The Association of Asymptomatic Urinary Tract Infection (UTI) with Diabetes Mellitus (DM) in Pregnant Women

Abdullah Al Kafi[1*], Mst. Asia Khatun[2], Belona Nasrin Shoshi[3]

[*1]Assistant Professor, Department of Medicine, Islami Bank Medical College, Rajshahi, Bangladesh.
Email: kafi_abdullah@yahoo.com
Orcid ID: 0000-0002-6611-7282
[2]Medical Officer, Chapai Nawabganj Diabetic Hospital, Chapai Nawabganj, Bangladesh,
Email: drasiachowdhury0@gmail.com
Orcid ID: 0000-0002-0211-0911
[3]Fellow, Department of Public Health, Varendra University, Rajshahi, Bangladesh.
Email: shoshiabdullah@gmail.com
Orcid ID: 0000-0002-3941-2059

*Corresponding author

Abstract

Background: Urinary tract infection (UTI) is a common infection of diabetic pregnant women because of excess urine glucose excretion and lowered immunity. UTI during pregnancy is directly proportionate to maternal and neonatal complications. Diabetes mellitus (DM) and urological health problems are closely related during pregnancy. DM patients are prone to UTI, bladder issues and sexual dysfunction. The intent of the study was to find out the association of asymptomatic urinary tract infection (UTI) with diabetes mellitus (DM) in pregnant women. **Material & Methods:** A prospective cross-sectional study was carried out in the Department of Public Health of Varendra University in Bangladesh for the duration of 4 months in the summer session from May 2018 to August 2018. All the pregnant mothers (N=119) with diabetes mellitus in Chapai Nawabganj during the study period constituted the study population. Ethical clearance was taken from the hospital. The data analysis was performed using Statistical Package for the Social Sciences (SPSS) Version 25.0. **Results:** Among the study population (N=119), the mean age of the respondents was 25.14 ± 4.82 years, and most of the respondents were in the age group of below 25 years. It was observed that around one-third of the respondents (36,30.3%) monthly income was up to 15,000 taka. Regarding the duration of gestation, it was observed that the mean duration of gestation was 19.06 ± 5.62 weeks. Around one-fourth of the respondents (33,27.7%) had good but unhygienic sanitation and the majority of them (78,65.5%) had good and hygienic sanitation conditions. It was recognized that the majority of the respondents (82,68.9%) had 6-8 times of micturition per day. Sixty-two respondents who had DM did not know about UTI and the relationship between the pattern of DM and urinary tract infection was not found statistically significant (p>0.05). **Conclusion:** In the case of pregnancy, in women with DM, UTI is the most commonly noticed maternal infection. The findings provided by the analysis might help in the management of asymptomatic urinary tract infections during pregnancy.

INTRODUCTION

Pregnancy is the reason behind various changes in the woman's body that rising the probability of Urinary tract infection (UTI). UTI is usually a reason behind severe infections during pregnancy.[1] Changes due to hormonal and mechanical changes can stimulate urinary stasis

and vesicoureteral reflux.[2] These variations, along with an already short urethral (almost 3 to 4 cm in females) and difficulty with hygiene due to a distended pregnant undercarriage, help make UTI the most common bacterial infection during pregnancy.[3] Asymptomatic bacteriuria (ASB) is the most significant factor which leads pregnant women to get UTI.[4] ASB is termed as more than 100,000 organisms/mL on a clean catch urinalysis obtained from an asymptomatic patient. The rate of subsequent UTI is approximately 25% if asymptomatic bacteriuria is untreated.[5] Due to both the high rate and potential importance of pyelonephritis, it is suggested that all pregnant women be screened for ASB at the prior prenatal visit.[6] Urine culture is the best option for diagnosis of UTI and the treatment of ASB lessens the rate of clinical infection to 3% to 4%.[7] UTI affected 2% to 10% of pregnant women.[8] Diabetes mellitus (DM) and urological health concerns are closely linked during pregnancy. DM are prone to UTI, bladder issues and sexual dysfunction.[8] DM can often make urologic conditions, even more, worsen as it can influence blood flow, nerves and sensory function in the body.[9] DM and gestational DM are considered important additional threat factors for both ASB and UTI during pregnancy. Similar or increased prevalence of ASB up to 24% in pregnant women with DM compared to women without DM.[10] The occurrence of UTI is higher in pregnant women with DM (3.3%-8.8%) in contrast to women without DM (1.3%-2.3%).[11] UTI is the commonest infection of diabetic pregnant women due to excess urine glucose excretion.[12] UTI during pregnancy relates to maternal and neonatal complications.[13] Diabetic pregnant women with UTI may have an increased threat of preterm labour,

