Risk Factors and Prevalence of Urinary Tract Infection among Pregnant Women Attending Antenatal Care at Wachemo University Comprehensive Specialized Hospital

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Abstract

Background: Urinary tract infection is the single most common bacterial infection of mankind.

Objective: To assess the risk factors and prevalence of Urinary tract infection among pregnant women attending antenatal care at Wachemo University Comprehensive Specialized Hospital, Central Ethiopia, 2023.

Methods: An institutional-based cross-sectional study design was conducted from 2 October to 29 December 2023. The total sample size was 405 and a systematic random sampling technique was used. Data were entered using the Epi-data 3.1 version and exported to SPSS 25 for analysis. Multicollinearity was checked. The goodness of fit test was done using the Hosmer-Lemeshow goodness of fit test. Binary logistic regression analysis was done, and variables with a p-value of <0.25 in the bivariable analysis were taken into the multivariable analysis. Statistical significance was declared at a p-value of <0.05 with an adjusted odds ratio and 95% confidence interval.

Result: The prevalence of urinary tract infection was 40.7% with 95%CI [36.5–45.2]. Rural resident [AOR: 2.32, 95% CI: 1.36–3.96], educational status of husband no formal education [AOR: 3.38, 95% CI: 1.24–9.21], educational status of husband primary level [AOR: 2.94, 95% CI: 1.06–8.18], having vaginal bleeding [AOR: 3.89, 95%CI: 1.78–8.47], having female genital mutation [AOR: 2.98, 95%CI: 1.83–4.84], itchiness around genitalia [AOR: 3.82, 95%CI: 1.14–12.82], and using water for cleaning after defecation [AOR: 0.46, 95%CI: 0.22–0.97] were significantly associated.

Conclusion: Four in ten pregnant women attending antenatal care had urinary tract infections. Residence, educational status of the husband, vaginal bleeding, female genital mutation, itchiness around genitalia, and mode of cleaning after defecation were significantly` associated. Therefore, creating awareness for rural women, improving the educational status of husbands`, treatment of vaginal bleeding, avoiding female genital mutation, screening and treating itchiness around genitalia, and using water for cleaning after defecation might reduce the burden.

Introduction

Urinary tract infection (UTI) is the single most common bacterial infection of mankind caused by the presence and growth of microorganisms in any part of the urinary tract (Demilie et al., 2012; Emiru et al., 2013; Ilusanya et al., 2018). UTI affects all age groups, but women are more susceptible than men due to the short urethra, lack of

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prostatic discharge, pregnancy, and easy contamination of the urinary tract with fecal flora (Al-Haddad, 2015; Hala et al., 2017).

Literature shows that UTI particularly during pregnancy causes serious obstetric complications, including poor maternal and perinatal outcomes such as intrauterine growth restriction, preeclampsia, cesarean section, and preterm birth (Al-Haddad, 2015; Tadesse et al., 2014). UTI is a major cause of morbidity and mortality in pregnant women in sub-Saharan Africa. About 30% of women with untreated asymptomatic bacteriuria during pregnancy develop pyelonephritis, which can result in the delivery of low birth weight or preterm infants (Emiru et al., 2013; Tadesse et al., 2014).

There are studies done in Ethiopia previously (Assefa et al., 2008; Demilie et al., 2012; Obied & Abo Gad, 2017; Tadesse et al., 2014), however, these studies are done before 10 years. Even though, the system of health delivery, the attitude of the mothers toward seeking treatment, the lifestyle, and living environment have changed today. There is little data that states the current UTI status among pregnant women (Gebretensaie et al., 2023). As a result, the authors initiated to come with recent evidence of Urinary tract infection among pregnant women attending antenatal care at Wachemo University Comprehensive Specialized Hospital, Central Ethiopia.

Methods and Materials

Study Area and Period

The study was conducted at Wachemo University Comprehensive Specialized Hospital (WCUCSH). It is a teaching hospital of Wachemo University found in Hosanna town, Central regional state of Ethiopia. Hosanna town is the capital of Central Ethiopia Regional State. It is located 232 km from Addis Ababa (the capital city of Ethiopia). The hospital provides multidisciplinary services including outpatient department, emergency department, inpatient, Maternal and child health, laboratory, pharmacy, optometry, psychiatric clinics, orthopedic, and oncology services. The hospital has a total of 561 workers and of them, 409 are health professionals. The antenatal care unit has four rooms in which midwives, general practitioners, obstetricians, and gynecologists give antenatal care to pregnant women. The study was conducted from 2 October to 29 December 2023.

