Bacterial Profile and Occurrence of Urinary Tract Infections, Associated Risk Factors among the Pregnant Women in A Tertiary Hospital of Chattogram, Bangladesh

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ABSTRACT

Bacground: *Due to the physiological changes during pregnancy, pregnant women are likely to develop recurrent Urinary Tract Infections (UTIs) and pyelonephritis, which may result preeclampsia and adverse obstetric outcomes, including prematurity and low birth weight. Pregnant women should be screened for the presence of bacteriuria early in pregnancy. This study employed a cross-sectional analysis of the presence, bacterial profile and risk factors associated with UTI among pregnant women attending antenatal check-ups.*

Materials and methods: *This observational study was conducted at the Department of Obstetrics and Gynaecology and Clinical Pathology, Institute of Applied Health Sciences (IAHS) Chattogram during the period from January to December 2021. Sociodemographic data, obstetrical history and personal hygiene information were obtained using a well-structured questionnaire. Afterward, clean catch mid-stream urine samples were collected from 104 pregnant women. Isolation and identification of bacteria was done by conventional culture method.*

Results: *Among the study samples, 31(29.8%) showed positive culture result and considered as confirmed UTI. E.coli (45.10%) was predominant isolated bacteria followed by klebsiella spp. (25.80%). The result of multivariate analysis revealed that pregnant women with UTI had a history of lower abdominal pain which was 4.9 times more observable then other symptoms. The odds of having UTI among pregnant women who had previously indwelling catheter were 19.1 times higher than the odds in pregnant women who had not previously indwelling catheter [p=0.023].*

Conclusion: *The current findings demonstrate that a high occurrence of UTIs exists among pregnant women, with significant bacteriuria in asymptomatic cases. Escherichia coli was the most predominant bacteria isolated. Routine screening for asymptomatic bacteriuria in early pregnancy is effective in preventing the occurrence of symptomatic UTIs and complications in pregnancy.*

Key words : Asymptomatic bacteriuria; E.coli; UTI.

Introduction

Urinary Tract Infection (UTI) is a prevalent infection during pregnancy that can lead to complications for both the mother and fetus including pyelonephritis, delivery of premature and low birth weight baby. It is higher in developing countries. The anatomy of the urinary tract undergoes significant changes during pregnancy, with hormonal and mechanical factors contributing to ureteral dilatation, dilatation of the renal calyces and urinary stasis, all of which predispose pregnant women to Urinary Tract Infections (UTIs).[1] According to the World Health Organization (WHO) estimates, various infections during pregnancy account for 10.7% of pregnancy-related maternal deaths worldwide. Recent studies estimate that most of these infections, almost 28% are located in the urinary tract.[2] The most significant factor predisposing women to cystitis and pyelonephritis in pregnancy may be Asymptomatic Bacteriuria (ASB) which is defined as >100,000 organisms/mL on a clean catch urinalysis obtained from an asymptomatic patient.[3] If ASB is untreated in pregnancy, the rate of subsequent UTI has been quoted at approximately 25%. In low-income countries, screening and treatment of UTI or ASB is challenging due to the costs and logistics of performing urine culture. Recently, the World Health Organization (WHO) made context-specific antenatal care recommendations for screening and treatment of ASB

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in LMIC (WHO, Geneva 2016) recommending urine culture in settings with capacity or mid-stream urine Gram stain and treatment of ASB.

The most reliable tool for diagnosing UTI is urine culture, as it helps to detect and quantify the pathogen causing the infection.[4-5] Escherichia coli bacteria is the leading cause of UTI, accounting for 70-80% of cases.[6] Other micro-organisms that can cause UTI include *Klebsiella pneumonia,* Proteus, Acinetobacter, *Staphylococcus saprophyticus,* Streptococcus group B and *Pseudomonas aeruginosa*.[7]

