

## Indicators of Urinary Tract Infections using Point of Care Testing among Primigravidas attending Antenatal care at Oli Health Center IV in Arua City.

Enzama, Emmanuel Johnson

Faculty of Clinical Medicine and Dentistry Kampala International University Western Campus Uganda.

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### ABSTRACT

Urinary tract infections (UTIs) continue to be the global leading infection among primigravidas with over 50% of them suffering at least one incidence of UTI during their course of pregnancy. In Arua at Oli Hospital, there is no study that has been done to determine the indicators of UTI using point-of-care testing among primigravidas. Therefore, this study intended to determine the indicators of UTI using point-of-care testing among primigravidas attending antenatal care at Oli Health Center IV in Arua City. This was a prospective descriptive cross-sectional study involving a sample size of 138 respondents. Data was collected using a self-generated questionnaire and analyzed using SPSS version 22.0. In this study of 138 participants, the majority 83(60.1%) of the respondents were aged 20-30 years. Results revealed that nitrites were present in 62(44.9%) urine samples whereas leukocytes (+++) were present in 65(47.1%) of the urine samples. The prevalence of urinary tract infections among primigravidas was 51.4%. It was found that 62(92.5%) of the symptomatic respondents had lower abdominal pain, more than three quarters 57(85.1%) of the symptomatic respondents had painful urination more than a quarter 22(32.8%) of the symptomatic respondents had a frequency of urination, less than a quarter 12(17.9%) of the symptomatic respondents had forceful urination more than three quarters 58(86.6%) of the symptomatic respondents had abnormal PV discharge, twenty-eight (41.8%) of the symptomatic respondents had urgency for micturition while more than three quarters 54(80.6%) of the symptomatic respondents had burning sensation on urination. Based on the study findings, we concluded that both nitrites and leukocytes were key indicators of urinary tract infections. The clinical presentations of urinary tract infections were lower abdominal pain, painful urination, frequency of urination, forceful urination, abnormal PV discharge, urgency for micturition and burning sensation on urination. The researchers recommended that health workers routinely carry out proper clerkship and dipstick tests for appropriate diagnosis of urinary tract infections among primigravidas.

**Keywords:** Urinary tract infections, Primigravidas, Antenatal care, Painful micturition, abdominal pain.

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### INTRODUCTION

Urinary tract infection (UTI) is a term used to describe the presence of microbial pathogens in the urinary tract with associated symptoms. When it affects the lower urinary tract, it is known as cystitis and when it affects the upper urinary tract it is known as pyelonephritis [1]. According to the International Classification of Diseases (ICD-10), urinary tract infections are infections affecting structures participating in the secretion and elimination of urine: the kidneys, ureters, urinary bladder, and urethra [2-4]. In the

year 2016, urinary tract infections (UTIs) were found to be one of the most common bacterial infections seen in primary care, second only to infections of the respiratory tract [1] while in 2018, UTIs were estimated to be the most common type of infection among primigravidas, affecting up to 10% of pregnant women and also being the second most common condition of pregnancy after anemia, affecting eight million (8million) women who visit physicians annually for evaluation of UTIs [5]. It can be asymptomatic, as well as

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symptomatic, complicating the diagnostic process. It is of importance to obstetricians because of its association with significant maternal and perinatal morbidity and mortality [6-8]. The incidence of asymptomatic bacteriuria among primigravidas as determined in UK studies was 2-5%, acute cystitis being difficult to accurately determine, but it was estimated to be 1.3% incidence rate and the incidence of pyelonephritis during the course of pregnancy was also 2%, making up to 23% of women experiencing a recurrence in the same pregnancy [9]. UTI is a serious problem for women and up to a third of all primigravidas experience UTI at some point in their gestational period. If left untreated it may lead to pyelonephritis, preterm labor, or Group B Streptococcal infection in the newborn [10]. UTIs remain a leading cause of morbidity and healthcare expenditure in all age groups which is estimated at a direct cost of \$659 million and aggregate cost of \$1.6 billion accounting for approximately 10 per cent of office visits by women, and 15 per cent of women will have a UTI at some time during their life [11,12]. It is also estimated that 5-10% of primigravidas develop some type of UTI, which is the cause of approximately 5% of all hospital admissions of such patients [5]. Factors found to affect the frequency of UTIs during pregnancy among primigravidas include gestational age, previous medical history of UTI, diabetes mellitus and anatomic urinary tract abnormalities [13]. In addition, anaemia, socio-economic status, educational status, sexual activity and catheterization are also associated with an increased risk of UTI [14-16]. Urinary tract infections are commonly caused by *Escherichia coli* accounting for 80% to 85% of the infection followed by *Staphylococcus* species which constitutes 10% to 15% [17,18]. In addition, bacterial species *Klebsiella*, *Pseudomonas*, *Proteus*, and *Enterococcus* species play a minor role in

