PREVALENCE OF ASYMPTOMATIC BACTERIURIA AMONG PREGNANT WOMEN AT KISUGU HEALTH CENTER III

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NOVEMBER 2021

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DECLARATION

I, Nabawanda Nodrine do hereby declare that this research Report is my original work. It has never been submitted by anyone to any institution of learning for any kind of academic award.

Signature:

Date: 10th January 2022

APPROVAL

I hereby declare that the research dissertation has been developed and submitted for examination under my supervision as a university supervisor.

Signature: Date: 10th January 2022

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DEDICATION

It is my sincere pleasure to dedicate this book to God for bestowing upon me good health, intelligence, inspiration, and all manner of blessings that have enabled me to complete this research process.

I would also like to dedicate this book to my family and friends that have been a great support system during this process.

ACKNOWLEDGEMENT

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ACRONYMS

ANC: Antenatal Clinic

ASB: Asymptomatic Bacteriuria

CFU: Colony Forming units

CIU: Clarke International University

CLED: Cystine Electrolyte Deficient agar

E.coli: Escherichia coli

MSU: Mid-stream urine specimen

UTI: Urinary tract infection

DEFINITION OF TERMS

A urinary tract infection; the microbial invasion of the urinary tract tissues, can present as symptomatic and asymptomatic.

Asymptomatic bacteriuria; finding of bacterium in quantitative counts of $\geq 10^5$ colony forming units/ml in a suitably collected urine sample obtained from a person presenting with no signs and symptoms of a urinary tract infection.

Colony forming unit; this is a unit used in estimation of microorganisms(bacteria/fungal cells) in a sample.

Culture media; is a liquid/gel designed to support the growth of microorganisms.

Gestational age; is the age of the fetus estimated by computing from the first day of the last menstrual period (time that precedes conception) until the day of the ANC.

Gravidity; is the number of times a woman has been pregnant.

Midstream urine sample; a urine specimen obtained from the middle part of urine flow.

Parity; Is the number of times a woman has given birth to a fetus with a gestational age of 24 weeks or more irrespective of whether the child was born alive or stillborn.

Pyelonephritis; inflammation of the kidney caused by a bacterial infection.

Uropathogen; is a microorganism that can cause disease or infection in the urinary tract.

Urinary stasis; a condition that results from increased urinary tract volume and loss of ureteral tone which results in the bladder not being able to completely empty.

Vesicoureteral reflux; is the backward flow of urine from the bladder to the ureters to the kidneys.

ABSTRACT

Background; Asymptomatic bacteriuria is finding of Bacterium in quantitative counts of≥ 10^5 colony forming units/ml in a suitably collected urine sample obtained from a person presenting with no signs and symptoms of a urinary tract infection. It has been linked to adverse maternal complications like pyelonephritis, low birth weight and preterm labor. The purpose of this study was to determine the prevalence of asymptomatic bacteriuria, common causative bacteria and associated risk factors among pregnant women at Kisugu health center III.

Methods; this study was a descriptive cross sectional study that enrolled 173 pregnant women presenting without signs and symptoms of urinary tract infections at Kisugu health center III between October and November 2021. Information on socio-demographic factors, obstetric factors and medical history of the pregnant women was acquired through questionnaires. Midstream clean catch urine samples were collected from the pregnant women. Urinalysis, culture and biochemical tests were performed on the samples. SPSS Version 20 was used to analyze the data and the results were presented in tables and pie charts. Logistics regression analysis and chi square tests were done to determine association of factors to asymptomatic bacteriuria. A p value of less than 0.05 was considered statistically significant.

Results; Twenty nine women out of 173 (16.8%) pregnant women enrolled in this study were positive for asymptomatic bacteriuria. The most isolated bacteria was *Escherichia coli* at 41.4%. The risk factors that had statistical significant association to asymptomatic bacteriuria were pregnant women that were married, had sexual intercourse more than twice a week and had a history of urinary tract infections.