Various factors increase the risk of UTI during pregnancy, including increasing age, number of births, frequency of sexual intercourse per week, diabetes, anaemia, previous history of UTI, compromised immunity and urinary tract abnormalities.[8] In 2020, a study was done in Sylhet, Bangladesh, showed one in 11 women had a UTI in pregnancy and approximately half of cases were asymptomatic.[8] In 2023, a study showed global prevalence of UTI among pregnant women to be 23.9%.[9] Therefore, it is recommended that all pregnant women undergo regular UTI screening tests and receive prompt treatment if diagnosed with UTI. Early detection and treatment of UTI during pregnancy are crucial to prevent complications that may affect the health of both the mother and the fetus.[10] But it is not a common practice in Bangladesh and screening for ASB in pregnancy is not considered as an essential part of Antenatal Care (ANC) like routine checkup for albumin and sugar in urine. In some cases, it is generally done only in the first visit of ANC.[11] The present study was designed to identify the common risk factors associated with UTI during pregnancy and determine the common uropathogen among pregnant women in IAHS, Chattogram.

Materials and methods
This hospital based observational study was carried out in the Department of Obstetrics and Gynaecology and Department of Clinical Pathology, IAHS Chattogram, during the period of January to December, 2021.

Inclusion criteria
Pregnant women aged between 18 to 45 years attending in IAHS Chattogram for antenatal visit were included in this research, irrespective of parity and gestational stage.

Exclusion criteria
Pregnant women, those who were not interested to participate and not accessible during data collection, under treatment with antimicrobials exempted from this study.

All the pregnant women irrespective of parity, gestation, with or without the symptoms of Urinary

Tract Infection (UTI) attending antenatal clinic for regular check-up were randomly enrolled in the study. 104 pregnant women, with or without the indications of UTI were included in this consideration. Sociodemographic, obstetrical history and personal hygiene information were obtained using a well-structured questionnaire. After taking both verbal and written consent from the respondents, with all aseptic precautions, clean-catch midstream urine samples about 15-20 ml were collected from each pregnant women into a sterile, wide-mouthed screw- capped container by standard technique for culture. After inoculating in UTI agar media by calibrated wire loop (0.01ml), identification of organisms were done as per standard laboratory methods of diagnosis. A specimen was considered positive for UTI if a single organism was cultured at a concentration of $\geq 10^5$ CFU/ml in both symptomatic and asymptomatic pregnant women.
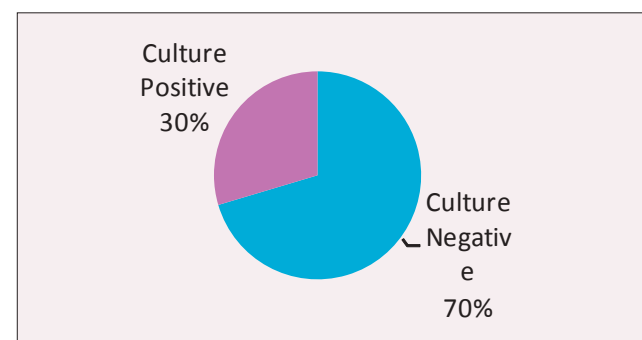
Results

Figure 1 Culture result of urine samples from pregnant women (n =104)

Among the 104 urine samples from pregnant women, 29.8% (31) showed positive culture result.
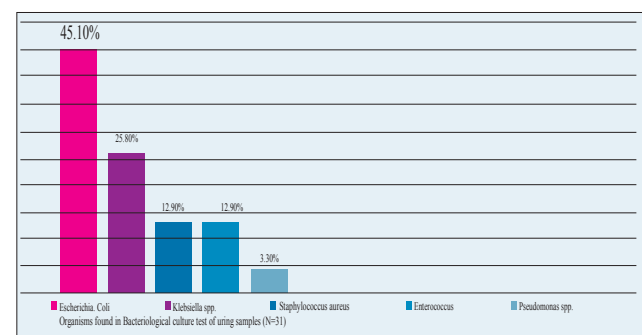

Figure 2 Distribution of bacterial isolates (n=31)

Distribution of the bacterial isolates showed *E. coli* (45.10%) was the predominant bacteria followed by *Klebsiella spp.* 25.80%, both *Staphylococcus aureus* and *Enterococcus spp.* 12.90% each and *Pseudomonas spp.* 3.30%.

