Should asymptomatic bacteriuria be screened in pregnancy?

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Summary

The incidence of asymptomatic bacteriuria is reported as 2-14% during pregnancy. Fetal and maternal complications like acute pyelonephritis, hypertension, anemia, preterm labor, low-birth-weight infants and intrauterine growth retardation can be expected.

The purpose of this study was to determine the incidence of asymptomatic bacteriuria during pregnancy and its relation to pregnancy complications.

The study involved 270 pregnant women up to 32 gestational weeks during a 9-month period. At the initial visit, they were screened with urine culture in order to detect asymptomatic bacteriuria. A control group was formed in a retrospective manner from the first day of the study with 186 pregnant women who delivered in our clinic and who were not screened for asymptomatic bacteriuria.

The incidence of asymptomatic bacteriuria was 9.31%. Escherichia coli accounted for 79%, which was the most frequent of the isolates. We observed recurrence and had to apply treatment again to 21.7% of the women.

The sensitivity, specificity, positive predictive and negative predictive values of leucocyturia as a screening test for asymptomatic bacteriuria were 91.3%, 83.6%, 45.6% and 98.5%, respectively.

We diagnosed preterm labor in six of 23 (26%) with asymptomatic bacteriuria and 16 in 163 (9.3%) women in the urine culture negative group.

The ratio acute pyelonephritis in the group which was routinely screened and treated for asymtomatic bacteriuria was 0.5% while the prevalence was 2.1% in the nonscreened group.

Considering the relatively high incidence of asymptomatic bacteriuria during pregnancy and the relevant complications, we propose to screen and treat asymptomatic bacteriuria routinely in all pregnant women.

Key words: Asymptomatic bacteriuria; Pregnancy complications.

Introduction

Asymptomatic bacteriuria is defined as a positive urine culture of at least 10^5 organism/ml of urine without symptoms of urinary tract infection. It is most often seen during pregnancy because of dilatation of the upper ureters and renal pelvises, decreased peristalsis of the ureters and bladder, increased urine pH, aminoasiduria and glycosuria [1-8].

Although in most studies the prevalence of asymptomatic bacteriuria ranges between 4% and 7%, this ratio rises with some properties like lower socioeconomic status, the sickle cell trait, diabetes mellitus, and some other diseases [9, 10].

E. Coli is the most frequent pathogen isolated in different studies. The other frequent organisms are klebsiella pneumonia, proteus mirabilis and enterococcus. Group B β hemolytic streptococci, staphylococcus saprophyticus, staphylococcus aureus are other pathogens that can cause asymptomatic bacteriuria [9-12].

Some important complications which can result from asymptomatic bacteriuria are acute pyelonephritis, chronic renal failure, sepsis, septic shock, postpartum endometrit, hypertension, anemia, prematurity, low birth weight, intrauterine growth retardation, intrauterine death, and fetal abnormalities [1-8].

We aimed to determine the incidence of asymptomatic bacteriuria during pregnancy among the pregnant women who were followed in the antenatal outpatient clinic of the Uludag University Faculty of Medicine, Department of Obstetrics and Gynecology and to investigate its relationship with complications of pregnancy.

Materials & Methods

From June 1998 to January 1999, all pregnant women up to 32 gestational weeks seen at the outpatient obstetrics clinic were included in the study. Patients who were followed-up at the antenatal clinic because of a renal disease before, had a diagnosis for asymptomatic bacteriuria, or who were taking antibiotics for any reason were excluded. The socioeconomic status of each woman was evaluated with a standard scale. According to a questionnaire which covered standard questions about income, occupation and economic status, a score was found for every woman. Their socioeconomic status was categorized as very good, good, moderate, poor, or very poor according to the score.

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All patients were screened with a whole blood count and a total urine analysis. A midstream sample of morning urine was obtained for culture at the first visit in order to detect asymptomatic bacteriuria. The urine culture was defined as positive when there was colonization of the same organism in a concentration of more than 100,000 bacteria/ml of urine. A positive culture was treated with 3 g of amoxicilin or 2 g of cephalexin during a 7-10 day period according to antibiotic sensitivity testing. Follow-up urine cultures were obtained one week after the treatment.

Pregnant women who had urine cultures were followed-up for complications during pregnancy. The babies and the patients were evaluated after the delivery. Gestational age at delivery, the indication of the section, the gender of the baby, weight and length of the baby, head circumference, Apgar scores at the 1st minute and 5th minute after the birth and the neonatal status were recorded if the woman delivered in our clinic. If not, we tried to reach the woman by phone in order to obtain this information. The participations who could not be reached were excluded from the study.

