
ASSOCIATION OF ASYMPTOMATIC BACTERIURIA AND PRE ECLAMPSIA IN EL SHATBY UNIVERSITY HOSPITAL

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Abstract

Background: Asymptomatic bacteriuria is defined as the presence of significant bacteriuria $>10^5$ colony forming units (cfu)/mL without the symptoms of an acute urinary tract infection. Pre-eclampsia is defined by blood pressure of greater than 140/90 mmHg after the 20th week of pregnancy and proteinuria of equal to or higher than 300 mg per 24 hours.

Objective: Detecting the incidence of asymptomatic bacteriuria among study group at El shatby antenatal care clinic and investigate the association between development of PE and presence of ASB.

Subjective: The study included 80 pregnant women. Quantitative culture remains the gold standard for diagnosis of urinary tract infection in pregnancy, Microscopic examination of a wet film of uncentrifuged urine was carried out to detect the presence of pyuria, which is considered when pus cells are >5 pus cells / HPF. Amount of urine (1 μ l) is inoculated on MacConkey agar, blood agar and sabouraud dextrose agar plates. The plates are incubated for 24-48 hours at 37°C. After incubation, the colony count of a pure single organism is performed a significant bacteriuria is considered when the colony count is $>10^5$ (cfu/ml).

Results: The net result of our study showed that the patients were screened for asymptomatic bacteriuria and the incidence was 30%. Asymptomatic bacteriuria was more common in preeclamptic group (37%) than control group (22%) but with no significant difference.

Conclusion: Asymptomatic bacteriuria was a common finding among pregnant women in our study (30% of whole cases).

INTRODUCTION

Urinary tract infections (UTI) are a common occurrence in pregnancy. The physiological and anatomical changes associated with pregnancy predispose to UTIs.⁽¹⁾

They are of two types: symptomatic and asymptomatic.

Asymptomatic bacteriuria (ASB) is a microbiological

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diagnosis where actively multiplying bacteria are isolated in a number greater than 105 CFU/ml from the urine of a person suffering from no symptoms of UTI.⁽¹⁾ Risk of ASB increases with low socioeconomic status, multiparity, increasing maternal age and previous history of UTI.⁽¹⁾

Patients may often seek treatment for symptomatic UTIs but asymptomatic bacteriuria has a high probability of being left untreated and is associated with diverse maternal and fetal complications.⁽²⁾

Fetal complications include low birth weight and associated perinatal morbidity and mortality. Several studies suggest association between asymptomatic bacteriuria and increased prevalence of symptomatic UTI and pyelonephritis which in turn can lead to preterm labour. It has also been indirectly linked to preeclampsia and anemia.⁽²⁾

Hence, it is recommended to regularly screen and treat asymptomatic bacteriuria, with increasing antibiotic resistance, consideration of local resistance pattern is necessary when choosing the therapy.⁽²⁾ In fact, urine analysis of such patients demonstrated considerable bacteriuria without pyuria. Urine culture also was positive.⁽³⁾

Escherichia coli is associated with up to 80% of isolates; other pathogens include *Klebsiella* species, *Proteus mirabilis* and group B streptococcus. Methods for diagnosing ASB include midstream urine culture (the gold standard), Gram stain and urine dipstick tests.⁽⁴⁾

Pre-eclampsia complicates about 3% of all pregnancies and remains a major cause of maternal and perinatal mortality and morbidity, and is particularly devastating in developing countries.^(5,6)

Pre-eclampsia can adversely affect all body systems and is defined by blood pressure of greater than 140/90 mmHg after the 20th week of pregnancy and proteinuria of equal to or higher than 300 mg per 24 hours.⁽⁷⁾

Pre-eclampsia predisposes the mother to high-risk pregnancy by affecting all maternal body systems, and can result in hazardous outcomes for both the mother and her fetus.⁽⁸⁾

Despite recent progress towards understanding the cause of preeclampsia and/or its phenotypes, the etiology of this serious disorder remains elusive.⁽⁹⁾

Current theories include abnormal placentation, cardiovascular immune mechanisms, an enhanced systemic inflammatory response, and nutritional, hormonal, and angiogenic factors. It seems probable, however, that multiple factors are involved.^(10,11)

Normal pregnancy evokes a mild increase in the systemic inflammatory response that becomes considerably greater in preeclampsia.⁽¹⁰⁾ Based on this concept, some authors have hypothesized that infection pathogenesis of preeclampsia, both in terms of its initiation (by increasing the risk of acute uteroplacental atherosclerosis) and/or its potentiation (by amplifying the maternal systemic inflammatory response).^(12,13)

Studies performed in recent years in identifying factors responsible for pre-eclampsia showed that primary infections during pregnancy increase the chance of pre-eclampsia.⁽¹⁴⁾

It is likely that subclinical infections result in increased maternal cytokines and subsequently cause pre-eclampsia via affecting the vascular endothelium.⁽¹⁴⁾

Since asymptomatic bacteriuria is one of the most common conditions during pregnancy and can have adverse effects on pregnancy, this study will be performed to investigate the relationship between asymptomatic bacteriuria and development of pre-eclampsia.