In Unuvariable logistic regression, history of catheterization [p= 0.003] clinical symptoms like, anaemia [p=0.009], frequent urination [p=0.200], lower abdominal pain [p=0.006], urgency and dysuria [p=0.038 and 0.206 respectively] were found to be significantly associated with UTI among pregnant women and were to be a candidate for multivariate logistic regression analysis (Table I).

The result of multivariate analysis revealed that pregnant women with UTI had a history of lower abdominal pain which was 4.9 times more observable than other symptoms. The odds of having UTI among pregnant women who had previously indwelling catheter were 19.1 times higher than the odds in pregnant women who had not previously indwelling catheter [p=0.023] (Table II).

Table I Output of univariate logistic regression analysis to explore causes of factors of UTI (n=104)

Variable	Category (n)	No. of UTI patients	Proportion	p-value (chi square)	OR (95% CI)	p value (Univariate logistic regression)
Sanitation	Well cleaned (11)	2	18.18%	0.046	Ref	
	Moderately Hygiene (28)	7	25.0%		1.49 (0.25-8.67)	0.651
	Dirty (65)	22			2.30 (0.45-11.58)	0.312
Parity	Primiparity (31)	8	25.81%	0.561	Ref	
	Multiparity (73)	23	31.51%		1.32 (0.51-3.39)	0.562
Trimester	After 12 weeks (71)	19	26.76%	0.319	Ref	
	Up to 12 weeks (33)	2	36.36%		1.56 (0.64-3.78)	0.321
Previous history of UTI	No (87)	24	27.59%	0.263	Ref	
	Yes (17)	7	41.18%		1.83 (0.62-5.37)	2.67
History of Catheterization	No (95)	23	24.21%	<0.0001	Ref	
	Yes (9)	8	88.89%		25.04 (2.97-210.99)	0.003 (s)
History of diabetes	No (94)	27	28.72%	0.459	Ref	
	Yes(10)	4	40.00%		1.65 (0.43-6.32)	0.462
History of anaemia	No (94)	24	25.53%	0.003	Ref	
	Yes(10)	7	70.00%		6.80 (1.62-28.43)	0.009 (s)
Frequent urination	No (85)	23	27.06%	0.195	Ref	
	Yes (19)	8	42.11%		1.96 (0.70-5.48)	0.200
Lower abdominal pain	No (82)	19	23.17%	0.004	Ref	
	Yes (22)	12	54.55%		3.97 (1.48-10.63)	0.006 (s)
Urgency of urination	No (94)	25	26.20%	0.028	Ref	
	Yes (10)	6	60.00%		4.14 (1.07-15.89)	0.038
Dysuria	No (96)	27	28.13%	0.194	Ref	
	Yes (8)	4	50.00%		2.55 (0.59-10.95)	0.206
Fever	No (101)	30	29.70%	0.892	Ref	
	Yes(3)	1	33.33%		1.18 (0.10-13.55)	0.892

s = Significant (<.05)

Table II Multivariate logistic regression model of risk factors for the UTI (n=104)

Factor	Category	OR	95% CI	p
History of Catheterization	No	Ref	-	0.023
	Yes	19.1	1.50-242.6	
Lower abdominal pain	No	Ref	-	0.020
	Yes	4.9	1.27-19.01	

Catheterization and lower abdominal pain had significant association with UTI.