conferring the infection [19]. Clinical presentations of UTIs include asymptomatic bacteriuria, acute cystitis, and pyelonephritis presenting with signs and symptoms such as dysuria, frequency, urgency, and supra-pubic pain in the absence of systemic illness pyrexia, rigor, nausea, vomiting, and renal angle pain and fetal tachycardia [20]. Other studies in 2017 demonstrated an increased risk for UTI, beginning from the 6th week and the peak levels were observed from the 22nd to 24<sup>th</sup> weeks with subsequent pyelonephritis rates of up to 28%, and preterm delivery rates of up to 12.8%, increased risk of pre-eclampsia, anemia, chorioamnionitis and postpartum endometritis and fetal risks being fetal growth restriction, stillbirth, perinatal mortality, mental retardation, and developmental delay [21].

Urinary tract infections in primigravidas are among the most prevalent health problems worldwide, especially in developing countries with a prevalence of 20.1% [22]. In 2017, the prevalence of UTIs in the third trimester was (48%) followed by the second trimester (45%), and the least is seen in the first trimester (7%). This is due to the increased pressure of the gravid uterus on the ureters causing stasis of urine flow and is also attributed to the humoral and immunological changes during normal pregnancy [21]. In Uganda, the prevalence of UTIs among primigravidas in the Kampala district was found to be 21-25 % [23] and in 2016, the prevalence among these women in Mulago Hospital, Uganda was found to be 13.3% [24]. The prevalence of UTIs among primigravidas attending the antenatal clinic in Lower Mulago Hospital remained high at 12.2% [23]. Despite the high prevalence, there is no study that has been done to determine the indicators of UTI using point-of-care testing among primigravidas in Arua at Oli Hospital. Therefore, this study intended to bridge this gap.

## METHODOLOGY

### Study design

The study was a prospective descriptive cross-sectional one for a period of three months. It was cross-sectional because data was collected and analyzed at a specific

point in time.

### Area of Study

The study was carried out at the Oli HC IV maternity ward and maternity out-patient department. Oli health centre IV is located in

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Arua City in northern Uganda. It has a bed capacity of 80.

#### **Study population**

The study was conducted among primigravidas attending ANC at Oli HC IV maternity ward and ANC clinic. On average, the facility receives 70 primigravidas per month making it 210 primigravidas for a period of three months.

#### **Inclusion Criteria**

All primigravidas who attended antenatal care at Oli HC IV willing to consent qualified for the study.

#### **Exclusion criteria**

The study excluded all primigravidas who were mentally ill.

It also excluded all primigravidas who were critically ill including those who were in labour and also those who refused to consent and provide information.

#### **Sample size determination**

The required sample size was determined using Sloven's (1962) formula with a precision of +/-5% at a confidence level of 95%.

The formula is given by the expression below.  $N = n / 1 + n(E)^2$

Where;

N = Number of respondents.

n = Target population, n=210 (Maternity ward and ANC clinic receive about 70 every month). E = Fixed error, E= 0.05

Therefore;

$$N = 210 / 1 + 210(0.05)^2 \quad N = 210 / 1 + 0.525$$

$$N = 210 / 1.525$$

$$N = 137.7$$

$N \approx 138$ , therefore 138 respondents were recruited for the study for the period of three months.

