

Original Research Article

Prevalence and Associated Factors of Urinary Tract Infections among Pregnant Mothers Attending Antenatal Medical Care Service in Yabello Primary Hospital, Borena Zone, Southern Ethiopia

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Abstract

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Urinary Tract Infections (UTI) during pregnancy is a prevalent disease condition which is associated with maternal complications and adverse obstetric outcomes like prematurity, low birth weight and higher fetal mortality rate. The key objective of this study was to assess the prevalence and associated factors of urinary tract infections in pregnant women visiting antenatal medical care service in Yabello Primary Hospital. A cross-sectional study design was conducted on all pregnant mothers attending antenatal medical care service in Yabello Primary Hospital and agreed to be enrolled in the study from 1 Sep. – 30 Dec. 2014/informal intermittently up to the beginning of 2016. A total of 280 mothers were enrolled in the study by convenient sampling technique. Each respondent was interviewed with pre-tested questionnaires and urine samples of each mother were checked for presence of urinary tract infections by laboratory test. All pregnant women who were on antibiotics treatment two weeks prior to hospital visit and those who did not agree to be enrolled were excluded from the study. The collected data were processed and analyzed using SPSS version 20. Microbial studies have found that experienced workers can achieve better diagnostic precision for UTI with urine microscopy than with urine culture. So urine microscopy was applied for effective detecting of the microbes identified and supplemented by dip sticks. Some samples were also counterchecked with the method of urine culture involving Gram-Stain, but no difference in accuracy. A total of 280 pregnant mothers were involved in the study and 31 (11.1%) of them had urinary tract infections. *Escherichia coli* (45.2%) was the commonest isolated bacterial pathogen. The highest age specific prevalence of urinary tract infection was seen in age group 30-34(19.4%) and the lowest was seen in age group 25-29 (10.0%) and none in those age groups greater than 45 years old (0.0%). There was no significant association between parity and presence of UTI, as well as between maternal age and prevalence of UTI but there was significant association between gestational age and presence of UTI. This study showed that 11.1% of pregnant women had UTI. *Escherichia coli* was the predominant isolate causing urinary tract infection in pregnant mothers. The comparison of the number of occurrence of pregnant women having UTI with the stages of trimester indicated that the pregnant women in the third trimester were very likely to be positive for UTI.

Key words: *Escherichia coli*, pregnant women, prevalence, urinary tract infections

INTRODUCTION

Urinary tract infections (UTIs) refer to both microbial colonization of the urine and tissue invasion of any

structure of the urinary tract as well as multi-action of organisms in the urinary tract (Giraldo et al., 2012; Vasu-

devan, 2014). Urinary tract infection is a common contagion among men and women but the incidence is quite high among women due to their physiology. In simple terms, it can be referred to as a condition which women do certainly encounter during the span of their life time and the prevalence is higher among women during pregnancy. As the name indicates, the infected parts involve the urinary tract comprising of the upper and lower urinary tract. The infection is named after the part that gets infected and is referred to as cystitis (bladder infection) and pyelonephritis (kidney infection) (Vasudevan, 2014).

Bacteria are the most commonly responsible agents for UTI although yeasts, viruses and protozoa may be involved. *Trichomonas vaginalis* is a parasitic protozoan causing millions of new urinary tract infections per year (Eshete et al., 2013). Pregnancy is one of the factors which increase the risk of UTI partly due to the pressure of gravid uterus on the ureters causing stasis of urine flow and is also attributed to the humoral and immunological changes during normal pregnancy (Ramzan et al., 2004; Assefa et al., 2008). During pregnancy there are a number of conditions associated with an increased prevalence of UTI (Dalzell and Lefevre, 2000). UTI is common with varying prevalence by age, sexual activity and the presence of genitourinary abnormalities (Colgan et al., 2006). The significance of risk factors like anaemia, low income level, past history of UTI and sexual activity and its association with UTI among women during pregnancy have been confirmed (Emiru et al., 2013).