Conclusion; The prevalence of asymptomatic bacteriuria among pregnant women at Kisugu health center III is high. I would recommend that culture and sensitivity is added as part of routine screening in pregnant women for asymptomatic bacteriuria. I would also recommend for another study to be done on antibiotic susceptibility testing.

CHAPTER ONE: INTRODUCTION

1.0 Introduction

This chapter will give a background on Asymptomatic Bacteriuria in pregnant women, problem statement, objectives of the study, hypothesis as well the conceptual background the study will be based on. It will also include reasons for why the study was done.

1.1 Background

A urinary tract infection which is the microbial invasion of the urinary tract tissues, can present as symptomatic and asymptomatic. Bacterial urinary tract infections, UTIs are the most common and are even listed as the most common bacterial infections in pregnant women (Obiogbolu *et al.,* 2009). Pregnant women are more susceptible to get urinary tract infections due to the physiological and anatomical changes they go through (Sabatini, 2015).

Asymptomatic Bacteriuria (ASB) has been reported worldwide to occur in about 2-15% of pregnant women. It has led to some countries like the USA and UK to incorporate routine screening and treatment of ASB in pregnant women as part of antenatal care as it has proven effective in preventing development of adverse maternal complications like pyelonephritis (Wiley et al., 2020) (Smaill et al., 2019). This can be seen in countries like Iran that reported a prevalence of 13% (Ghafari *et al.*, 2016).

A number of studies done in some African countries also show a high prevalence of asymptomatic bacteriuria among pregnant women like Nigeria that reported a prevalence of 29.5% (Izuchukwu *et al*., 2017) and Ethiopia that reported a prevalence of 21.2% (Kahsay *et al*., 2018).

In East Africa, some studies have been done in Kenya and Uganda. In Kenya a study revealed a high prevalence of ASB at 21.5% (Ayoyi *et al.,*2017) while a study done in Uganda in 2018 revealed a prevalence of 13.3% (Andabati *et al.*, 2018).

However in the area of Namuwongo particularly at Kisugu health center III, there wasn't any data/research done on the prevalence of ASB among pregnant women. Therefore this study was to determine the prevalence of ASB among pregnant women at Kisugu health center III.

1.2 Problem statement

As much as Ministry of Health included routine screening and treatment of urinary tract infections as part of standard antenatal care in Uganda, screening for asymptomatic bacteriuria was not routinely done as part of antenatal care and there wasn't a specific treatment protocol for ASB in pregnant women (Nteziyaremye, 2020).

There wasn't enough data on the extent of prevalence of ASB in Kampala, Uganda and particularly at Kisugu health center III, with increased antibiotic resistance of uropathogenic bacteria in Uganda (Nteziyaremye *et al.*, 2020) it was important to know the common causative bacteria to be able to know how to handle and treat ASB accordingly in pregnant women to prevent pregnancy complications like pyelonephritis, low birth weight and pre term birth (Smaill *et al.*,2019).

Therefore this study was going to determine prevalence of ASB in pregnant women at Kisugu health center III.

1.3 Objectives

BROAD OBJECTIVE

To determine the prevalence of asymptomatic bacteriuria among pregnant women at Kisugu health center III.

1.4 Specific Objectives

    i.   To determine the prevalence of asymptomatic bacteriuria among pregnant women at Kisugu health center III.

    ii.   To identify the common causative bacteria of asymptomatic bacteriuria among pregnant women at Kisugu health center III.

    iii.   To determine the risk factors associated with asymptomatic bacteriuria among pregnant women at Kisugu health center III.

1.5 Research Questions

    i.   What is the prevalence of asymptomatic bacteriuria among pregnant women at Kisugu health center III?

    ii.   What are the common causative bacteria of asymptomatic bacteriuria among pregnant women at Kisugu health center III?

    iii.   What are the risk factors of asymptomatic bacteriuria among pregnant women at Kisugu health center III?