#### **Sampling procedure**

The respondents were selected by simple random sampling. In this procedure, codes of "1" and "0" were assigned on small chips of paper and placed in a box. Patients were allowed to pick only one paper at random without replacing it. All the patients who picked a "1" were considered for the study while those who picked a "0" were excluded from the study. We collected data through patient interviews and laboratory tests.

#### **Data collection**

We used both qualitative and quantitative methods for data collection. Self-generated

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questionnaires for interviewing the selected patients were used. The responses and urinalysis results from the participants were filled into the corresponding questionnaires by the researcher or research assistants. We collected data through patient interviews and laboratory tests (urinalysis). Data regarding socio-demographics, obstetric history, and confounding variables were obtained through secrecy interviews of the participants or caretakers whereas information regarding laboratory results was gotten from the patient's laboratory form with aid from the laboratory technician.

#### **Laboratory procedure for urinalysis**

- i. Urine-collecting containers were thoroughly cleaned and dried.
- ii. Participants were given clean and dried containers and instructed to collect morning midstream urine.
- iii. The participants were instructed to cover the filled container.
- iv. The urine was taken to the laboratory for testing.
- v. The containers were labeled with the corresponding patient's identity number.
- vi. Urine samples were kept at room temperature before testing.

#### **Test procedure for urinalysis**

##### **Visual exam**

- A laboratory technician examined the urine's appearance for color and odor.
- Recorded the findings in the laboratory form.

##### **Dipstick test**

- ❖ Well-mixed urine samples were tested as soon as possible after receipt.
- ❖ Without touching the test area with fingers, the reagent strip was immersed in urine briefly—no longer than 1 second.
- ❖ Excess urine was drained off—run the edge of the strip along the rim of the tube, or blot the edge on absorbent paper.
- ❖ This was done while not laying the reagent strip directly on the workbench surface.
- ❖ We followed exact timing recommendations for each chemical

test.

- ❖ We held reagent strip close to the color chart, and read under good lighting.
- ❖ Record the findings on a piece of paper/laboratory form provided.

#### **Microscopic exam**

- ✓ Ten to fifteen milliliters of urine were centrifuged at low speed between 2,000 to 3,000 revolutions per minute for about 7 minutes.
- ✓ We decanted the supernatant to obtain some sediment, which was then used to examine the presence of crystals, casts, white and/ or red blood cells. We retained about 0.2-0.5 ml of the supernatant in the test tube.
- ✓ Using a pipette, we collected and placed a drop of the re-suspended sediment on to the microscopic slide and place a cover slip over the drop for observation.
- ✓ Results were recorded accordingly.

#### **Results interpretation**

- I. For dipstick, results were obtained by comparing testing strip color with that on the color chart (container).
- II. In addition, a table for normal ranges of parameters tested was used to interpret results.
- III. Participants with bacteriuria  $\geq 10^5$  CFU, without signs and symptoms were considered as having asymptomatic UTIs while those with signs and symptoms with positive urinalysis results were

#### **Socio-demographic characteristics of the respondents**

According to the results in Table 1 below, the majority 83(60.1%) of the respondents were aged 20- 30 years. The majority 81(58.7%) of the respondents were Muslims. It was also found that the majority 121(87.7%) of the respondents were

considered as symptomatic UTIs patients.

#### **Validity of Data Collection Instrument**

We used the Content Validity Index. This involved getting 6 participants who were not part of the sample population and doing questionnaire pre-testing. The inter-participant agreement was then measured. The agreement of more than 70% was a measure that the items of the questionnaire would give us the required information about UTIs among primigravidas attending ANC at Oli HC IV.

#### **Reliability of Data Collection Instrument**

By using Cronbach's coefficient alpha, a value of more than 0.8 was taken to indicate that items of the questionnaire are reproducible and consistent.

#### **Data processing and analysis**

After checking for completeness, data was entered into a computer using SPSS for analysis. Data were analyzed according to the specific objectives. It was processed accordingly and summarized using frequencies and percentages.