Most commonly urinary tract infections during pregnancy are asymptomatic. Asymptomatic bacteriuria in pregnancy has been attributed to increased urinary stasis, ureteric relaxation and other anatomical change during pregnancy. This pathological condition begins in week 6 and peak during week 22 to 24 and this prevent easy passage of urine (Ramzan et al., 2004). UTI is more common in primigravidae than multiparae, previous history of UTI increases the chance by 50%, presence of asymptomatic bacteria increases the chance by 25%, abnormality in the renal tract is found in about 25% (Emiru et al., 2013).

Pregnancy enhances the progression from asymptomatic to symptomatic bacteriuria which could lead to pyelonephritis and adverse obstetric outcomes such as prematurity, low-birth weight and higher fetal mortality rate (Ramzan et al., 2004; Kladsenský, 2012).

It had been ascertained that no research work was conducted on urinary tract infections in this study area here before. Therefore, the key objective of this study was to assess the prevalence and associated factors of urinary tract infections in pregnant women visiting

antenatal medical care service in Yabello Primary Hospital.

METHODS

Study area and period

The study was conducted from 1 Sep.-30 Dec. 2014 in Yabello Primary Hospital, Borena Zone, Southern Oromia, Ethiopia. After that, other informal diagnostic examinations for the urinary tract infections with the same pathogens were executed intermittently in the population of pregnant mothers in this very hospital up to the beginning of 2016 and the infections had been proved to be persistent in the region. (Figure 1)

Study design, population and eligibility criteria

Hospital-based cross-sectional study design was employed to determine the prevalence and associated factors of UTIs among pregnant mothers. All pregnant mothers attending antenatal clinic (ANC) at Yabello Hospital during the study period, and volunteer to participate were included in the study. All pregnant women who were on antibiotics treatment two weeks prior to hospital visit were excluded from the study.

Sample size determination and technique

In this study, the required sample size (n) for the study was calculated using a formula for a single population proportion. Taking critical value at 95% confidence level ($Z_{\alpha/2} = 1.96$) and degree of precision of 5% and sample proportion 0.25. Then a total of 280 pregnant mothers were recruited in the study.

Regarding the sampling technique, convenient sampling technique was applied to select the study population, due to the small number of attendants during study period.

Data collection methods and quality assurance

Information on parity and stage of pregnancy was extracted from patient card. Other information was obtained using a well structured questionnaire by trained senior clinical nurse in ANC clinic. A pre-designed and structured questionnaire was used for the collection of data on associated risk factors. All questionnaires were filled by trained clinical nurse who can understand local language. The questionnaire was prepared in English

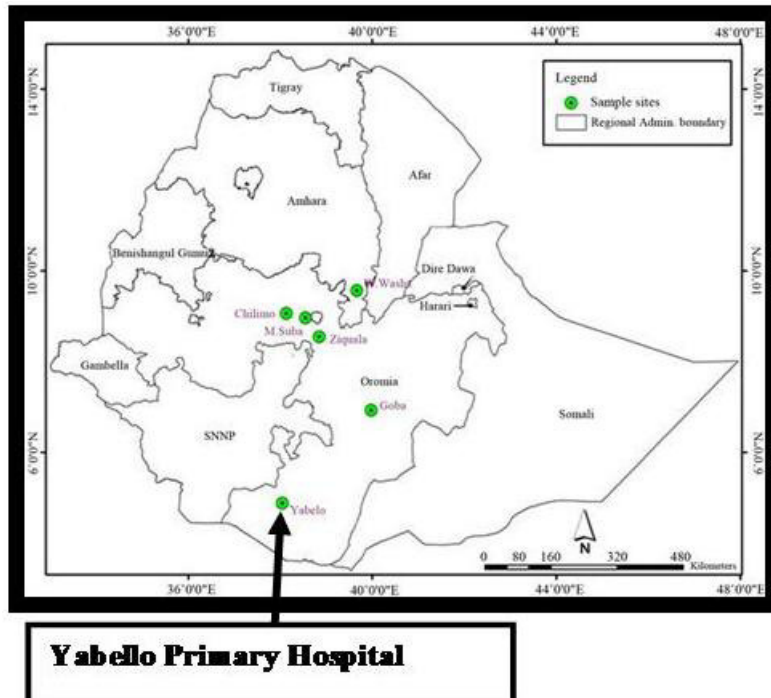


Figure 1. The map of Ethiopia showing the exact location of Yabello Primary Hospital in Yabello Town, Borana Zone, Southern Oromia, Ethiopia.

version and it was translated into local language (Afan Oromo) then turn to English to maintain the consistency of the data.