hypertensive disorders, anaemia, and other adverse pregnancy results.[14] The intent of the study was to find out the association of asymptomatic urinary tract infection (UTI) with diabetes mellitus (DM) in pregnant women.

Objectives

The aim of the study was to evaluate the association of asymptomatic urinary tract infection (UTI) with diabetes mellitus (DM) in pregnant women.

Specific objectives

- To find out UTI by routine urine examination of pregnant mothers.
- To find out socio-demographic characteristics of the pregnant mothers.

MATERIAL AND METHODS

This cross-sectional descriptive type of study was carried out in the Department of Public Health of Varendra University in Bangladesh for the duration of 4 months in the summer session from May 2018 to August 2018. All the pregnant mothers (N=119) with diabetes mellitus in Chapai Nawabganj during the study period constituted the study population. Purposive sampling techniques were followed. A partially structured questionnaire which was duly pre-tested was used to collect data from the respondents. Ethical clearance was taken from the hospital. Verbal consent was taken from all the participants before starting data collection.

Data collection procedure: The researcher collected data from pregnant mothers with diabetes mellitus in Chapai Nawabganj by face-to-face interview through a partially structured

questionnaire. All efforts were made to collect data accurately. For open questions, the respondents were asked in such a manner so that they could speak freely and explain their opinion in a normal and neutral way. No leading questions were asked.

Data Analysis

The study coordinators performed random checks to verify data collection processes. Completed data forms were reviewed, edited, and processed for computer data entry. Frequencies, percentages, and cross-tabulations were used for descriptive analysis. The data analysis was performed using Statistical Package for the Social Sciences (SPSS) Version 25.0. The significance level of 0.05 was considered for all tests.

RESULTS

Among the study population (N=119), the mean age of the respondents was 25.14 ± 4.82 years, and most of the respondents were in the age group of below 25 years, around one-fourth of the study population (31,26.1%) were in 25-30 years age group & about one-fifth of the respondents (26,21.8%) age were more than 30 years old. It was observed that around one-third of the respondents (36,30.3%) monthly income was up to 15,000 taka, & only five respondents (5,4.2%) monthly income was more than 30,000 taka, and the mean monthly family income of the respondents was taka 19354.256 ± 6522.63. Regarding occupation status, the majority of the respondents (69,58.0%) were housewives. Regarding the duration of gestation, it was observed that the mean duration of gestation was 19.06 ± 5.62 weeks and seventy-eight respondents (78,65.5%) had up to 20 weeks of gestation, & around one-fourth (32,26.9%) had 21-28 weeks of gestation [Table 1]. Around one-fourth of the respondents (33,27.7%) had good but unhygienic sanitation and the majority of them (78,65.5%) had good and hygienic sanitation conditions [Table 2]. Most of the respondents (71,59.7%) had a tube well as the source of drinking water, around one-fourth of the respondents used to boil water, and nine respondents (9,7.6%) drank water from a river or pond. Most of the respondents drank 7-10 glasses of water every day and eleven respondents (11,9.2%) drank 3-6 glasses of water every day [Table 3]. It was recognized that the majority of the respondents (82,68.9%) had 6-8 times of micturition per day, one-fifth of them (24,20.2%) had 3-5 times and only thirteen of them (13,10.9%) had >9 times of micturition per day [Table 4]. It was discovered that most of the respondents (109,91.6%) did not have a history of urine retention and about half of them (62,52.1%) had a family history of DM [Table 5]. Regarding the pattern of DM, eighty-three (83,69.7%) had a form of DM and only twelve (12,10.1%) had complications during pregnancy [Table 6]. It was found that majorities of the respondents (83,69.7%) did not know about their urinary tract infection, thirty-three (33,27.7%) did not have any UTI & three (3, 2.5%) had UTI and only two respondents (2,1.7%) had blood in urine [Table 7]. Sixty-two respondents had DM but did not know about UTI and the relationship between the pattern of DM and urinary tract infection was not found to be statistically significant (p>0.05) [Table 8].