#### **Ethical considerations**

##### **Approval**

The research was conducted after the approval of the research proposal by the institutional review committee or research ethics committee of Kampala International University-western campus and introductory letter from the faculty of clinical medicine and dentistry sought by the researcher. Permission to collect data was obtained from the hospital administration Oli hospital.

## **RESULTS**

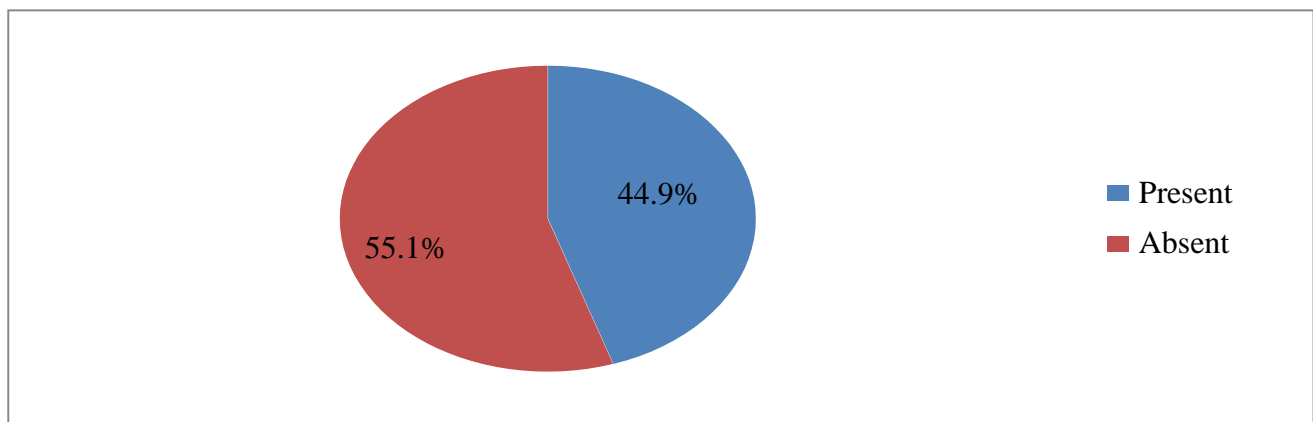
Ugandans. Regarding education level, the majority 93(67.4%) of the respondents had primary as the highest education level attained. The majority 135(97.8%) of the respondents had their monthly income level below 0.5M. Similarly, the majority 78(56.5%) of the respondents were in their second trimester.

**Table 1: Distribution of socio-demographic characteristics of the respondents**

| Variable                          | Category         | Frequency (n=138) | Percentage |
|-----------------------------------|------------------|-------------------|------------|
| <b>Age</b>                        | <20 years        | 42                | 30.4       |
|                                   | 20-30 years      | 83                | 60.1       |
|                                   | 30 years         | 13                | 9.4        |
| <b>Religion</b>                   | Catholic         | 20                | 14.5       |
|                                   | Muslim           | 81                | 58.7       |
|                                   | SDA              | 10                | 7.2        |
|                                   | Anglican         | 27                | 19.6       |
| <b>Nationality</b>                | Ugandan          | 121               | 87.7       |
|                                   | Non-ugandan      | 17                | 12.3       |
| <b>Highest level of education</b> | Primary          | 93                | 67.4       |
|                                   | Secondary        | 32                | 23.2       |
|                                   | Tertiary         | 13                | 9.4        |
| <b>Income level</b>               | <0.5M            | 135               | 97.8       |
|                                   | 0.5 M-1 M        | 3                 | 2.2        |
| <b>Gestational period</b>         | First trimester  | 18                | 13.0       |
|                                   | Second trimester | 78                | 56.5       |
|                                   | Third trimester  | 42                | 30.4       |