Regarding the urine sample collection and laboratory investigation, two laboratory technicians were recruited and provided with two days of training on the study protocol as well as recording formats. Urine specimens were processed in the laboratory within 2 hours of collection and specimens that were not processed within 2 hours were kept refrigerated at 4°C until it was processed. The study subjects were properly informed to collect 5-10 ml of clean catch of mid stream urine samples into sterilized bottles. Urine samples were labeled and prepared for analysis in the laboratory. The collected urine sample was tested for the presence UTIs by microscopic urine test and urine dipstick test. We have chosen dipstick urinalysis and microscopic urine examination (Bahbah et al., 2015), since in limited time and resource the appropriate method of diagnosis is urine dipstick chemical analysis (Ohly and Teece, 2003) in complementing with clinical examination. Urine dip sticks are one of the most frequently used instruments for diagnostic testing if there is clinical evidence that a patient is suffering from UTI (Schmiemann et al., 2010). In addition, the urine dipstick test is useful in all populations to exclude the presence of infection as

recommended in different reviews (Deville et al., 2004). Not only that, some studies have found that experienced workers with urine microscopy can achieve better diagnostic precision than with urine culture (Schmiemann et al., 2010). Some samples were counterchecked with the method of urine culture (involving Gram-Stain), but the results identified remained the same as the technicians participated in this study were highly experienced.

To assure the quality of data, the data collection process was supervised by the investigators and the data were checked for completeness and accuracy on daily basis. We recorded a lot of numbers and expiration dates of the urine dipsticks and controls on the Urine Dipstick QC log sheet, along with the date and time. We kept the control solutions at room temperature before use. The same sample was re-examined by a second independent laboratory technician. Any discordant results were reread later.

Data analysis

Data was analyzed by using statistical package for social sciences (SPSS) version 20. The collected data were cleaned, checked for completeness, compiled and

Table 1. Prevalence of urinary tract pathogens, Yabello Hospital, 1 Sep. – 30 Dec. 2014.

Pathogenic species	Frequency N(%)
<i>Escherichia coli</i>	14 (45.2)
<i>Staphylococcus aureus</i>	8 (25.8)
<i>Candida albicans</i>	4 (12.9)
Enterococcus	3 (9.7)
<i>Trichomonas vaginalis</i>	2 (6.5)
Total	31 (11.1)