1.6 Hypothesis

1. Pregnant women at Kisugu health center III have asymptomatic bacteriuria.

2. Pregnant women at Kisugu health center III do not have asymptomatic bacteriuria.

1.7 Conceptual frame work


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┌─────────────────────────┐
│ Socio-demographic       │
│ factors                 │
│                         │
│ Maternal age            │
│                         │
│ Level of education      │──────╲
│                         │        ╲
│ Marital status          │          ╲
│                         │            ╲
│ Occupation              │              ╲
└─────────────────────────┘                ╲
                                             ╲
                                          ╭──────────╮
┌─────────────────────────┐               │ Prevalence of │
│ Obstetric factors       │──────────────▶│ ASB           │
│                         │               ╰──────────╯
│ Parity/gravidity        │              ╱
│                         │            ╱
│ Gestation age           │          ╱
└─────────────────────────┘        ╱
                                 ╱
┌─────────────────────────┐    ╱
│ Medical factors         │  ╱
│                         │╱
│ Previous history of     │
│ UTI                     │
└─────────────────────────┘
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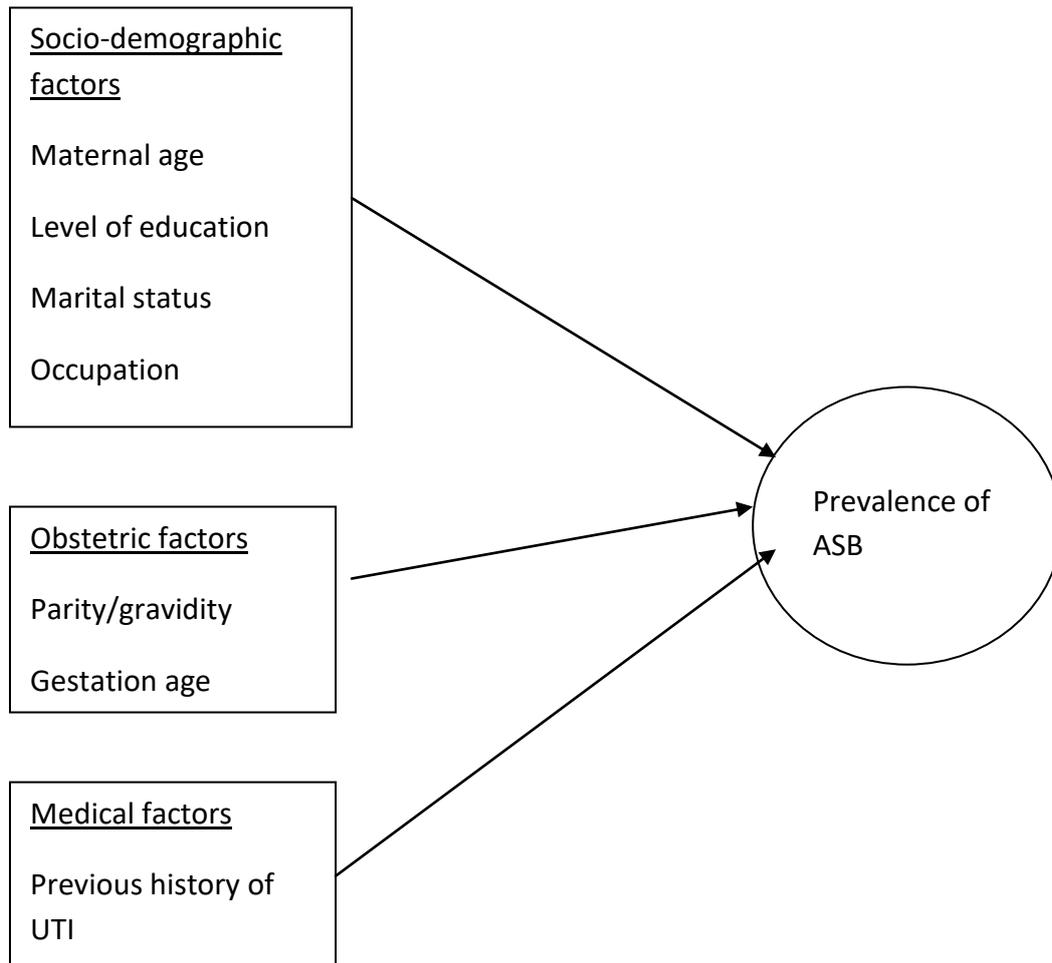
INDEPENDENT VARIABLES   **DEPENDENT   VARIABLE**