Study design: An institutional-based cross-sectional study was conducted.

Source population: All pregnant women who visit antenatal care follow-up in Wachemo University Comprehensive Specialized Hospital.

Study population: All selected pregnant women who visit antenatal care follow-up in Wachemo University Comprehensive Specialized Hospital at the time of data collection time.

Eligibility Criteria

All pregnant women who visited antenatal care follow-up in WCUCSH at the time of data collection were included. However, pregnant women aged less than 18 years and critically ill were excluded from the study.

Sampling Size Determination

The sample size was determined using a single population formula. The assumptions of a 95% confidence interval, 5% margin of error, and a proportion of 39.8% taken from a previous study are as follows:

$$\frac{\left(\frac{z\alpha}{2}\right)^2 p(1-p)}{d^2} = \frac{(1.96)^2 0.398(0.602)}{(0.05)^2} = 368$$

By considering a 10% non-response rate, the sample size was 405.

Sampling Procedure

The preceding three months' report of ANC clinic was identified and it was 864. Then, the women were selected by using a systematic random sampling technique, considering a constant value of 2, which was obtained by dividing the total population by the total sample size (864/405). The first woman was determined by a lottery method and every second woman was interviewed.

Study Variables

Dependent variable: Urinary tract infection

Independent Variables

Sociodemographic factors: Age, marital status, residence, religion, ethnicity, educational status of mother, educational status of husbands, occupational status of mothers, and occupational status of husbands

Maternity-related factors: Gestational age, number of ANC visits, gravidity, parity, HIV status, vaginal bleeding in current pregnancy, history of abortion, and female genital mutilation.

Medical-related factors: Diabetes mellitus status, history of UTI, history of hematuria, burning sensation, itchiness around genitalia, fever, abdominal pain, and history of catheterization.

Environmental and individual-related factors: Mode of defecation, material for cleaning genitalia after defecation, and material for cleaning genitalia after urination.

Operational Definition

Bacterial identification: Clean catch midstream urine samples were collected from all participants using a wide-mouthed sterile-capped container. The specimen was promptly transported to the microbiology laboratory and cultured within one hour of collection. The test was performed on all isolates according to the Clinical & Laboratory Standards Institute protocol (Clsi, 2015).

Urinary tract infection detection: This is an infection of a unitary tract of a pregnant woman. It was measured by considering the laboratory investigation result. Then, categorized as **yes** (if the lab result was positive) and **no** (if the lab result was negative). The asymptomatic infection was clinically detected based on definite clinical manifestations.

Data Collection Tool and Procedures

The tool was prepared in English and was structured questionnaires from related literature (Emiru et al., 2013; Tadesse et al., 2014). Data was collected through face-to-face interviews with mothers at the ANC clinic. The data was collected by three graduated Bachelor's degree midwives and supervised by an epidemiologist and a microbiologist.

Data Quality Control

The questionnaire was translated to Amharic (the official language of Ethiopia) before data collection, and back to English after data collection to ensure consistency by language expertise. A Pre-test was done on 5% of the total sample size at Doyogena Primary Hospital and necessary modification was performed based on the pre-test. Data collectors and the supervisor were trained for one day on the objectives of the study, how to select study participants, how to keep the collection format, and data quality management. The supervisors conducted daily follow-ups during the whole period of data collection. Every day, after data collection, each questionnaire was reviewed and checked for completeness by the investigator. The necessary feedback was given to the data collectors the next day.

Statistical Analysis

Data were entered by using Epi data version 3.1 and exported to SPSS version 25 software for analysis. Descriptive findings were presented by frequency tables, graphs, and percentages. Multi-collinearity was checked by considering tolerance and variance inflation factors. The goodness of fit test was done using the Hosmer-Lemeshow model goodness fit test. Bivariable analysis was done and variables with a p-value <0.25 were taken to multivariable logistic regression analysis. Adjusted odds ratio with a 95% confidence interval was considered and statistical significance was declared at p-value less than 0.05.