Table 1: Distribution of the study population based on Characteristics (N=119)

Characteristics	(N,%)
Age Mean±SD: 25.14 ± 4.82	
<25 years	62, 52.1%
25 - 30 years	31,26.1%
30+ years	26, 21.8%
Monthly family income	
Up to Taka 15000	36, 30.3%
Taka 15001 – 30000	78, 65.5%
Taka >30000	5, 4.2%
Occupation status	
Student	30, 25.2%
Housewife	69, 58.0%
Official Job	17,14.3%
Business	3, 2.5%
Duration of gestation Mean±SD: 19.06 ± 5.62	
Up to 20 weeks	78,65.5%
21 - 28 weeks -	32,26.9%
>28 weeks	9,7.6%

Table 2: Distribution of the study population based on Sanitation (N=119).

Sanitation	(N,%)
Poor	8,6.7%
Good but unhygienic	33,27.7%
Good and hygienic	78,65.5%

Table 3: Distribution of the study population based on Drinking water (N=119)

Source of drinking water	(N,%)
Tube well	71,59.7%
River/Pond -	9,7.6%
Boil water	30,25.2%
Mixed	9,7.6%
Amount of glass water per day	
3-6 glasses	11,9.2%
7-10 glasses	101, 84.9%
11-13 glasses	7,5.9%

Table 4: Distribution of the study population based on Frequency of micturition (N=119)

Frequency of micturition	(N,%)
3-5 times	24, 20.2%

6-8 times	82,68.9%
>9 times	13,10.9%

Table 5: Distribution of the study population based on H/O of urine retention & Family H/O of DM (N=119)

H/O of urine retention	(N,%)
Yes	10,8.4%
No	109,91.6%
Family history of DM	
Yes	62,52.1%
No	57,47.9%

Table 6: Distribution of the study population based on Pattern of DM & Complications during pregnancy (N=119)

Pattern of DM	(N,%)
Yes	83,69.7%
No	36,30.3%
Complications during pregnancy	
Yes	12,10.1%
No	107,90.0%

Table 7: Distribution of the study population based on UTI & blood in urine (N=119)

UTI	(N,%)
Yes	3,2.5%
No	33,27.7%
Don't know	83,69.7%
Blood in urine	
Yes	2,1.7%
No	117,98.3%

Table 8: Distribution of the study population based on the Relationship between pattern of DM and UTI

Pattern of DM	UTI			
	Yes	No	Don't know	Total
DM	2	19	62	83

*p value: >.05

DISCUSSION

This cross-sectional analysis was carried out mainly to find out the prevalence of DM with UTI in pregnant women. In this study, regarding the age distribution of the respondents, it was found that out of 119 respondent's majority (52.1%) were in the age group of < 25 years, 26. 1% were in the 25-29 years age group and 21.8% were 30+ years age

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group. The mean age of the respondents was 25.14 ± 4.82 years. The mean age was quite similar (26.13) found in another study.[15] Another study conducted in Ghana showed that all pregnant women were from 15 to 32 years old.[16]

In this present study, it was observed that around one-third of the respondent's (36,30.3%) monthly income was up to 15,000 taka. Another related study carried out in Southern Ethiopia found that about 32% of the study population had an average monthly income of less than 1000 Ethiopian birr.[17]

A systematic review based on Asian countries found that the majority of the UTI-affected women came from the low socio-economic condition and their monthly income was <Rs. 10,000/month.[18]

In our study most of the respondents were housewives. An analysis carried out in Iraq showed that most of the respondents were housewives.[19] Another similar study stated that about 69.0% were housewives.[20]