Figure 1: Showing the conceptual frame work

Interpretation of conceptual framework

Under the independent variables, factors like level of income, level of education, maternal age, the trimester/gestation age and Parity/ gravidity of the pregnant mother are known to affect the prevalence of ASB which is the dependent variable.

1.8 Significance of the study

Determining the prevalence of asymptomatic bacteriuria and common causative bacteria will help to develop a better screening and treatment protocol for diagnosing asymptomatic bacteriuria among pregnant mothers at Kisugu health center III and other health centers.

This was also in partial fulfillment for the award of a bachelor's degree in medical laboratory science at Clarke International University.

1.9 Scope of the study

This study was carried out at Kisugu health center III October and November 2021. It involved determining the prevalence of ASB among pregnant women between the ages of 15-49 at Kisugu health center III as well as identifying the common causative bacteria and associated risk factors.

CHAPTER TWO: LITERATURE REVIEW

2.1 Prevalence of Asymptomatic bacteriuria

Globally asymptomatic bacteriuria has been reported to occur in 2-15% of pregnant women. ASB which can be described as finding of Bacterium in quantitative counts of$\geq 10^5$ colony forming units/ml in a suitably collected urine sample obtained from a person presenting with no signs and symptoms of a urinary tract infection, has been reported in different countries and regions with some countries reporting high values while others report low values.

Urinary tract infections have been listed as the most common bacterial infections in pregnant women (Obiogbolu *et al.,* 2009). This is because pregnant women are more susceptible to get UTIs due to physiological and anatomical changes they go through (Sabatini, 2015). One of such changes is dilation of the ureter that leads to urinary stasis and can be caused by progesterone hormone that causes smooth muscle relaxation. Dilation is also caused by compression of the ureter by the uterus. An effect of urethral dilation and urinary stasis is vesicoureteral reflux (backward flow of urine from the bladder to the kidneys). It is also stated that because pregnant women are immunocompromised it could be a risk factor (Habak et al., 2020). These changes facilitate growth of bacteria and as such are a factor that can lead to asymptomatic bacteriuria developing into a symptomatic UTI in pregnant women (Doland, 2012). According to Habak et al., 2020, 25% of untreated ASB infections result into symptomatic UTI

UTIs have been shown to increase maternal morbidity and adverse pregnancy outcomes like low birth weight and preterm birth (Lee et al., 2019). A known risk factor for UTI in pregnant women is ASB with approximately 25% of positive untreated ASB cases progressing into symptomatic UTI according to Habak et al., 2020. Aside from being a risk factor for UTI, ASB has also been linked to pyelonephritis with up to 30% of the pregnant mothers with

ASB developing acute pyelonephritis infections (Smaill, et al., 2019). It is therefore important to include early screening and treatment of ASB in pregnant women as part of antenatal care to be able to prevent these maternal complications like pyelonephritis.