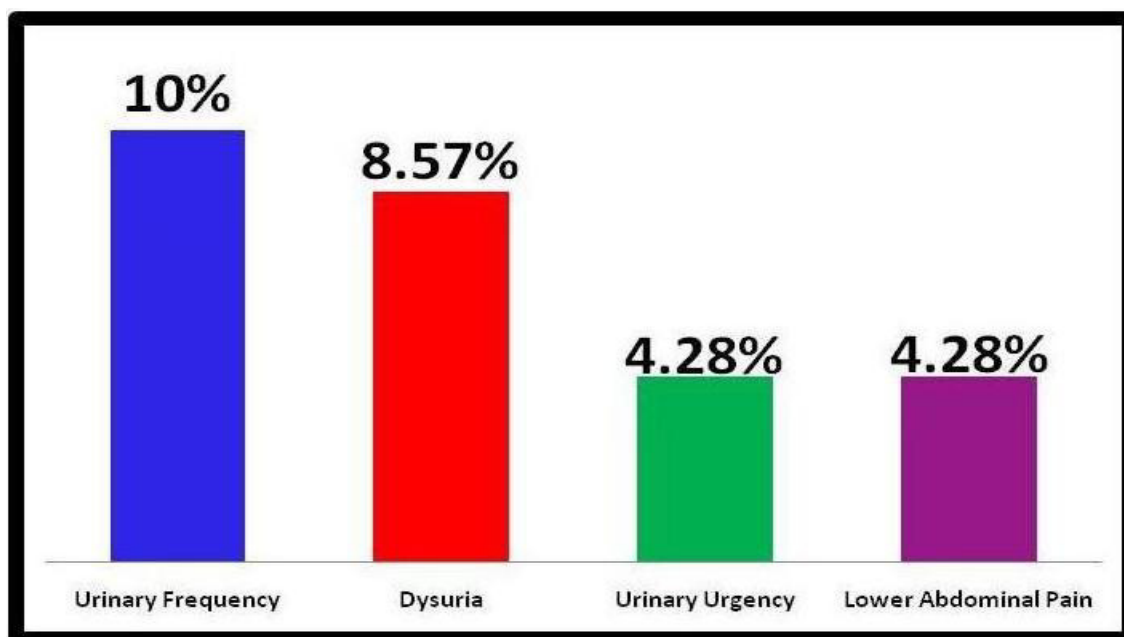


Figure 2. The statistic of histogram demonstrating 4 types of symptoms of Urinary Tract Infections reported as urinary complaints of illness by pregnant mothers positive for the Urinary Tract Infections, Yabello Hospital, 1 Sep. – 30 Dec. 2014.

analyzed. The results were presented in tables, figure and statements. The association between variables was determined by using chi-square test and differences were considered significant at $p < 0.05$.

Ethical considerations

The study was conducted after approval of proposal by ethical review committee of Dilla University, College of Health Sciences and Medicine. The consent was obtained from Yabello Hospital Administrator. A verbally informed consent was obtained from each respondent to participate in the study. Detailed explanation about objectives, purposes, benefit of the study was given to the study participants. Confidentiality of the respondents was assured by omitting their names before data collection and data collectors were trained and oriented.

Patients' management

All pregnant mothers diagnosed (found to be positive) for urinary tract infections were offered treatments according to national guidelines.

RESULTS

Prevalence of UTI among pregnant women, Yabello Hospital

Regarding the result of laboratory urine examination, out of the total 280 pregnant mothers who were enrolled in the study, 11.1% had urinary tract infection. Regarding the isolation of the agents in urine culture, the most frequent species identified and causing UTI in pregnant mothers was *Escherichia coli* with 45.2%. This is followed

Table 2. Age-wise prevalence of urinary tract infections among pregnant women, Yabello Hospital, 1 Sep.– 30 Dec. 2014.

Age (years)	No. tested for UTI (%)	No. positive for UTIs (%)	p-value
<15-19	25 (8.9%)	3 (11.1%)	0.253
20-24	50 (17.9%)	6 (12.0%)	
25-29	70 (25%)	7 (10.0%)	
30-34	67 (23.9%)	13 (19.4%)	
40-44	15 (5.4%)	2 (13.3%)	
>45	4 (1.4%)	(0.0%)	

by *Staphylococcus aureus*, *Candida albicans*, Enterococcus and *Trichomonas vaginalis* with prevalence of 25.8%, 12.9%, 9.7%, and 6.5% respectively (Table 1).

Out of the 280 pregnant mothers studied, 27.14% complained one or more of the symptoms caused by UTI. The percentage of the cases and the type of complaint presented were shown in figure 2:

- 10% urinary frequency
- 8.57% dysuria
- 4.28% lower abdominal pain
- 4.28% urinary urgency

As shown in Table 2 the prevalence of UTI was highest within the 30 – 34 years of age group (19.4%), and was least within the age group of 25 – 29 years (10.0%), and those with age greater than 45 had no urinary tract infection (0.0%), although age did not significantly affect the prevalence of UTI (P=0.253).