Another similar study found that the majority of pregnant women were unemployed/ homemakers by occupation.[21]

In our study, regarding the duration of gestation, it was observed that the mean duration of gestation was 19.06 ± 5.62 weeks. Another study demonstrated in Nigeria found that women in the 6 and 7 months of their pregnancy had the highest occurrence of 50.0% & 71.4% respectively while women in the early month of their pregnancy had no specific bacteria growth and no signs of UTI.[22]

A contradictory study found that the mean gestational age of the respondents was 34.05±7.44.[23] Another study depicted that the mean gestational age was 37.9±2.8.[24]

In this current analysis, around one-fourth of the respondents (33,27.7%) had good but unhygienic sanitation and the majority of them (78,65.5%) had good and hygienic sanitation conditions. Another study depicted that women with UTIs had poor personal hygiene.[25] A related study found that women were in good hygienic condition.[26]

In this current analysis, most of the respondents (71,59.7%) had tube well as the source of drinking water, around one-fourth of the respondents used to boiled water, and nine respondents (9,7.6%) drank water from a river or pond. Most of the respondents drank 7-10 glasses of water every day and eleven respondents (11,9.2%) drank 3-6 glasses of water every day. A related study published in an American journal found that all respondents drank 3-5 times water/per day.[26]

It was recognized that the majority (68.9%) of the respondents had 6-8 times of micturition, 20.2% had 3-5 times and 10.9% had >9 times of micturition. It was discovered that the majority (91.6%) of the respondents did not have a history of urine retention and 8.4% had that history. During pregnancy, changes in the urinary tract predispose women to infection.[27]

In this current content, it was found that the majority (52.1%) of the respondents had a family history of DM and 47.9% did not have a family history of DM. A related study suggested that around 22% of respondents had a family

history of DM & 26% had a previous history of UTI.[28]

In this present study, most (89.9%) of the respondents did not have any complications during pregnancy and 10.1% had a history of this complication. A contradictory study suggested that pyelonephritis is the most common severe bacterial infection that can lead to maternal and perinatal complications during pregnancy.[29]

It was found that majorities (69.7%) of the respondents did not know about their urinary tract infection, 27.7% did not have any UTI and 2.5% had UTI. In the postpartum period, changes in bladder sensitivity and bladder overdistention may predispose to UTI.[30]

It was found that most (98.3%) of the respondents did not have any blood in their urine and 1.7% had blood in their urine. The relationship between the pattern of DM and urinary tract infection was not found statistically significant (p>0.05). Diabetes mellitus (DM) in women with urinary tract infection (UTI) and in the time of pregnancy are most frequent and can have far-reaching consequences for the woman and neonate.[31]

In our finding, out of 83 diabetic pregnant women, 2 respondents had UTI, & 62 respondents did not know about UTI.

CONCLUSIONS

In the case of pregnant women with DM, UTI is the most commonly noticed maternal infection, because in addition to the anatomical and physiological variations seen in the renal tract during pregnancy, DM usually subdues the immune system and increases the progression of acute pyelonephritis and renal abscess. The findings provided by the study might help in the management of asymptomatic urinary tract infections along with diabetes mellitus during pregnancy.

Recommendations
Screening for asymptomatic UTIs should regularly be carried out in pregnant mothers having diabetes mellitus. Nutrition counseling and physical activity should be the main and prime strategies. If lifestyle modification alone fails to maintain normoglycemia, OADs(Metformin) and insulin should be considered. Postpartum care should not be overlooked, as it plays an acute part m the prevention of future chronic non-communicable diseases.