Result

Sociodemographic Characteristics of Pregnant Women

Four hundred-five pregnant women participated in the study, which made the overall response rate 100%. Out of the 405 pregnant women, 149(36.8%) were in the age group of 25–29 years old, and 382(94.3%) were married. The residents of 287(70.9%) were urban and more than half, 213(52.6%) were followers of the protestant religion. Of the ethnicity of more than half, 282(69.6%) were from Hadiya. The educational status of 137(34.4%) was secondary school and 137(34.4%) husbands` educational status was secondary. The occupation of 290(71.6%) were housewife and 128(31.4%) husbands` occupation was merchant. (Table 1)

Maternity-Related Characteristics of Pregnant Women

The gestational age of more than half, 227(56.0%) was in the third trimester, and only 5(1.2%) had antenatal care visits. More than half, 292(72.1%) and 241(59.5%) were multigravida and multipara respectively. Only, 9(2.2%) were human immune deficiency virus carriers and 54(13.3%) had vaginal bleeding in their current pregnancy. About 59(14.6%) had history of abortion and 219(54.1%) were genitally mutilated. (Table 2).

Medical-Related Factors of Pregnant Women

Of the 405 pregnant women, 19(4.7%) were known diabetes mellitus patients and 67(16.5%) had a history of urinary tract infection. Similarly, 36(8.9%) had a history of hematuria and 51(12.6%) had a burning sensation in their current pregnancy. Only, 61(15.1%) had itchiness around genitalia in the current pregnancy and 42(10.4%) had a fever in the current pregnancy. Fewer, 49(12.1%) had abdominal pain in the current pregnancy and 30(7.4%) had a history of catheterization. (Table 3).

Environmental and Individual-Related Factors

The mode of defecation for 363(89.6%), 31(7.7%), and 11(2.7%) was a private toilet, public toilet, and open defecation respectively. Majority, of 354(87.4%) cleaning genitalia after defecation with water, on the other hand, 51(12.6%) use tissue paper. Most, 385(95.1%) women wash their genitalia after urination, however, 20(4.9%) did not wash their genitalia after urination.

Urinary Tract Infection Among Pregnant Women

Out of the 405 pregnant women who participated in this study, 240(59.3%) had no urinary tract infection, however, 165(40.7%) had urinary tract infection. (Figure 1).

Table 1. Sociodemographic Characteristics of Pregnant Women Attending Antenatal Care at WCUCSH, Central Ethiopia, 2023.

Variables (n = 405)	Category	Frequency	Percent
Age (years) of pregnant women	19–24	103	25.4
	25–29	149	36.8
	30–34	109	26.9
	35–40	44	10.9
Marital status	Married	382	94.3
	Single	7	1.7
	Divorced	13	3.2
	Widowed	3	0.7
Residence	Urban	287	70.9
	Rural	118	29.1
Religion	Protestant	213	52.6
	Orthodox	107	26.4
	Catholic	5	1.2
	Muslim	77	19.0
	Adventist	3	0.7
Ethnicity	Hadiya	282	69.6
	Kenbata	77	19.0
	Silte	17	4.2
	Gurage	25	6.2
	Wolaita	4	1.0
Educational status	No formal education	63	15.6
	Primary	199	49.1
	Secondary	109	26.9
	Above secondary	34	8.4
Educational status of husbands' (n = 398)	No formal education	32	8.0
	Primary	118	29.6
	Secondary	137	34.4
	Above secondary	111	27.9
Occupational status	Housewife	290	71.6
	Merchant	52	12.8
	Government employee	33	8.1
	Private employee	16	4.0
	Student	14	3.5
Occupational status of husbands' (n = 398)	Farmer	99	24.9
	Merchant	125	31.4
	Driver	58	14.6
	Government employee	66	16.6
	Private employee	44	11.1
	Daily laborer	6	1.5