The control group was formed in a retrospective manner from the first day of the study with 186 pregnant women who delivered in our clinic and who were not screened for asymptomatic bacteriuria. All the data of the control group were compared to the study group except for the socioeconomic status of the patients.

The analysis was performed using "instant version 2.02" software and the statistical assessment was acquired by using the Student's t-test and Fisher chi-square test. The relation was statistically significant if the p value was < 0.05.

Results

During the study period, 270 patients were screened for asymptomatic bacteriuria. We obtained 247 results of 270 urine cultures; 61 of 247 screened patients were excluded from the study because of insufficient delivery records. Thus there were 186 patients in both the study and control groups.

Twenty-three of the 247 women has positive urine cultures and the incidence of asymptomatic bacteriuria was 9.31%.

When we look at the gestational age of the women when urine culture was obtained, the highest ratio of positive urine cultures was between the 25th and 32nd weeks which was 12.8% where at the beginning of the pregnancy the ratio was smaller (6.3%).

E. Coli was the most frequent pathogen of asymptomatic bacteriuria as 78.2%. The second most common microorganism was klebsiella penumonia (8.6%). Streptococcus saprophyticus, stafilococcus hominis and enterococus fecalis were seen in 4.4% of the patients.

Fifteen of the 23 asymptomatic bacteriuric patients were treated with ampicillin, seven with cephalexin and one with nitrofuration. A secondo sample was obtained one week after the treatment and a positive culture was confirmed in five of the patients. The recurrence rate of asymptomatic bacteriuria was 21.7% in our study. The women who had recurrence were investigated for renal disease with renal ultrasonography and renal function tests. Bacteriuria was eradicated in two patients but the culture remained positive for the other three. Continuous antimicrobial therapy was initiated for these unresponsive patients.

The sensitivity, specificity, positive (+) predictive and negative (–) predictive values of leucocyturia were 91.3%, 83.6%, 45.6% and 98.5% respectively.

First phase results:

The culture positive (+) group and culture negative (–) group who were screened for asymptomatic bacteriuria were routinely compared in the first phase of the study.

The difference between both groups regarding age was not significant. However there was a significant relationship between socioeconomic status and asymptomatic bacteriuria. The socioeconomic status of the positive urine culture group was moderate with 66.31% ± 8.67 points but the score for the negative (–) culture group was 75.74 ± 9.72 which represents a good socioeconomic status ($p < 0.05$). Other parameters like pregnant and working, education, the physical conditions of their house, etc. were not statistically significant.

In addition, their gynecologic history and some characteristics like smoking or alcohol consumption were not statistically significant.

The cesarean section rate was not significantly high in the positive culture group when compared with the negative culture group.

Thirteen percent of the babies in the positive culture group and 4.3% of the babies in the negative culture group were low birth weights (Figure 1). The difference between the two groups was significant.

The first minute Apgar score was 9 or 10 in 61% of the positive culture pregnant women while 85% in the negative culture group. The difference was statistically significant ($p < 0.05$), but the same difference was not observed in 5th min. Apgar score.

Six of the 23 pregnant women in the positive culture group (26%), and 16 of the 163 women in the negative culture group (9.8%) had premature labor. The difference was statistically significant ($p < 0.05$).

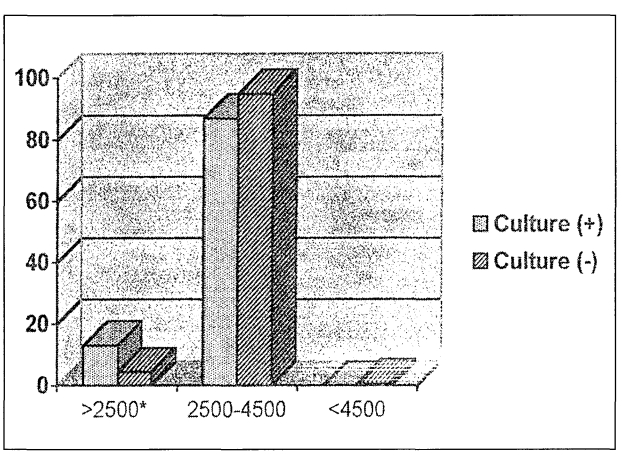

Figure 1. — The mean percentages of newborn weights in both groups.

