women were identified and antimicrobial susceptibility was tested and interpreted.

**Results:** Prevalence of ASB was 12% in the antenatal women studied. ASB was significantly more frequent in primi-gravidas 64% than the multi-gravidas 36%. Un-booked women had significantly increased incidence of ASB. Pus cells were more than 8 in 60% of women. As the number of pus cells increased, chances of a significant colony count increased proportionately. *E. coli* was the most common organism causing ASB (54%) followed by *Klebsiella* sp. (28%). ASB also occurred due to *Pseudomonas* sp. (6%), *Enterobacter* sp. (4%), Others like *Citrobacter*, *Acenitobacter*,  $\beta$ - Hemolytic Streptococci, Non-hemolytic Streptococci and *Morganella* (8%). Mixed infections occurred more frequently with underlying urinary tract abnormalities and pyelonephritis; more commonly involving *E. coli* and *Klebsiella* sp. Adverse maternal outcome like maternal anemia (56%), lower mean Hb% (10%), need for blood transfusions (0.5%) and pyelonephritis (6%); Maternal events like symptomatic UTI (18%), fever (16%), wound infections (10%) and sub-involution (14%) was found. Hospital stay was prolonged in women with ASB 7.5 days. Threatened abortion (10%), abortion (8%), hypocalcaemia (6%), hyponatremia (2%), HMD (6%), still births (4%) and neonatal deaths (4%) were more common in women with ASB, Adverse fetal outcome like threatened pre-term (24%), PROM (20%), decrease in mean period of gestation at delivery (34 weeks 5 days), lower APGAR scores at 1st minute (6.2) and 5th minute (8.4), lower mean birth weight (2.4 kgs), higher IUGR rates (26%), longer mean NICU stay (9.2 days), hypoglycemia (12%), neonatal infections (16%) hyperbilirubinemia requiring photo-therapy (14%), apnea (8%) and birth asphyxia were seen in babies born to women with ASB.

**Conclusion:** Undiagnosed and untreated asymptomatic bacteriuria is associated with complications during pregnancy. Hence routine screening of antenatal women for Asymptomatic bacteriuria during all trimesters must be considered for preventing the adverse maternal and foetal outcomes particularly with known risk factors like increasing age, multi-parity and previous history of Urinary tract infection.

**Keywords:** Asymptomatic bacteriuria, maternal complications, fetal complications

### Introduction

Asymptomatic Bacteriuria - Presence of greater or equal to 105 colony forming units (CFU's) per milliliter of urine [1]. The cut off of 105 was introduced by Kass. This has been universally accepted and remains gold standard for diagnosis of ASB. This cut off value will differentiate infection from contamination and colonization by commensals [2]. An overall incidence of 2-11% has been quoted by various workers [3]. It is known to be 5% in 1st trimester and 10% at term [4]. A study done in Tamil Nadu, depicted the incidence to be 10% in the investigated community [5]. Incidence of ASB, high as 24.7% has been observed in 620 pregnant women at, Karnataka [6]. It has been shown that, after culturing for fastidious organisms like *Ureoplasma Ureolyticum*, *Gardnerella Vaginalis*, anaerobic organisms, lactobacilli and micro-aerophilic streptococci, incidence of ASB was 25% during

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pregnancy [7]. Prevalence of ASB is no different between the pregnant women and their non-pregnant counterparts, but the incidence of progression to symptomatic disease was significant during pregnancy. Some studies suggest that, 25-50% of all ASBs have the kidneys as the source of bacteriuria, in the form of silent pyelonephritis. These patients are more prone to adverse maternal and fetal outcome [8]. Many anatomical, hormonal, mechanical [9] and immunological changes occurring during pregnancy greatly predispose to UTI. UTI is much more common in the females, due to: A shorter urethra (3-4 CMS) when compared to males. External urethral orifice being close to the anus, is constantly contaminated. Females usually do not empty their bladders as completely as men [10]. Bacteriuria is a cause of serious complications to the mother and the baby as well as risk to concerned health personnel, family and society. If left unrecognized, ASB lead to adverse maternal out-come like pyelonephritis, anemia, symptomatic UTI, puerperal fever, wound infections and sub- involution; adverse fetal outcome like threatened pre-term, IUGR, PROM, pre-term births, decreased gestational age at birth, lower APGARs, LBW, birth asphyxia, neonatal infections, hypo-glycemia, hyper-bilirubinemia requiring phototherapy, apnea, and prolonged NICU stay. So, this study was undertaken.