Factors Associated with Urinary Tract Infection Among Pregnant Women

In bivariable logistic regression analysis, residence, educational status of the husband, vaginal bleeding in current pregnancy, female genital mutation, history of urinary tract infection, burning sensation in current pregnancy, itching around genitalia, abdominal pain in current pregnancy and mode of cleaning after defecation were significantly associated with urinary tract infection among pregnant women attending antenatal care. Whereas in multivariable logistic regression analysis, residence [AOR: 2.32, 95% CI: 1.36–3.96], educational status of husband no formal education [AOR: 3.38, 95% CI: 1.24–9.21], educational status of husband primary level [AOR: 2.94, 95% CI: 1.06–8.18], vaginal bleeding in current pregnancy [AOR: 3.89, 95%CI: 1.78–8.47], female genital mutation [AOR: 2.98, 95%CI: 1.83–4.84], itchiness around genitalia [AOR: 3.82, 95%CI: 1.14–12.82], and mode of cleaning after defecation [AOR: 0.46, 95%CI: 0.22–0.97] were significantly associated with urinary tract infection among pregnant women attending antenatal care. (Table 4).

Discussion

The magnitude of urinary tract infection among pregnant women attending antenatal care was 40.7% with 95%CI

Table 2. Maternity-Related Characteristics of Pregnant Women Attending Antenatal Care at WCUCSH, Central Ethiopia, 2023.

Variables (n = 405)	Category	Frequency	Percent
Gestational age	First trimester	36	8.9
	Second trimester	142	35.1
	Third trimester	227	56.0
Number of antenatal care visits women achieved	One	58	14.3
	Two	81	20.0
	Three	75	18.5
	Four	71	17.5
	Five	52	12.8
	Six	45	11.1
	Seven	18	4.4
	Eight	5	1.2
Gravidity	Primigravida	95	23.5
	Multigravida	292	72.1
	Grand multigravida	18	4.4
Parity	Null para	57	14.1
	Primipara	90	22.2
	Multipara	241	59.5
	Grand multipara	17	4.2
Human immune deficiency virus status	Positive	9	2.2
	Negative	396	97.8
Vaginal bleeding in current pregnancy	Yes	54	13.3
	No	351	86.7
History of abortion	Yes	59	14.6
	No	346	85.4
Female genital mutilation	Yes	219	54.1
	No	186	45.9

Table 3. Medical-Related Factors of Pregnant Women Attending Antenatal Care at WCUCSH, Central Ethiopia, 2023.

Variables (n = 405)	Category	Frequency	Percent
Known diabetes mellitus patient	Yes	19	4.7
	No	386	95.3
History of urinary tract infection	Yes	67	16.5
	No	338	83.5
History of hematuria	Yes	36	8.9
	No	369	91.1
Burning sensation in current pregnancy	Yes	51	12.6
	No	354	87.4
Itchiness around genitalia in current pregnancy	Yes	61	15.1
	No	344	84.9
Fever in the current pregnancy	Yes	42	10.4
	No	363	89.6
Abdominal pain in the current pregnancy	Yes	49	12.1
	No	356	87.9
History of catheterization	Yes	30	7.4
	No	375	92.6

[36.5–45.2]. It was consistent with studies conducted in Ghana 39.8%, Tanzania 41.0% (Mlugu et al., 2023), and 42.7% (Adabara et al., 2012). However, it was higher than studies conducted in various parts of Ethiopia were 9.5%-15.5% (Assefa et al., 2008; Demilie et al., 2012; Gebretensaie et al., 2023; Obied & Abo Gad, 2017; Tadesse et al., 2014), and study from Ghana was 17.1% (Adjato et al., 2019). In addition, it was higher than studies
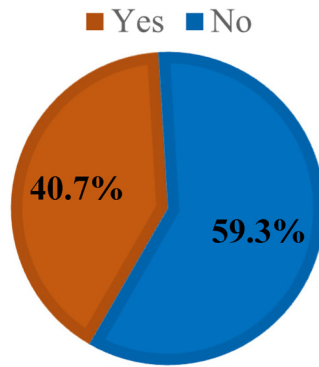
Figure 1. Urinary tract infection of pregnant women attending antenatal care at WCUCSH, Central Ethiopia, 2023.