AIM OF THE WORK

The aim of this study is to determine the relationship between asymptomatic bacteriuria and pre-eclampsia and if asymptomatic bacteriuria is a predisposing factor for development of preeclampsia.

PATIENTS

The study included 80 pregnant women who was present to El shatby University Hospital antenatal care clinic.

Forty pregnant women who presented with preeclampsia after 20 weeks of gestational age was selected as case group and 40 healthy pregnant women at the same gestational age as control group.

All participants was informed about the nature of the study and informed consent was taken from all of them.

Inclusion criteria:

1. All women at 20 weeks of gestation or later.
2. All primigravida.
3. Age from 20:35.
4. All of them have singleton pregnancy.

Exclusion criteria:

1. Systemic or infectious diseases e.g. DM.
2. Intake of antibiotics in the last three months.
3. Having any renal problems.
4. Having any urinary complaints.

METHODS

Patient's evaluation:

- Detailed history including (age, marital status, occupation, Menstrual and obstetric history).
- The pregnant women was trained how to accurately collect clean catch mid-stream urine samples.
- The samples were immediately delivered to the microbiology lab of Alexandria main university hospital.
- A wet film was performed to detect white blood cells in the urine samples as well as bacteria. Pyuria is defined as ≥ 5 white blood cells per high power field (HPF) in uncentrifuged urine sample.
- Urine culture, bacterial identification

and antimicrobial susceptibility was performed using the standard microbiological techniques.

- A significant colony count of one type of bacteria ($\geq 10^5$ CFU/ml) growing on culture plates in a patient having no urinary symptoms was interpreted as asymptomatic bacteriuria.

RESULTS

Regarding demographic data the pre eclamptic cases mean age is 24.8 while mean age of control cases is 25.3 with no significant differences were found between the two groups, while the mean gestational age of pre eclamptic cases is 29.1 while mean gestational age of control cases is 29.6 with no significant differences between the two groups as shown in table (1).

The asymptomatic bacteria was higher in preeclampsia group more than no preeclampsia but this increase was insignificant, the incidence of organism identified in the two groups was matched without significant difference, the most frequent organism was *E. coli* in the two groups (Table 2).

Pre eclamptic cases with detected pyuria are 3 (7.5%) while in control cases 6 (15%) had pyuria, there were no statistically significant differences, the blood pressure show a significant increase in preeclampsia more than the non eclamptic cases. Table (3).

Cases who had ASB with pyuria was 4 cases (16.7%) while cases without ASB who had pyuria was 5 (8.9%) with no significant differences. Mean age of Cases with asymptomatic bacteriuria, was 22 years while mean age of cases without ASB was 26 years with significant difference between the two groups ($P < 0.001$). Mean gestational age of cases with ASB was 27.9 weeks while mean gestational age of cases without ASB was 29.9 weeks with significant difference (p value = 0.049) (Table 4).

Six preeclamptic cases with ASB developed

complication while 5 preeclamptic cases without ASB develop complication. There were no significant difference as regard development of complication between preeclamptic cases with ASB and preeclamptic cases without ASB (Table 5).

Table (1): Comparison between the two studied groups as regard to age and gestational age

	Total (n = 80)	Preeclampsia		T	p
		Yes (n = 40)	No (n = 40)		
Age (years)	25.06 ± 4.31	24.82 ± 4.21	25.30 ± 4.44	0.491	0.625
Gestational age	29.36 ± 4.25	29.10 ± 4.51	29.63 ± 4.01	0.550	0.584

Table (2): Comparison between the two studied groups as regard presence of asymptomatic bacteriuria and the organism identified.