#### Aim of the study

To determine prevalence, risk factors, etiological agents, maternal and fetal complications among antenatal women with asymptomatic bacteriuria in our hospital.

#### Methodology

It was a Cross sectional study done after obtaining ethical clearance from Mamata Medical college ethical committee. The study was conducted on patients who attended to Mamata Medical College and Hospital, khammam, on out-patient and in-patient basis during the three year study period i.e, January 2017 to december 2019. Women who satisfied the inclusion and exclusion criteria, and who gave consent for the study were considered. Pregnant women with bacteriologically proven bacteriuria, without overt symptoms of urinary tract infections were included. Chronic medical or surgical illnesses, Pregnancy complications like severe anemia, hypertensive disorders in pregnancy, Diabetes Mellitus, sensitized Rh negative pregnancy were excluded from our study. Our sample size was 200 antenatal women. Our study was done to see the prevalence of ASB in the population and analyze the spectrum and frequency of the causative organisms of ASB and materno-fetal outcome. A detailed history was obtained. Antenatal women were advised to under-go urine routine, colony count, culture and sensitivity tests. They were treated based on culture sensitivity reports. The women were asked to collect the mid-stream urine in a wide mouthed sterile container, provided for the same purpose by the hospital, taking care not to touch the edges of the container. The sample was immediately sent to the microbiology laboratory. Un-centrifuged fresh (i.e., < 2 hours) urine was used to perform: Urine routine, which included Ph, specific gravity, albumin, sugar, pus cells, epithelial cells, RBCs, casts and presence of motile organisms. Colony count, culture and antibiotic sensitivity patterns. Streak plate cultures were performed on Mac Conkey and Blood agars, using a standard platinum loop, which could carry 0.01 ml

of urine. These plates were incubated at 37 degrees for 24 hours; after which, the plates were analyzed and microscopic examination was performed. Colony counts of  $\geq 105$  were considered positive. The data was collected and analysed by appropriate statistical method.

**Table 1:** Age wise distribution

Age in years	Number of women	Percentage
$\leq 20$	90	45%
21-25	70	35%
26-30	30	15%
31-35	10	05%
Total	200	100%

In this study the majority of the women 45% were less than 20 years of age and the least i.e., only 5% of them were in between 31 to 35 years.

**Table 2:** Gravidity wise distribution

Gravida	Number of women	Percentage
Primi-gravida	128	64%
Multi-gravida	72	36%
Total	200	100%

The study shows that primi-gravidae had statistically higher prevalence of ASB, when compared to multi-gravidae (P value 0.01).

**Table 3:** Booking status

Booking status	Number of women	Percentage
Booked	60	30%
Booked elsewhere	52	26%
Un-booked	88	44%
Total	200	100%

Un-booked women were significantly more in our study accounting for 44%.

**Table 4:** PUS cell count

Pus cells	Number of women	Percentage
$\leq 4$	36	18%
5 – 7	44	22%
$\geq 8$	120	60%
Total	200	100%

Majority of the women 60% had more than 8 pus cells on high power field. Only 18% of them had less than 4 pus cells in our study.

**Table 5:** Isolated organisms

Organism	Number	Percentage
<i>E. coli</i>	108	54%
<i>Klebsiella</i>	56	28%
<i>Pseudomonas</i>	12	6%
<i>Enterobacter</i>	08	4%
Others	16	8%
Total	200	100%

The table shows the relative frequency of organisms isolated in our study. *E. coli* was the most common organism causing ASB (54%) followed by *Klebsiella* (28%). ASB also occurred due to *Pseudomonas* (6%), *Enterobacter* (4%), Others like *Citrobacter*, *Acenitobacter*,  $\beta$ - Hemolytic

Streptococci, Non- hemolytic Streptococci and *Morganella* (8%).