Iran reported a prevalence of 13% (Ghafari *et al*., 2018). It was noticed that factors like prior UTI infection before the pregnancy, socioeconomic status, poor personal hygiene, having been pregnant before, increased age and sexual activity increased the risk of ASB. However a more recent study in Iran shows that the prevalence of ASB has decreased to 8.7% according to Azami et al., 2019. This may be due to the fact that Iran has a government funded health system for pregnant women with a program that includes urine testing (includes urine analysis and urine culture test) on the first prenatal visit which makes it easier to identify and treat ASB in pregnant women. It was also noticed that the prevalence ofASB was highest in pregnant women in their first trimester-11.7% and lowest in the third trimester- 6.1%. Azami et al. attributes the high prevalence in the first trimester to lack of care before the pregnancy and says it is important to screen for UTIs before pregnancy. It is also due to hormonal changes prior to the anatomical changes in the pregnant mother (Sujatha et al., 2014).

Another study in Bangladesh however showed the prevalence to be 4.5% and listed some of the risk factors for ASB in pregnant women to be due to maternal under nutrition, giving birth for the first time (primiparity) as well as low education status (Lee *et al.,* 2019). India (Sujatha et al., 2014) showed a prevalence of 7.3% and reported the highest incidence being in women between 21-30 years of age (72%). The study also recorded the highest prevalence in pregnant women in their first trimester (45.5%) and the lowest in the third trimester (18.8%).

In Africa, majority of the studies done on ASB among pregnant women have reported high prevalence. Some of these countries are Ethiopia-21.2% (Kahsay et al., 2018), Nigeria-

29.5% (Izuchukwu et al., 2017) and Eqypt- 10-15% (Elzayat *et al.*, 2017). The high prevalence can be attributed to the fact that these countries are low and middle income counties with limited capability for screening and treatment in their health care facilities.

Some studies even show that the prevalence of ASB can vary in different regions of the same country due to factors like different socioeconomic levels, different cultural and religious behaviors, sexual contact, etc as can be seen in Ghana that reported higher prevalence values in the North of Ghana than in the South of Ghana (20%-35% vs. 5.5%-7.3% respectively). The researcher attributed this difference to the fact that the cultural practices and socioeconomic levels are different in the two areas (Karikari et al., 2020).

In East Africa, Kenya reported high prevalence of 21.5% (Ayoyi *et al.,* 2018). The high number was also attributed to the fact that Kenya is a low-middle income country with limited capability for screening and treatment in its health care facilities.

It is however important to note that for these particular studies in Ethiopia (Kahsay et al., 2017) and Nigeria (Izuchukwu et al., 2017) the sample sizes were smaller (259 and 220 respectively) compared to the sample size used by the study in Kenya (Ayoyi et al., 2017) which was a sample size of 1020.

Astudy on prevalence of ASB in pregnant women in Uganda showed a prevalence of 13.3% (Andabati *et al*., 2010) and a 2020 study done in Eastern Uganda showed a lower prevalence of 3.75%(Nteziyaremye *et al*., 2020). This could have been due to the fact that pregnant women were taking antibiotics before the study according to Nteziyaremye *et al.*

There is no data on the prevalence of ASB among pregnant women in Namuwongo.

2.2 Common causative agents of Asymptomatic bacteriuria

Globally gram negative bacteria are identified as the most predominant causative bacteria for ASB compared to Gram positive bacteria and this is due to the fact that gram negative bacteria have a more enhanced structure that helps them attach and adhere strongly to the uroepithelium preventing them from being washed away (Ayoyi et al., 2017).

Escherichia coli (E.coli) has been identified as the most common uropathogen and most common gram negative bacteria to cause asymptomatic bacteriuria in approximately 65-84% of pregnant women (Azami et al., 2019) globally.

This can be seen in countries such as India; 77.27% (Sujatha et al., 2014), Iran; 63.2% and Bangladesh; 38% (Lee e*t al.,* 2019).