Hyperemesis gravidarum, gestational diabetes mellitus, pyelonephritis, hypertension, anemia, premature rupture of the membrane, intrauterine growth retardation, polyhydramnios, fetal abnormalities, and intrauterine death did not differ in the two groups (Table 1).

The gestational age of the six patients who had premature labor with asymptomatic bacteriuria were between 25-32 weeks.

Second phase results:

The study group who were routinely screened for asymptomatic bacteriuria and the control group who delivered in our hospital before the study began and were not screened routinely, were compared to each other.

The mean age of patients in the study group was 27.71 ± 5.12 and 27.74 ± 4.59 in the control group ($p \leq 0.05$).

As in the first phase results, there was no significant difference between the study and the control groups for the mode of delivery and for the weight of the newborn.

The pyelonephritis ratio was 0.5% in the study group and 2.1% in the control group ($p < 0.05$). Intrauterine growth retardation was observed in one baby (0.5%) in the study group, but in five babies (2.68%) in the control group ($p < 0.05$). The difference between the two groups for polyhydramnios was also significant; 0.05% in the study group and 2.38% in the control group.

Hypertension was found in 4.3% of the study group and 9.6% of the control group ($p < 0.05$).

There was no significant difference between the two groups for the other complications (Table 2).

Table 1. — *Pregnancy complications in culture (+) and culture (–) groups.*

Complications of Pregnancy	Culture (+) group		Culture (–) group	
	n. 23	%	n. 163	%
Hyperemesis gravidarum	2	8.6	10	6.1
GDM	1	4.3	6	3.6
Pyelonephritis	0	0	1	0.6
Hypertension	1	4.3	7	4.2
Anemia	6	26	35	21.4
Premature Labor	6	26	16	9.8
PROM	1	4.3	5	3
IUGR	0	0	1	0.6
Polyhydramnios	0	0	1	0.6
Fetal anomalies	0	0	3	1.8
Intrauterine death	1	4.3	0	0

Table 2. — *Pregnancy complications in screened (study) and non-screened (control) group.*

Complications of Pregnancy	Study G.	n. 186	Control G.	n. 186
	n	%	n	%
Hyperemesis gravidarum	12	6.4	7	3.76
Gestational diabetes mellitus	7	3.76	5	268
Pyelonephritis	1*	0.5*	4*	2.1*
Hypertension	8*	4.3*	18*	9.6*
Anemia	41	22	54	29
Prematurity				
Premature rupture	22	11.8	18	9.6
of membrane	6	3.21	7	3.76
Intrauterine growth				
retardation	1*	0.5*	5*	2.68*
Polyhydramnios	1*	0.5*	5*	2.68*
Fetal abnormalities	3	1.6	2	1
Intrauterine death	1	4.3	7	3.7

* $p < 0.05$

Discussion

In our study the incidence of asymptomatic bacteriuria was 9.31%. In the literature this ratio has been reported between 4-10% [1-8]. It is known that some factors like lower socioeconomic status, increased parity, increased maternal age, sickle cell trait, diabetes mellitus & preeclampsia increase the prevalence of asymptomatic bacteriuria [9, 10]. Low socioeconomic status was the only characteristic found statistically significant in our study.

At the beginning of the 3rd trimester, the ratio of the asymptomatic bacteriuria was 12.8% whereas at the beginning of the pregnancy the ratio was 6.3%. With these results it is obvious that there is a higher susceptibility to asymptomatic bacteriuria in the late period of pregnancy. Thus it is necessary to investigate asymptomatic bacteriuria in the late period even if it was not investigated during the early period of pregnancy.

In most of the studies, E. Coli was the leading pathogen responsible for asymptomatic bacteriuria [9, 10, 12-15]. In our study E. Coli accounted for 79% of the isolates. In the literature this ratio is reported between 75-90%. Klebsiella pneumonia, proteus mirabilis and other enterococci come after E. Coli [3]. Klebsiella pneumonia with an 8.6% frequency was the second most common pathogen in our study. Streptococcus saprofiticus, stafilococcus hominis and enterococcus fecalis were seen in one case (4.4%).