Mixed infections occurred more frequently with under lying urinary tract abnormalities and pyelonephritis; more commonly involving *E. coli* and *Klebsiella* sp. Adverse maternal outcome like maternal anemia (56%), lower mean Hb% (10%), need for blood transfusions (0.5%) and pyelonephritis (6%) was found in our study. Incidence of anemia (i.e., Hemoglobin concentration < 10 gram/ dl of blood); mean hemoglobin concentration and mean blood transfusions were significantly greater.

**Table 6:** Maternal complications

Maternal Complication	No. of women	Percentage
Wound infections	20	10%
Fever	32	16%
Symptomatic UTI	36	18%
Pyelonephritis	12	6%
Sub-involution	28	14%
Without complication	72	36%
Total	200	100%

Maternal events like symptomatic UTI (18%), fever (16%), wound infections (10%) and sub-involution (14%) was found. Hospital stay was prolonged in women with ASB 7.5 days.

**Table 7:** Maternal and fetal outcome

Morbidity	No of women	Percentage
Threatened abortion	20	10%
Abortion	16	08%
Hypocalcemia	12	06%
Hyponatremia	04	02%
Threatened pre-term	48	24%
Pre-term births	32	16%
PROM	40	20%
HMD	12	06%
Still births	08	04%
Neonatal deaths	08	04%
Total	200	100%

Threatened abortion (10%), abortion (8%), hypocalcaemia (6%), hyponatremia (2%), HMD (6%), still births (4%) and neonatal deaths (4%) were more common in women with ASB, Adverse fetal outcome like threatened pre-term (24%), PROM (20%), decrease in mean period of gestation at delivery (34 weeks 5 days).

**Table 8:** Neonatal complications

Neonatal Complication	No. of Babies	Percentage
IUGR	52	26%
Hypoglycemia	24	12%
Neonatal infection	32	16%
Hyperbilirubinemia	28	14%
Apnea/Birth asphyxia	16	8%
Without complication	48	24%
Total	200	100%

Lower APGAR scores at 1st minute (6.2) and 5<sup>th</sup> minute (8.4), lower mean birth weight (2.4 kgs), higher IUGR rates (26%), longer mean NICU stay (9.2 days), hypoglycemia (12%), Neonatal infections (16%) hyperbilirubinemia requiring photo-therapy (14%), apnea (8%) and birth asphyxia were seen in babies born to women with ASB.

## Discussion

In our study Prevalence of ASB was 12% in the antenatal women studied. Most of the studies give a prevalence of 2 to 14%<sup>3</sup> which correlates well with the present study. It is known that, lower socio-economic status, poor personal hygiene and patients attending public hospitals more frequently harbor ASB<sup>3</sup>. This explains why the prevalence is slightly on the higher side in our population. We found ASB was significantly more frequent in primi-gravidas 64% than the multi-gravidas 36%. Un-booked women had significantly increased incidence of ASB. Pus cells were more than 8 in 60% of women. As the number of pus cells increased, chances of a significant colony count increased proportionately. When the cut off for pus cells were considered as  $\geq 5$ ; Sensitivity was 81% and Specificity was 85%. This correlates with the previous works which have showed a sensitivity of 81.3%, specificity of 71%<sup>[11]</sup> positive.