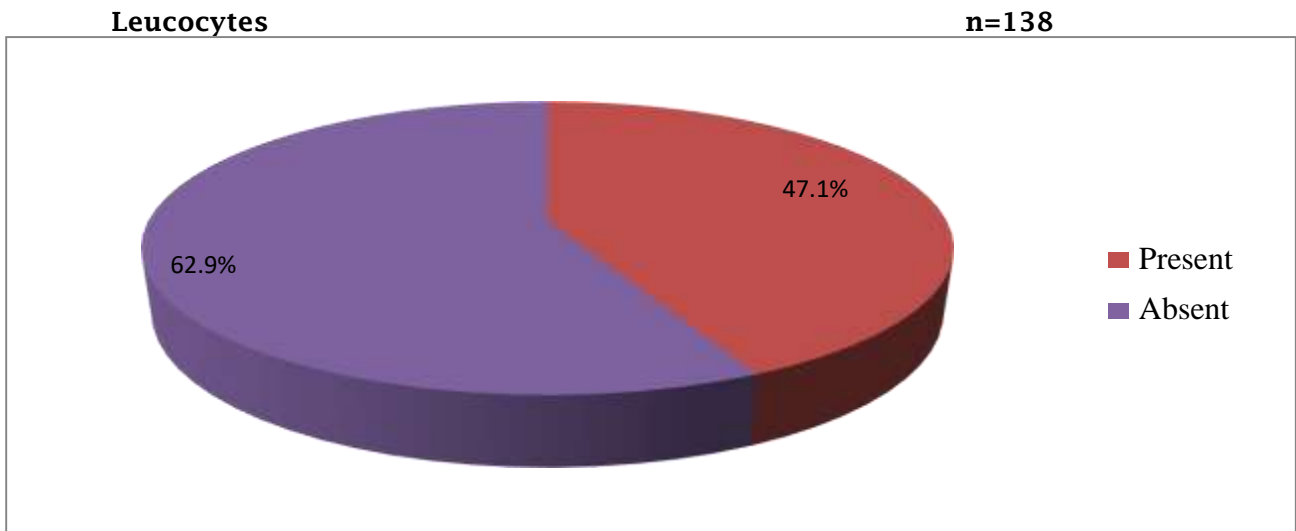
**Nitrites in urine**

**n=138**



**Figure 1: Presence of nitrites in urine**

From Figure 1 above, nitrites were present in 62(44.9%) urine sample.



**Figure 2: Presence of leucocytes**

It was found that leucocytes (+++) were present in 65(47.1%) of the urine samples as shown in Figure 2 above.

**Other indicators of UTIs**

As shown in Table 2 below, the majority 83 (60.1%) of the respondents had their

urine samples pale yellow whereas 55 (39.9%) of the respondents had their urine samples abnormal (turbid).

It was also found that Bacteriuria was present in 66 (47.8%) of the urine samples.

**Table 2: Other indicators of UTIs**

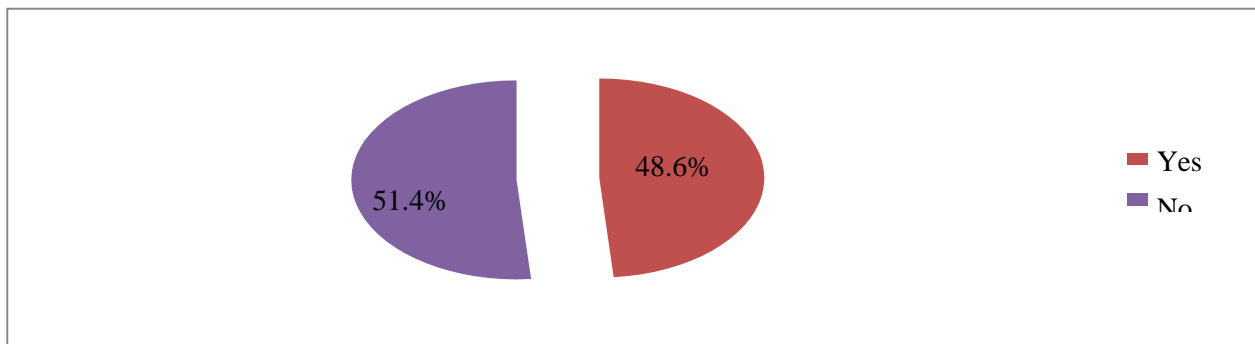
| Variable           | Category    | Frequency (n=138) | Percentage |
|--------------------|-------------|-------------------|------------|
| <b>Color</b>       | Pale yellow | 83                | 60.1       |
|                    | Abnormal    | 55                | 39.9       |
| <b>Bacteriuria</b> | Present     | 66                | 47.8       |
|                    | Absent      | 72                | 52.2       |