	Total (n = 80)		Preeclampsia				χ^2	p
			Yes (n = 40)		No (n = 40)			
	No.	%	No.	%	No.	%		
Asymptomatic bacteriuria								
No	56	70.0	25	62.5	31	77.5	2.143	0.143
Yes	24	30.0	15	37.5	9	22.5		
Organism identified								
Staphylococcus saprophyticus	4	16.7	1	6.7	3	33.3	1.053	^{FE} p=0.615
E-coli	10	41.7	7	46.7	3	33.3	1.829	0.176
Acinetobacter spp	1	4.2	1	6.7	0	0.0	1.013	^{FE} p=1.000
Enterococcus faecalis	3	12.5	1	6.7	2	22.2	0.346	^{FE} p=1.000
Klebsiella	5	20.8	4	26.7	1	11.1	1.920	^{FE} p=0.359
Staphylococcus aureus	1	4.2	1	6.7	0	0.0	1.013	^{FE} p=1.000

Table (3): Comparison between the two studied groups as regard to the presence of pyuria. and blood pressure of the patients.

Pyuria	Total (n = 80)		Preeclampsia				χ^2	^{FE} p
			Yes (n = 40)		No (n = 40)			
	No.	%	No.	%	No.	%		
No	71	88.8	37	92.5	34	85.0	1.127	0.481
Yes	9	11.3	3	7.5	6	15.0		
Blood pressure (mmHg)								
Systolic								
Min. – Max.	90.0 – 160.0		120.0 – 160.0		90.0 – 130.0		10.157*	<0.001*
Mean ± SD.	123.62 ± 19.50		138.25 ± 12.38		109.0 ± 13.36			
Diastolic								
Min. – Max.	50.0 – 100.0		70.0 – 100.0		50.0 – 90.0		10.167*	<0.001*
Mean ± SD.	78.75 ± 14.0		89.25 ± 7.64		68.25 ± 10.59			

Table (4): Comparison between cases with ASB and cases without ASB as regard to presence of Pyuria, age and gestational age. (n = 80)

	Asymptomatic bacteriuria				Test	P value
	No (n = 56)		Yes (n = 24)			
	No.	%	No.	%		
Pyuria						
No	51	91.1	20	83.3	$\chi^2=1.008$	0.441
Yes	5	8.9	4	16.7		
Age (years)	26.21 ± 4.25		22.37 ± 3.12		T=4.501*	<0.001*
Gestational age	29.96 ± 4.23		27.96 ± 4.03		T=2.011*	0.049*

Table (5): Comparison between preeclampsia cases with ASB and preeclampsia cases without ASB as regard to development of Preeclampsia complication (n = 34)

	Asymptomatic bacteriuria				χ^2	FEp
	No (n = 22)		Yes (n = 12)			
	No.	%	No.	%		
Eclampsia						
Negative	21	95.5	11	91.7	0.201	1.000
Positive	1	4.5	1	8.3		
HELLP syndrome						
Negative	21	95.5	9	75.0	3.130	0.115
Positive	1	4.5	3	25.0		
Abruptio placenta						
Negative	19	86.4	10	83.3	0.057	1.000
Positive	3	13.6	2	16.7		
Uncomplicated						
Negative	6	27.3	6	50.0	1.756	0.27
Positive	16	72.7	6	50.0		

There were six cases failed to be traced

DISCUSSION

In our study, the prevalence of asymptomatic bacteriuria among antenatal population at El shatby hospital was common (30% of all subjects). The reported asymptomatic bacteriuria in pregnant women has been noted as 10.1% in Tehran, Iran ,14.2% in Saudi Arabia, 28.5% in Pakistan, 23.9% in Nigeria, 12.3% in brazil ,8.5% in turkey ,4% in Australia, and 2.2% in London. ⁽¹⁵⁻¹⁸⁾

These figures reflect variable rates of asymptomatic bacteriuria in different geographic re-

gions. It seem that various factors such as age, sexual activity, socioeconomic status, history of urinary tract infection before pregnancy, anatomic malformations of the urinary system, and gestational age all have influential role in asymptomatic bacteriuria rate.

The high rate of asymptomatic bacteriuria observed in the current study can be the result of the method of sampling, cultural, and social status of the study population. These statistics indicate that, although the incidence of ASB in pregnancy varies in different countries and geographic regions, ASB

could overall be considered to affect a significant number of pregnant women worldwide.

For the first time in 1936, Peters et al. suggested association between bacteriuria and pre-eclampsia. ⁽¹⁹⁾ Then, Smith and Bullen reported that bacteriuria was more common in pregnant women with pre-eclampsia compared to those without pre-eclampsia. ⁽²⁰⁾

Stuart et al. later noted that pre-eclampsia was 4 times more common in women with bacteriuria than in those without bacteriuria. ⁽²¹⁾

In our study The rate of asymptomatic bacteriuria was higher in pre-eclampsia group(37%) than in control group(22%) but with no significant difference , perhaps this due to small number of our cases. In our study, ASB rate was more common in preeclamptic cases than control cases by 1.6 times.