Predictive value of 88%<sup>[12]</sup> in the diagnosis of ASB. *E. coli* was the most common organism causing ASB (54%) followed by *Klebsiella* sp. (28%). In our study. World-wide, *E. coli* has been the commonest organism with a prevalence of 80%. In Rotakh of India, a study was conducted on the sub-urban population showed that, the *E. coli* accounted for 62% of all cases of ASBs<sup>[13]</sup>. *Klebsiella* sp. emerged as the second most common cause of ASB with a prevalence of 28%, whereas, world-wide, this accounted for only 8% of all cases of ASBs, and 29% of all ASBs in Rotakh of India. *Pseudomonas* sp. occurred in 6% of all ASBs and probably these were community acquired as the urine samples were collected on the day of admission. Commensals like *CONS*, *Acanitobacter* sp., *Enterococcus* sp. and Non- hemolytic Streptococci occasionally caused opportunistic infections and were invariably associated with adverse materno-fetal outcome. We also found mixed infections which occurred more frequently with under lying urinary tract abnormalities and pyelonephritis; more commonly involving *E. coli* and *Klebsiella* sp. in the literature the incidence of septicemia in pyelonephritis is quoted as 30%<sup>[14]</sup>. All cases of pyelonephritis had adverse materno-fetal outcome in the form of maternal anemia, prolonged hospital stay, increased incidence of blood transfusions, PPRM, pre-term labor, IUGR or fetal wastage in different combinations. ASB is more common in patients with urinary tract abnormalities, and usually yields mixed cultures<sup>[15]</sup>. We did find few women with urinary tract abnormalities and pyelonephritis in our study too. Adverse maternal outcome like maternal anemia (56%), lower mean Hb% (10%), need for blood transfusions (0.5%) and pyelonephritis (6%) was found in the present study. Savage *et al.* showed an incidence of anemia as 16%<sup>[16]</sup> and Gilstrap *et al.* showed that 4% of cases with ASB were associated with anemia<sup>[17]</sup>. These studies were done in the western population. In our study, the incidence of anemia is much higher (56%), as the incidence of pre-existing anemia was high (25%) in our population. Maternal Events like symptomatic UTI (18%), fever (16%), wound infections (10%) and sub- involution (14%) was found. Hospital stay was prolonged in women with ASB 7.5 days. Studies have shown that, endometritis, chorio-amnionitis and subsequent sub- involution; and puerperal fever are more common in patients with un-treated ASB<sup>8</sup>. Threatened abortion (10%), abortion (8%), hypocalcaemia (6%), hyponatremia (2%), HMD (6%), still births (4%) and neonatal deaths (4%) were more common in

women with ASB, Adverse fetal outcome like threatened pre-term (24%), PROM (20%), decrease in mean period of gestation at delivery (34 weeks 5 days) was also noted in our study. Recent Cochrane evidence suggests that, there is no significant association between fetal wastage and ASB3. The present study showed that, though fetal loss (in the form of abortion, still birth and neonatal death) was higher in the study group, none of them were statistically significant. Various studies give an incidence of 20 to 50% for pre-term deliveries in patients with un-treated ASB, which correlates with the study [2]. Boston city hospital reported that, 20% of LBWs, and many IUGRs can be avoided by prompt treatment of ASB early in pregnancy [18]. Lower APGAR scores at 1<sup>st</sup> minute (6.2) and 5<sup>th</sup> minute (8.4), found in our study correlates with other studies, which show decreased APGAR scores irrespective of whether the source of ASB is from the upper urinary tract or the lower tract. In the present study, We also noted lower mean birth weight (2.4 kgs), higher IUGR rates (26%), longer mean NICU stay (9.2 days), hypoglycemia (12%), neonatal infections (16%) hyperbilirubinemia requiring photo-therapy (14%), apnea (8%) and birth asphyxia were seen in babies born to women with ASB. Studies support this finding that, neonatal infections and their subsequent adverse outcome occurs in pregnancies complicated with ASB20.

### Conclusion

Undiagnosed and untreated asymptomatic bacteriuria is associated with complications during pregnancy. Hence routine screening of antenatal women for Asymptomatic bacteriuria during all trimesters must be considered for preventing the adverse maternal and foetal outcomes particularly with known risk factors like increasing age, multi-parity and previous history of Urinary tract infection.

### Conflict of interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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