DISCUSSION

The prevalence of UTI among the pregnant women in this study was 11.1% - regardless to the women's age, parity, gestational age and marital status - and *E. coli* was the dominantly isolated pathogen.

The prevalence of UTI among pregnant women is similar with the prevalence of UTI among these women in other areas like 14.0%, 12% and 11.6% in Khartoum (Sudan), Gondar (Ethiopia) and Addis Ababa (Ethiopia) (Hamdan et al., 2014; Ferede et al., 2012) respectively. This is lower than the 39.69% obtained by Oladeinde et al., (2011) and Jalali et al., (2014) with 19.8%. However, lower prevalence of UTI compared to the present study was reported: Benin City (Nigeria) 8.6% (Akerelle et al., 2001), Iran 3.3%, (Jazayeri and Irajian, 2009), United Arab Emirates 4.8% (Abdullah and Al-Moslih, 2005) and Ghana 7.3% (Turpin et al., 2007).

E. coli was the predominant isolate causing UTI in the current study. This agrees with previous findings (Oladeinde et al., 2011; Aiyegoro et al., 2007; Ferede et al., 2012; Jalali et al., 2014). The reason for the high

prevalence and pathogenicity of *E. coli* is possibly due to number of virulence factors specific for colonization and invasion of the urinary epithelium, such as the P-fimbria and S-fimbria adhesions (Sheffield and Cunningham, 2005). However two studies in Benin City (urban settlement), Nigeria indicate *Staphylococcus aureus* as the predominant isolate (Omoriegie et al., 2008; Omoriegie and Eghafona, 2009). However, *S. aureus* was the second most predominant pathogen isolated in this finding.

The age range of 30 – 34 years old had the highest prevalence of UTI (19.4%). Similarly, the highest prevalence of UTI was reported among 30-34 years of age group in Kumasi, Ghana (Obirikorang, 2012). This is inconsistent with the findings of Oladeinde et al., (2011). However, the prevalence of UTI did not differ significantly within age groups in this study.

This study observed that pregnant women in the third trimester had the highest prevalence of UTI followed by second trimester of pregnancy which is not similar with the finding of Obirikorang (Obirikorang, 2012), who studied asymptomatic bacteriuria among pregnant women in Ghana. The prevalence of urinary tract infection was associated with gestational age (trimester) of current pregnancies in this study. This is similar with (Tugrul et al., 2005). Perhaps the susceptibility of UTI during this period is due to urethral dilatation which started as early as 6 week and reaching the maximum during 22-24 weeks (Dalzell and Lefevre, 2000). The present study regarding the association of prevalence of UTI and trimester was inconsistent with studies conducted in Gondar (Ethiopia), Bahir Dar (Ethiopia), Tanzania and Sudan (Ferede et al., 2012; Emiru et al., 2013; Masinde et al., 2009; Hamdan et al., 2011). However, age and parity were not associated with UTI in this study as well as in (Gondar) Ethiopia, Tanzania and Sudan (Ferede et al., 2012; Masinde et al., 2009; Hamdan et al., 2011). Though, maternal age and parity have been previously observed as risk factors for UTI among pregnant women (Haider et al., 2010; Basu et al., 2010).

By the parity pregnant women who were nulliparous had slightly higher prevalence of UTI when compared to

pregnant women with at least existing child (multiparous) also the difference between percentage of occurrence were not statistically significant ($p=0.950$); this is consistent to the finding by Olusanya and Ogunlendum (Olusanya and Ogunlendum, 1993), which attributed the increased prevalence of UTI among young women and primigravida to the trauma caused by movement of penis in the vagina. But the study conducted by Obirikorang (Obirikorang, 2012) which dealt with asymptomatic bacteriuria among pregnant women attending antenatal clinic in university hospital in Ghana, reported highest prevalence among multi parous mother. The reason for the observed increased UTI among nullparous women in this study cannot be readily explained from this study in the light of the absence of clinical data history of sexual frequency and time of marriage.