Women with a positive urine culture were treated based on antibiotic sensitivity testing as universally applicable. Treatment generally covers a 7-day period, but a single dose treatment or 3-day treatment period were also acceptable protocols [16-24]. In our study women with aymptomatic bacteriuria were treated with a 7-10 day protocol. Recurrence rate is given as between 70 to 80%. No difference was reported between the 7-10 day protocol and the 1-3 day protocol for the efficiency of treatment and recurrence. In this study's follow-up, urine cultures were obtained one week after treatment. In follow-up urine cultures, recurrence of asymptomatic bacteriuria was found in 21.7% (5 patients). These patients were treated a further seven days based on antibiotic sensitivity testing. Two women, whose repeat cultures were positive, were placed on daily antibiotic suppression with nitrofuratoin (100 mg/day) for the remainder of their pregnancies. These results show that after treating the asymptomatic bacteriuria, it is necessary to repeat cultures.

The sensitivity of leucocyturia was 91.3% and specificity was 83.6%, positive and negative predictive values

were 45.6% and 98.5%, respectively. In the literature, Chongsomchai *et al.* found a sensitivity for urinalysis of 18.4% and a total accuracy of the test of 88.4% [25]. Palleras *et al.* found a sensitivity of leucocyturia as low as 22% and a specificity of 91% [26].

Earlier studies have demonstrated that a high prevalence of asymptomatic bacteriuria correlates with increased parity and maternal age, but in our study we found no difference regarding the age and parity in the positive urine culture and negative urine culture groups [27, 28].

There was however, a correlation between lower socioeconomic status and high prevalence of asymptomatic bacteriuria. In agreement with these studies the socioeconomic score of the positive urine culture was significantly lower than the negative urine culture group's score.

Regarding the complications of pregnancy, only preterm labor was significantly higher in the positive culture group than the negative culture group. In the asymptomatic bacteriuria group, six of the 23 (26%) had preterm labor whereas in the negative culture group 16 of the 163 (9.8%) had preterm labor. Four of the six women who had preterm labor were between 25-32 gestational weeks when they were diagnosed and preterm delivery could not be prevented. Mittendrof *et al.*, reported a relevant relation with asymptomatic bacteriuria and preterm labor and low-birth weight in 1962 [27]. There are different studies which had opposite results regarding the relation between asymptomatic bacteriuria and preterm delivery and low-birth weight [29, 30]. Analysis of these studies shows that untreated asymptomatic bacteriuria leads to an increased risk of preterm labor and low-birth weight [31]. In non-bacterluric women, relative risk of preterm labor is 0.5 and for low-birth weight it is 0.65. When asymptomatic bacteriuria is treated then the relative risk is again 0.65. Therefore asymptomatic bacteriuria should be treated. In our study four pregnant women who had asymptomatic bacteriuria and preterm labor were between the 25th and 32nd gestational weeks. Pregnant patients who had urine cultures before the 25th gestational week did not have any preterm labor. Thus we can conclude that asymptomatic bacteriuria could lead to preterm labor and should be treated to prevent this serious pregnancy complication.

There was no pyelonephritis in the 23 positive urine culture group but there was one pyelonephrit in 163 of the negative urine culture group. Four cases of pyelonephritis existed in the control group where no urine culture tests during their pregnancies were done (2.1%). The result of our study is consistent with the literature [8, 32]. This analysis demonstrates that screening and treatment of asymptomatic bacteriuria may prevent pyelonephritis when compared with no screening.

In a study by Lanke *et al.*, it was reported that the ratio of acute pyelonephritis was 1.8% in the group which was not screened for asymptomatic bacteriuria and this ratio decreased to 0.6% after routine screening and treatment [33]. This ratio was 2.1 and 0.3% in our study and this difference was statistically significant.

It has been reported that diabetes mellitus increases the prevalence of asymptomatic bacteriuria [34, 35]. In the study group there was no type I or II diabetes mellitus however in the bacteriuria positive group and negative culture group the ratio of gestational diabetes mellitus was 4.3% and 3.6%, respectively. Though the difference was not significant, the ratio of gestational diabetes mellitus in the group not screened routinely was no different than the routinely screened group (3.76%).

It has been reported that preeclampsia is a risk factor because of low serum proteins [30, 36, 37]. We found the prevalence of hypertension in the positive culture and negative group to be 4.3% and 4.2%, respectively. These results are not consistent with the literature.

Although there is a study showing that anemia is a risk factor for asymptomatic bacteriuria, anemia was found to be 26% in the positive culture group and 21.1% in the negative culture group. The difference was not significant in our study.

In conclusion, because of a close relationship between asymptomatic bacteriuria and low-birth weight and pyelonephritis, urine culture should be used as a routine screening test during pregnancy. Low socioeconomic status should be accepted as a risk factor. It is also necessary to repeat the culture in women who have been treated before because of the high recurrence rate of asymptomatic bacteriuria.

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