**Clinical presentations of UTIs**

**Signs and symptoms**

It was found that 67(48.6%) of the respondents had signs and symptoms of

urinary tract infections as shown in figure 4 below.



**Figure 3: Presence of signs and symptoms (n=138)**

**Clinical presentations of UTIs**

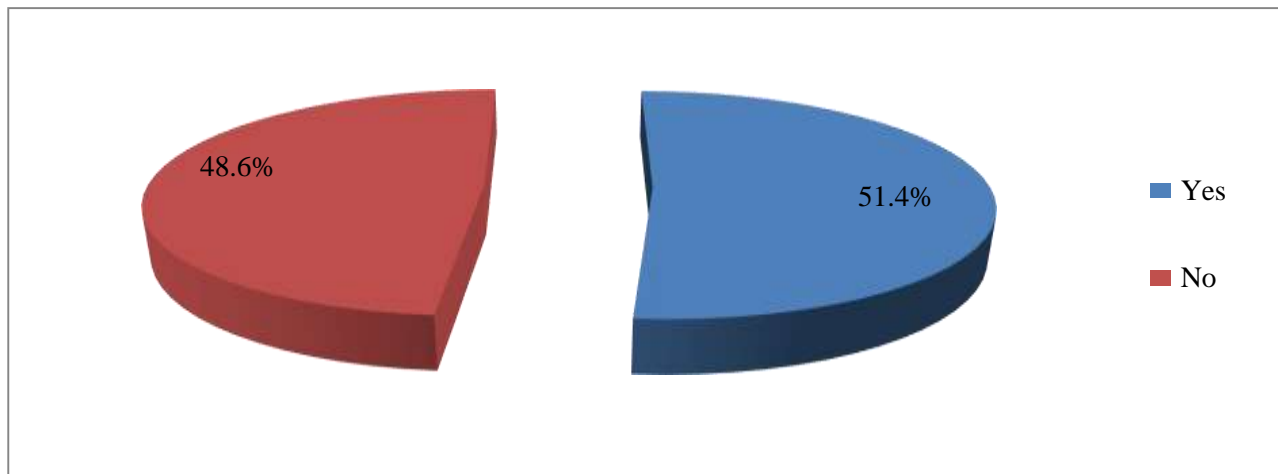
It was found that 62(92.5%) of the symptomatic respondents had lower abdominal pain. More than three-quarters 57(85.1%) of the symptomatic respondents had painful urination. More than a quarter 22(32.8%) of the symptomatic respondents had frequency of urination. It was found that less than a quarter of 12(17.9%) of the

symptomatic respondents had forceful urination. More than three-quarters 58(86.6%) of the symptomatic respondents had abnormal PV discharge. Twenty-eight (41.8%) of the symptomatic respondents had urgency for micturition. More than three-quarters 54(80.6%) of the symptomatic respondents had a burning sensation during urination.