REFERENCES

1. Kline KA, Lewis AL. Gram-Positive Uropathogens, Polymicrobial Urinary Tract Infection, and the Emerging Microbiota of the Urinary Tract. Microbiol Spectr. 2016;4(2):10.1128/microbiolspec.UTI-0012-2012. doi: 10.1128/microbiolspec.UTI-0012-2012.
2. Ansaldi Y, Martinez de Tejada Weber B. Urinary tract infections in pregnancy. Clin Microbiol Infect. 2022:S1198-743X(22)00431-1. doi: 10.1016/j.cmi.2022.08.015.
3. Ugarcina Perovic S, Ksiezarek M, Rocha J, Cappelli EA, Sousa M, Ribeiro TG, Grosso F, Peixe L. Urinary Microbiome of Reproductive-Age Asymptomatic European Women. Microbiol Spectr. 2022;10(6): e01308-22.
4. Schneeberger C, Kazemier BM, Geerlings SE. Asymptomatic bacteriuria and urinary tract infections in special patient groups: women with diabetes mellitus and pregnant women. Curr Opin Infect Dis. 2014;27(1):108-14.
5. El Taha L, Bazi T, Maalouf H, Hajjar R, Hasbini Y, El Ouweini H, et al. The clinical utility of intrapartum

screening urinalysis for the prevention of postpartum pyelonephritis. Eur J Obstet Gynecol Reprod Biol. 2021;261:154-159. doi: 10.1016/j.ejogrb.2021.04.034.

6. Matuszkiewicz-Rowińska J, Małyszko J, Wieliczko M. Urinary tract infections in pregnancy: old and new unresolved diagnostic and therapeutic problems. Arch Med Sci. 2015;11(1):67-77. doi: 10.5114/aoms.2013.39202.

7. Claeys KC, Trautner BW, Leekha S, Coffey KC, Crnich CJ, Diekema DJ, et al. Optimal Urine Culture Diagnostic Stewardship Practice-Results from an Expert Modified-Delphi Procedure. Clin Infect Dis. 2022;75(3):382-389. doi: 10.1093/cid/ciab987.

8. Dimetry SR, El-Tokhy HM, Abdo NM, Ebrahim MA, Eissa M. Urinary tract infection and adverse outcome of pregnancy. J Egypt Public Health Assoc. 2007;82(3-4):203-18.

9. Liang CC, Chao M, Chang SD, Chiu SY. Impact of prepregnancy body mass index on pregnancy outcomes, incidence of urinary incontinence and quality of life during pregnancy - An observational cohort study. Biomed J. 2020;43(6):476-483. doi: 10.1016/j.bj.2019.11.001.

10. Getaneh T, Negesse A, Dessie G, Desta M, Tigabu A. Prevalence of Urinary Tract Infection and Its Associated Factors among Pregnant Women in Ethiopia: A Systematic Review and Meta-Analysis. Biomed Res Int. 2021;2021:6551526. doi: 10.1155/2021/6551526.

11. Baer RJ, Nidey N, Bandoli G, Chambers BD, Chambers CD, Feuer S, et al. Risk of early birth among women with a urinary tract infection: a retrospective cohort study. Am J Perinatol. 2021;11(01):e5-14.

12. Jagadeesan S, Tripathi BK, Patel P, Muthathal S. Urinary tract infection and Diabetes Mellitus-Etio-clinical profile and antibiogram: A North Indian perspective. J Family Med Prim Care. 2022;11(5):1902-1906. doi: 10.4103/jfmpc.jfmpc_2017_21.

13. Chawanpaiboon S, Buayaem T, Sodsee S, Titapant V, Pooliam J. Prevalence of asymptomatic bacteriuria among Thai diabetic pregnant women. Afr J Reprod Health. 2021;25(5):133-9.

14. Smaill FM, Vazquez JC. Antibiotics for asymptomatic bacteriuria in pregnancy. Cochrane Database Syst Rev. 2015;(8):CD000490. doi: 10.1002/14651858.CD000490.pub3.

15. Tadesse E, Teshome M, Merid Y, Kibret B, Shimelis T. Asymptomatic urinary tract infection among pregnant women attending the antenatal clinic of Hawassa Referral Hospital, Southern Ethiopia. BMC Res Notes. 2014;7:155. doi: 10.1186/1756-0500-7-155.

16. Afoakwa P, Domfeh SA, Afranie BO, Owusu DO, Donkor S, Sakyi KK, et al. Asymptomatic Bacteriuria and Anti-Microbial Susceptibility Patterns among Women of Reproductive Age. A Cross-Sectional Study in Primary Care, Ghana. Med Sci (Basel). 2018;6(4):118. doi: 10.3390/medsci6040118.