reported Kenya 15.7% (Onyango et al., 2018), Tanzania 16.8% (Kaduma et al., 2019), Cameroon 23.5% (Egbe et al., 2020), Iran 13.1% (Farazi and Jabbariasl, 2016), and India (20.1%–28.0%) (Ranjan et al., 2017; Takre et al., 2015). In contrast, it was lower than studies done in Nigeria (Adabara et al., 2012), and Saudi Arabia. The possible explanation for this variation might be due to variation within a country, across countries, and geographical areas, respectively, which can be attributed to factors such as varied personal hygiene practices, attitudes around UTIs, sexual behavior, limited healthcare infrastructure, and diagnostic tools. The within-country variation among Ethiopian studies might be related to the time differences, sexual behavior, and improved diagnostic tools in the current healthcare system.

In this study, residence was significantly associated with urinary tract infections among pregnant women attending antenatal care. Pregnant women whose residences were rural were 2.32 times more likely to have urinary tract infections compared to pregnant women whose residences were urban. In the Ethiopian setting, there is a limitation of infrastructures such as; educational coverage, toileting, health coverage, and clean water supply in rural areas. The limitation of these infrastructures especially, having poor knowledge about infection prevention, exposes the woman to UTI.

This study revealed that the educational status of husbands` was found to be significantly associated with urinary tract infections among pregnant women attending antenatal care. Pregnant women whose husbands had no formal education were 3.38 times more likely to have urinary tract infections compared to pregnant women whose husbands were educated above the secondary level. Similarly, pregnant women whose husbands attended the primary level were 2.94 times more likely to have urinary tract infections compared to pregnant women whose husbands were educated above the secondary level. This could be explained from different directions. Those husbands who had better educational status gave information to their wives about the UTI itself and the mechanisms of prevention.

Similarly, educated husbands live in environments where there is better infrastructure exposure to social media, and with educated neighbors. Additionally, those pregnant women whose husbands were educated above the secondary level could have better socioeconomic status, live in urban settings, and manage lifestyles. Due to these possible reasons, pregnant women whose husbands lack educational access were prone to urinary tract infections.

Vaginal bleeding in current pregnancy was significantly associated with urinary tract infection among pregnant women attending antenatal care in this study. Pregnant women who had vaginal bleeding in their current pregnancy were 3.89 times more likely to have urinary tract infections compared to pregnant women who did not have vaginal bleeding in their current pregnancy. This might be related to the nature of bleeding that predisposes the mother to anemia. In another study anemia is a significant factor for UTI among pregnant women (Emiru et al., 2013). The high probability of developing UTI among anemic pregnant women may be related to immunity. In addition, bleeding from the vagina gives a chance for the microorganisms to ascend via the urethra.

In this study, female genital mutation was significantly associated with urinary tract infection among pregnant women attending antenatal care. Genitally mutilated pregnant women were 2.98 times more likely to have urinary tract infections compared to pregnant women who are not genitally mutilated. Sadly, female genital mutilation is common in the current study area and the mutilation is carried out by traditional means at various childhood ages. The type of mutilation practiced in the area is cutting the clitoris. This association might be due to the absence of a clitoris that makes microorganisms easily ascend through the urethra.

In this study, itchiness around genitalia was significantly associated with urinary tract infections among pregnant women attending antenatal care. Pregnant women who had itchiness around genitalia were 3.82 times more likely to have urinary tract infections compared to pregnant women who did not have itchiness around genitalia. This was stated in another study as pregnant women who had a previous history of UTI were 3.397 times more likely to be infected than the compared group (Emiru et al., 2013). This might be due to continued exposure to the causing microorganisms. In addition, itching around the genitalia might be the clinical manifestation of the infection.