**Table 3: Clinical presentations of UTIs among primigravidas**

| Variable                       | Category | Frequency (n=62) | Percentage |
|--------------------------------|----------|------------------|------------|
| Lower abdominal pain           | Yes      | 62               | 92.5       |
|                                | No       | 5                | 7.5        |
| Pain on urination              | Yes      | 57               | 85.1       |
|                                | No       | 10               | 14.9       |
| Frequency                      | Yes      | 22               | 32.8       |
|                                | No       | 45               | 67.2       |
| Forceful urination             | Yes      | 12               | 17.9       |
|                                | No       | 55               | 82.1       |
| Abnormal PV discharge          | Yes      | 58               | 86.6       |
|                                | No       | 9                | 13.4       |
| Urgency                        | Yes      | 28               | 41.8       |
|                                | No       | 39               | 58.2       |
| Burning sensation on urination | Yes      | 54               | 80.6       |
|                                | No       | 13               | 19.4       |
| Nausea and vomiting            | No       | 67               | 100.0      |
| Fever and chills               | No       | 67               | 100.0      |
| Blood in urine                 | No       | 67               | 100.0      |

**Prevalence of UTI**



**Figure 4: Prevalence of UTI (n=138)**

The prevalence of urinary tract infections among primigravidas was 51.4%.

## DISCUSSION

### Socio-demographic characteristics of the respondents

In this study 138 respondents were recruited, majority 83(60.1%) of the respondents were aged 20-30 years. The majority 81(58.7%) of the respondents were Muslims. It was also found that majority 121(87.7%) of the respondents were Ugandans. Regarding education level, the majority 93(67.4%) of the respondents had primary as the highest education level attained. The majority 135(97.8%) of the respondents had a monthly income level below 0.5 Million. Similarly, the majority 78(56.5%) of the respondents were in their second trimester.

### Nitrites in urine

According to the study findings, nitrites were present in 62(44.9%) urine samples. The nitrite test was based on the ability of most infecting bacteria to reduce dietary-derived urinary nitrates to nitrites [25]. The findings were congruent with those from a study conducted by Powell *et al.* [26], which found that the dip-strip test for urinary nitrite was fairly reliable in symptomatic urinary and asymptomatic UTIs in primigravidas with urinary infection.

Results obtained were also in agreement with a literature review study which included 70 publications whereby the occurrence of nitrites was high in pregnant women and elderly people [27].

### Leucocytes

Results of the study revealed that leucocytes (+++) were present in 65(47.1%) of the urine samples. Our findings were similar to those in a study done by Levine *et al.* [28], which found that the use of urinary biomarkers such as leukocyte esterase and nitrite can aid in the diagnostic process. Leukocyte esterase is highly sensitive to detecting a UTI but lacks

Based on the study findings, we concluded that both nitrites and leukocytes were key indicators of urinary tract infections. The clinical presentations of urinary tract infections were lower abdominal pain, painful urination, frequency of urination, forceful urination, abnormal PV discharge,

specificity. Similarly, our findings were in agreement with a meta-analysis of the accuracy of urine dipstick test to rule out UTIs by Walter *et al.* [27] which found that the accuracy of leukocyte-esterase was high in studies in urology patients and sensitivities were highest in family medicine (86%).

### Clinical presentations of UTIs

Urinary tract infections can be asymptomatic, as well as symptomatic. According to our study findings it was found that 67(48.6%) of the respondents had signs and symptoms of urinary tract infections. It was found that 62(92.5%) of the symptomatic respondents had lower abdominal pain, more than three quarters 57(85.1%) of the symptomatic respondents had painful urination more than a quarter 22(32.8%) of the symptomatic respondents had a frequency of urination, less than a quarter 12(17.9%) of the symptomatic respondents had forceful urination more than three quarters 58(86.6%) of the symptomatic respondents had abnormal PV discharge, twenty-eight (41.8%) of the symptomatic respondents had urgency for micturition while more than three quarters 54(80.6%) of the symptomatic respondents had burning sensation on urination. The clinical presentations from our study were in agreement with Szweda [5] who found that dysuria, urinary frequency, urgency, painful urination, and discomfort in the lower abdomen with accompanying bacteriuria.

The results were also congruent with those in a study carried out in Addis Ababa, Ethiopia which found that the most common urologic clinical manifestation combinations in this study were dysuria, urine urgency, and urgency incontinence [29], [30-35].

## CONCLUSION

urgency for micturition and burning sensation on urination.

### Recommendations

We the researchers recommended that health workers routinely carry out proper clerkship and dipstick tests for appropriate diagnosis of urinary tract infections among



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