17. Edae M, Teklemariam Z, Weldegebreal F, Abate D. Asymptomatic Bacteriuria among Pregnant Women Attending Antenatal Care at Hiwot Fana Specialized University Hospital, Harar, Eastern Ethiopia: Magnitude, Associated Factors, and Antimicrobial Susceptibility Pattern. Int J Microbiol. 2020;2020:1763931. doi: 10.1155/2020/1763931.

18. Belete MA, Saravanan M. A Systematic Review on Drug Resistant Urinary Tract Infection Among Pregnant Women in Developing Countries in Africa and Asia; 2005-2016. Infect Drug Resist. 2020;13:1465-1477. doi: 10.2147/IDR.S250654.

19. Almukhtar SH. Urinary tract infection among women aged (18-40) years old in Kirkuk city, Iraq. Open J Nurs. 2018;12(1):248-254.

20. Hassan MH, Hassan A. Effect of intervention guidelines on self-care practices of pregnant women with urinary tract infection. Life Sci J. 2015;12(1):113-24.

21. Kant S, Lohiya A, Kapil A, Gupta SK. Urinary tract infection among pregnant women at a secondary level hospital in Northern India. Indian J Public Health. 2017;61(2):118-123. doi: 10.4103/ijph.IJPH_293_15.

22. Okonko IO, Ijandipe LA, Ilusanya OA, Donbraye-Emmanuel OB, Ejembi J, Udeze AO, et al. Incidence of urinary tract infection (UTI) among pregnant women in Ibadan, South-Western Nigeria. Afr J Biotechnol. 2009;8(23):6649-6657.

23. Masinde A, Gumodoka B, Kilonzo A, Mshana SE. Prevalence of urinary tract infection among pregnant women at Bugando Medical Centre, Mwanza, Tanzania. Tanzan J Health Res. 2009;11(3):154-9. doi: 10.4314/thrb.v11i3.47704.

24. Al-Bash MR, Mathew M, Al-Kharusi LA, Abu-Heija AT. Symptomatic Urinary Tract Infection in Diabetic Pregnant Women, Effect of the Type of Diabetes and Glycemic Control. Saudi J Med Med Sci. 2016 May-;4(2):104-107. doi: 10.4103/1658-631X.178327.

25. Shaheen HM, Farahat TM, Hammad NA. Prevalence of urinary tract infection among pregnant women and possible risk factors. Menoufia Med J. 2016;29(4):1055.

26. Alvarez JR, Fechner AJ, Williams SF, Ganesh VL, Apuzzio JJ. Asymptomatic bacteriuria in pregestational diabetic pregnancies and the role of group B streptococcus. Am J Perinatol. 2010;27(3):231-4. doi: 10.1055/s-0029-1239485.

27. Guinto VT, De Guia B, Festin MR, Dowswell T. Different antibiotic regimens for treating asymptomatic bacteriuria in pregnancy. Cochrane Database Syst Rev. 2010;(9):CD007855. doi: 10.1002/14651858.CD007855.pub2.

28. Shaheen HM, Farahat TM, Hammad NA. Prevalence of urinary tract infection among pregnant women and possible risk factors. Menoufia Med J. 2016;29(4):1055.

29. Le J, Briggs GG, McKeown A, Bustillo G. Urinary tract infections during pregnancy. Ann Pharmacother. 2004;38(10):1692-701.

30. Guyatt GH, Oxman AD, Schünemann HJ, Tugwell P, Knottnerus A. GRADE guidelines: a new series of articles in the Journal of Clinical Epidemiology. J Clin Epidemiol. 2011;64(4):380-2. doi: 10.1016/j.jclinepi.2010.09.011.

31. Schneeberger C, Kazemier BM, Geerlings SE. Asymptomatic bacteriuria and urinary tract infections in special patient groups: women with diabetes mellitus and pregnant women. Curr Opin Infect Dis. 2014;27(1):108-14. doi: 10.1097/QCO.0000000000000028.