Discussion

Urinary Tract Infections (UTI) are the most common bacterial infections during pregnancy. Untreated UTI can be associated with serious obstetric complications. The present study was conducted to determine the proportion of UTI among pregnant women, their risk factors and common bacterial agents. A total of 104 pregnant women were enrolled in this study. Of these, thirty one (31) urine samples gave significant growth amounting to 29.81% (95% CI: 21.23 - 39.56) which is nearly similar to K. Perveen, Uttara Adhunik Medical College, who reported prevalence of 26.0%.[12] The prevalence rate was also showing similarity with the study done by M Shaheen, Menoufia University, Egypt. And it was 32.0%.[13] UTI can be both symptomatic and asymptomatic. In present study, Asymptomatic Bacteriuria (ASB) was 18.75 % (95 % CI: 8.94-32.62) and Symptomatic Bacteriuria (SB) was 39.29% (95 % CI: 26.5 - 53.2). A study done by Shankar, showed the prevalence of ASB was 17% which was incongruent with current study.[14] It is also observed that prevalence of ASB was 21.2% in Ethiopia (Tadesse) 29.5% in Nigeria (Izuchukwu).[15, 16] The different levels of ASB across different states within the country and different countries might be due to the differences in related factors, such as the sample size, geographical differences, social habits prevalent in the community and the health-related practices (Tadesse).[15] In this study, a big amount of women with bacteriuria were asymptomatic. The availability of asymptomatic cases have relevance with respect to screening procedures in Low Middle Income Countries (LMIC). A symptomatic approach to UTI will miss the majority of cases and the opportunity for intervention-treatment to prevent maternal morbidity and adverse pregnancy outcomes. While urine culture is standard of care in High Income Countries (HIC) it is typically costly and requires laboratory resources, infrastructure and personnel involvement which is not feasible in many LMIC settings. The diagnostic accuracy of urine dipstick and gram stain for diagnosis of ASB is poor, with particularly low sensitivity.[17,18] Lower cost, feasible and accurate point of care methods/diagnostics for screening for ASB are urgently needed to improve detection and management of UTI in LMICs.

The majority of the isolates were gram negative *E. coli* (45.10%), followed by *klebsiella* spp. Which was (25.80%) and then *enterococcus* spp. (12.90%). The gram positive *staphylococcus aureus* was (12.90%) and *pseudomonas aeruginosa* was (3.30%). Simillar result was observed in a study done by S. khanum, BIRDEM where *E. coli* was the predominant isolated pathogen followed by klebsiella spp. which was 50.4% and 20.0% respectively.[19] This is similar to most other studies throughout the world where *E. coli* has been consistently the predominant organism causing UTI (Enayet).[20] The major contributing factor for isolating higher rate of *E. coli* is due to urine stasis in pregnancy which favors for *E. coli* strain colonization.[21] The high ratio of *E. coli* is also due to the presence of this bacteria in the feces, thus it cause autoinfection. In addition, after gaining entry to the bladder, *E. coli* are able to attach to the bladder wall and form a biofilm that resists the body's immune response. Other studies of UTI etiology in Bangladesh have similarly reported a predominance of gram negatives, particularly *E. coli,* which comprised 59–75% of isolates and *Klebsiella species,* which ranged from 6 to 11% of isolates.[22, 23]

In this population, catheterization was a major risk factor for UTI, as was the presence of lower abdominal pain in the respondents. According to Ali et al. the risk of UTI was 3.2 times higher in pregnant women who previously had to use an indwelling catheter than in pregnant women who had never used one.[24] Other studies were supporting the findings that catheterization history increased the risk of UTI with pregnant women.[25,26,27]

Lower abdomen pain was the most common symptom among pregnant women with UTI, according to present study and this finding was in harmony with Tabassum et al. and Asmat et al.[28,29]

Poor hygiene habits are more common in young first-time mothers and those with low socioeconomic position, making them more susceptible to urinary tract infections (Schnarr et al).[29] But in further analysis, the study did not find it significant. However, several of the impacts of this study's univariate analysis were shown to be insignificant in multivariate models, which could be due to the study's low power due to the small number of data.

Conclusion

This study was undertaken to evaluate the occurrence of Urinary Tract Infecton (UTI) among pregnant women, associated risk factores and bacteriological

profile in IAHS hospital. The screening and treatment of urinary tract infections in pregnancy is standard of care in high-income countries and is now recommended by the WHO for LMIC. UTI in pregnancy is associated with maternal morbidity and adverse pregnancy outcomes. So further research is needed to identify low-cost, feasible and accurate methods for UTI screening and to address high rates of antibiotic resistance in LMIC.

Disclosure
The authors declared no competing interest.

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