The results showed that marital status and other socio-demographic variables of these women were not significantly associated with increased UTI. But the presence of association with was reported by Amiri et al., (2009). A study conducted in Bahir Dar Town, to assess urinary bacterial profile and antibiotic susceptibility pattern among pregnant women in North West Ethiopia; out of 367 pregnant enrolled in the study 37 were symptomatic and 330 were asymptomatic.

Pregnant mothers must be fully informed (by way of public health education using mass media) about the fact that doctors can do a lot to delay an early delivery. If the baby (fetus) gets to grow inside the mother's body up to the due date, he or she will be free from prematurity related health problems after birth. Not only that, most urinary tract infections are easy to treat, even when mothers are pregnant. Most antibiotics are safe to prescribe for pregnant women and there are many different safe options. Any obstetrician knows which antibiotics to avoid, and the choice of antibiotic depends on a woman's allergies and what trimester of pregnancy she is in. If a woman in the first trimester of pregnancy has low progesterone level in blood test, it can be an indication of a threatened miscarriage. It is easy for doctors to treat this threat of miscarriage and remedying turn it into the continuous healthy pregnancy if the problem of progesterone level was checked up early on time.

On the other hand, if pregnant mothers are left unchecked for urinary tract infections and untreated on time, what can be entailed are devastating mortality and morbidity. These known potential dangers include:

- ▶miscarriage/stillbirth, in other words, the death of an embryo or fetus (pregnancy loss), i.e., spontaneous abortion,
- ▶preterm labor or premature labor to result in preterm-premature birth babies:

- some of who die in their first month of life (neonatal mortality),
- some of who die in their first year of life (infant mortality), and
- a large number of who survive and suffer serious disabilities such as difficulties (incapabilities):
 - Respiratory Distress Syndrome (due to immaturity in lungs development),
 - Necrotizing Enterocolitis (due to immaturity in development of the digestive system), and
 - Hypoxic Ischemic Encephalopathy (due to immaturity in neurological development).

CONCLUSION

In conclusion, 11.1% of the 280 women participated in this study were positive for urinary tract infections. *Escherichia coli* was the most frequently isolated species followed by *Staphylococcus aureus*. The prevalence of UTI was highest in pregnant women within 30-34 years of age group. The comparison of the number of occurrence of pregnant women with UTI showed that pregnant women in the third trimester are very likely to be positive for UTI. Interestingly, there is no significant association between marital status and presence of UTI, as well as presence of UTI with maternal age and parity. Therefore, each and every pregnant mother attending antenatal care service in hospitals or other health centers must be checked up for urinary tract infections by antenatal care service providers as an international medical mandate early on time in regular intervals of duration suggested (decided) by health professionals. This mandate of medical service for the pregnant mothers must be registered as one of the components of the World Health Organization (WHO) Guide Lines. The follow up with this strength of accountability will be able to safeguard the pregnancy and to neutralize/avoid the occurrences of miscarriages and preterm-premature births. Performing this is a matter of creating healthy and productive generations of humans powerful in science and technology; otherwise, it can be producing generations of humans with morbidity of various prematurity birth related disabilities including incapability to learn. In the meantime, mothers with urinary tract infections suffer from *urethritis*, *cystitis*, and *pyelonephritis* which can be the basis for bacteria to enter bloodstream and cause blood poisoning called *septicaemia* or *urosepsis*. If the urinary tract infection and births of prematurity related problems in pregnant mothers are not resolved effectively and accountably, the resultant outcome is that the humans who are incapable to learn cannot build up science and technology. Providing effective health care services to safeguard the

lives of pregnant mothers and to achieve/ensure medically controlled term-births of babies is one of the national top priority issues in any self-sufficient nation and this crucial task must be implemented.

Competing Interests

The authors declare that they have no competing interests of any kind with anybody.

ACKNOWLEDGMENTS

We would like to thank the laboratory staffs of Yabello Hospital for their assistance during data collection. Our appreciation also goes to the study participants without whom this work could have not been possible. Finally, we acknowledge the College of Health Sciences and Medicine, Dilla University for all the necessary supports we were given to complete the task of this study.

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