There is partial agreement in our results with other studies by Borghei in Gorgan, Akerele, and Caroline as they showed similar results as ours, but they reported that bacteriuria was significantly more common in pregnant women with pre-eclampsia unlike our study, ASB was more common in pre eclamptic cases but with no significant difference ⁽²²⁻²⁴⁾

Studies by Shamsi in Pakistan and Rizek from UAE showed similar results as ours, with no significant difference was seen regarding bacteriuria between pre-eclampsia group and control group. ⁽²⁵⁻²⁶⁾

Maybe the agreement of our results with those of reported by Shamsi in Pakistan and Rizek from UAE is the adjustment for confounding variables such as gestational age and maternal age with matching.

The discrepancy with the results by Borghei, Akerele, and Caroline may be due to differences in cultural and socioeconomic status and the fact that the mentioned studies did not adjust confounding variables.

The results of our study showed that there was no significant difference between groups

of cases and control as regard to age.

Sheraz et al reported that PE was more common in patients younger than 21 years and above 35 years. ⁽²⁷⁾ Sajith et al reported that the highest prevalence of pregnancy hypertension was observed in the 22–28 age group with 41.3 %. ⁽²⁸⁾

As can be seen, the results of these studies are consistent with the findings of our study as preeclampsia rate is more common in the age range from 20:25 (57%) so PE is more common in younger age.

In our study, the mean gestational age of the two groups was not significantly different, as mean gestational age of preeclamptic cases was 29.1 while in control cases was 29.6 This finding was consistent with Hazhir and Shamsi's studies. ^{(15) (25)}

In our study, the mean age of cases with ASB was 22 years and 79 % of these cases had an age range from 20:25 years so ASB is more common in younger age. This consistent with increased prevalence of ASB with lower maternal age by Hazhir ⁽¹⁵⁾ .The exact link between maternal age and ASB is yet to be established.

In our study, mean gestational age of cases with ASB was 27 weeks

In our study, most culture positive cases were seen in second trimester (54.2%), which was similar to Girishbabu R J study and Nath et al study. ⁽²⁹⁻³⁰⁾

In our study *Escherichia coli* species was the most prevalent organism isolated in 41% of cases followed by *Klebsiella* in 20%. Most of the earlier reports showed *Escherichia coli* to be the predominant organism. ^{(16) (31-33)}

Unlike these reports, in a regional study in Ethiopia, the prevalent agents in ASB cases in pregnancy are coagulase-negative *Staphylococcus* species in 32.6% of cases, followed by *E. coli* in 26.1% and *Staphylococcus aureus* in 13%.⁽³⁴⁾

Another study, by Akerele et al in Benin found that the most prevalent organism was klebsiella ⁽²³⁾

The possibility of pre-eclampsia is the highest when there is previous history of contact with antigens that affect the body and especially affect the lymphocytes function. ⁽³⁸⁻⁴⁰⁾

In general, ASB are more common in women with pre-eclampsia and this may reflect a background disease in the kidneys.

The results of this study showed that ASB is more common in cases with preeclampsia by 1.6 times than cases without preeclampsia but with no significant difference so to fully understand if there is any link between PE and ASB ,we need a larger number of cases to study.

CONCLUSIONS

- Asymptomatic bacteriuria was a common finding among pregnant women in our study (30% of whole cases).
- Asymptomatic bacteriuria was more common in preeclamptic group (37%) than control group (22%).
- The most common organism in asymptomatic bacteriuria in the studied group of pregnant women at El shatby antenatal care clinic is E.coli (41%).
- E.coli was most sensitive to Imipenem (100%) ,nitrofurantoin (100%) and trimethoprim sulphamehoxazole (100%) , while Klebsiella spp to Imipenem (100%) and Cefotriaxone (100%) while Staphylococcus saprophyticus to Vancomycin ,teicoplanin and Linezolid (100%)

RECOMMENDATIONS

We recommend screening for bacteriuria early in pregnancy (1st prenatal care) and follow in 2nd and 3rd trimester of pregnancy to detect cases with asymptomatic bacteriuria so we can prevent the main side effect in pregnancy and the safety of mothers.

There is particular need for guidelines defining the basic principles to be followed in antibiotic treatment of ASB in pregnant women.

We recommend doing more clinical research on larger scale of pregnant women with PE and ASB to investigate the association between both of them.

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