Mode of cleaning after defecation was significantly associated with urinary tract infection among pregnant women attending antenatal care. Pregnant women who clean with water after defecation were 54% less likely to have urinary tract infections compared to pregnant women who clean with soft tissue. This is due to that washing the anus and genitalia after defecation removes fecal contents from the anus. In contrast, using tissue paper does not remove all fecal contents which give the best opportunity for microorganisms to

Table 4. Bivariable and Multivariable Logistic Regression Analysis of Pregnant Women Attending Antenatal Care at WCUCSH, Central Ethiopia, 2023.

| Variables (n = 405) | Category | UTI | | COR(95% CI) | AOR(95% CI) | p-value |
		No	Yes			
Residence	Urban	188 (44.4%)	99 (24.4%)	1	1	
	Rural	52 (12.8%)	66 (16.3%)	2.41 (1.56–3.73)	2.32(1.36–3.96)	0.002*
Educational status of husband (n = 398)	No formal education	7 (1.8%)	25 (6.3%)	3.82 (1.54–9.52)	3.38 (1.2–49.21)	0.017*
	Primary	61 (15.3%)	57 (14.3%)	2.78 (1.13–6.87)	2.94 (1.06–8.18)	0.039*
	Secondary	60 (15.1%)	77 (19.3%)	1.79 (0.71–4.51)	1.56 (0.55–4.43)	0.408
	Above secondary	37 (9.3%)	74 (18.6%)	1	1	
Vaginal bleeding in current pregnancy	Yes	43 (10.6%)	11 (2.7%)	3.06 (1.53–6.12)	3.89 (1.78–8.47)	0.001*
	No	197 (48.6%)	154 (38.0%)	1	1	
Female genital mutation	Yes	151 (37.3%)	68 (16.8%)	2.42 (1.61–3.63)	2.98 (1.83–4.84)	0.000*
	No	89 (22.0%)	97 (24.0%)	1	1	
History of UTI	Yes	29 (7.2%)	38 (9.4%)	0.46 (0.27–0.78)	0.99 (0.43–2.27)	0.976
	No	211 (52.1%)	127 (31.4%)	1	1	
Burning sensation in current pregnancy	Yes	33 (8.1%)	18 (4.4%)	3.08 (1.67–5.69)	1.66 (0.66–4.17)	0.277
	No	132 (32.6%)	222 (54.8%)	1	1	
Itchiness around genitalia	Yes	43 (10.6%)	18 (4.4%)	4.35 (2.40–7.87)	3.82 (1.14–12.82)	0.030*
	No	122 (30.1%)	222 (54.8%)	1	1	
Abdominal pain in the current pregnancy	Yes	16 (4.0%)	33 (8.1%)	3.50 (1.86–6.60)	1.09 (0.34–3.50)	0.890
	No	224 (55.3%)	132 (32.6%)	1	1	
Mode of cleaning after defecation	With water	203 (50.1%)	151 (37.3%)	0.51 (0.27–0.97)	0.46 (0.22–0.97)	0.042*
	With tissue paper	37 (9.1%)	14 (3.5%)	1	1	

Abbreviations: AOR: Adjusted Odds Ratio; **COR:** Crude Odds Ratio; **UT:** Urinary Tract Infection.
Hint: 1: Reference group; ***:** significant at p-value less than 0.05.

grow. Then, due to the anatomic nearness of the anus to the urethra, the microorganism freely spread to the urethra.

Conclusion

Four in ten pregnant women attending antenatal care had a urinary tract infection. Residence, educational status of the husband, vaginal bleeding in the current pregnancy, female genital mutation, itchiness around genitalia, and mode of cleaning after defecation were significantly associated with urinary tract infection among pregnant women attending antenatal care. Therefore, creating awareness about urinary tract infections for rural women, improving the educational status of husbands', early and effective treatment of vaginal bleeding during pregnancy, avoiding female genital muta- tion, screening and treating itching around the genitalia, and using water for cleaning after defecation might reduce the burden of urinary tract infection among pregnant women.

Authors' Contribution

All authors made a significant contribution to the work reported, whether that is in the conception, study design, execution, acquisi- tion of data, analysis, and interpretation, or all areas; took part in drafting, revising, and critically reviewing the article; gave final approval of the version to be published; have agreed on the journal to which the article has been submitted; and agreed to be accountable for all aspects of the work.

Availability of Data

The data used for analysis are available on secure and reasonable request.

Declaration of Conflicting Interests

The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Ethical Consideration

The research ethical review committee of the comprehensive nursing department approved the proposal of this research (CMHS/DCN/39/15).

Informed Consent

Written informed consent was obtained from each participant as the information obtained from them would not have been disclosed to a third person and it was only for investigation purposes.

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