E.coli was also reported in some African countries as the most common uropathogen such as in Ethiopia; 34.6% (Kahsay *et al.,* 2018), Kenya; 38.8% (Ayoyi *et al.,* 2017) and even Uganda; 46.4% (Nterziyaremye *et al.,* 2020). *E.coli*'s high prevalence can be attributed to its virulence for urinary tract colonization and particularly its ability to adhere to the urinary tract (Andabati *et al.*)

However E.coli is not always the most common pathogen isolated in connection with ASB. A study in Nigeria showed *Klebsiella* species as the most common isolate (Izuchukwu *et al.*). Another study in Ghana showed *Staphylococcus aureus* as the most common isolate-64.1% (Karikari*et al*., 2020). This shows that it is important to identify common isolates in an area to guide in treatment and management of ASB.

2.3 Risk factors associated with ASB among pregnant women

A number of risk factors have been identified worldwide in past studies done on asymptomatic bacteriuria in pregnant women and these include; maternal age, gravidity,

gestational age, socioeconomic status, education background and medical history such as past history of UTI, diabetes and HIV.

A study in India identified previous history of UTI as the most common risk factor with an18.9% prevalence (Rajaratnam*et al., 2014*). This can be seen in other studies conducted in Iran (Ghafari et al., 2016) and Africa in Cameroon (Tchente*et al., 2019*) andKenya (Ayoyi *et al., 2017*). According to Tchente, 2019, some women are more predisposed to UTIs due to anatomical predisposition and genetic propensity hence their increased predisposition to ASB.

Maternal age has been shown to be another risk factor as seen in studies done in Ethiopia that showed pregnant women between the ages of 18 and 26 had higher incidences of ASB (Edae et al., 2020).

In Egypt it was also found that ASB was predominant in pregnant women 20-30 years and was thought to be due to the fact that women in this age group have had early and intensive sexual intercourse that may cause some minor urethral trauma and increased transfer of bacteria into the bladder from the perineum (Elzayat et al., 2017).

In Uganda a study showed that pregnant women between the ages of 20 and 24 years were less likely to have Asymptomatic bacteriuria compared to those below 20 years (Nteziyaremye *et al*., 2020).

The parity of the pregnant mother has in some studies shown that it can predispose the mother to ASB as it is seen that the higher parity of the mother the more anatomical changes the mother goes through such as descent of the pelvic organs and the widening of the urethral orifice all known to influence the ascent of bacteria (Elzayat *et al.*). This can be seen in a study in Bangladesh showed that pregnant women pregnant for the first time had higher chances of ASB (Lee et al., 2019) while a study in Cameroon showed that women who had 4-

5 pregnancies were most likely to have ASB (Tchente *et al.,* 2019). But some studies have also shown that there is no statistical significant relationship between parity and ASB in pregnant women as seen in Egypt (Elzayat *et al.*), Cameroon (Tchente *et al.*) and Kenya (Ayoyi et al.). They attributed this to the small sample sizes in their respective studies.

Another factor is gestational age of the mother that has been shown in several studies to be risk factor for ASB in pregnant women.

Sujatha e*t al*. conducted a study in India that showed that 45.5% of the positive ASB cases in the study were from women in their first trimester and the lowest was in women in their third trimester (18.8%). This is similar to a study in Iran (Azami *et al)* that showed the highest prevalence in women in their first trimester(11.7%) and lowest in women in their third trimester (6.1%) and attributed this to the fact that there is lack of care/ screening for UTIs before the pregnancy. It is also due to hormonal changes prior to the anatomical changes in the pregnant mother (Sujatha et al., 2014).

The socioeconomic status of the pregnant mother has also shown that it affects the prevalence of ASB in pregnant women. This socioeconomic status can be measured by assessing the educational background of the mother (level of education; primary, secondary and higher education) and employment status/income. These factors have been shown to affect the prevalence ofASB in pregnant women this is because the educational level and economic/income status of the mother are known to influence behavioral and hygiene practices such as going to screen for UTIs regularly, wiping/washing their genitals from back to front after urination/defecation, etc. prevalence of ASB in pregnant women has been found highest in women of low education level, low economic status and those living in rural areas compared to those living in urban areas, with a high level of education and a middle- high income socioeconomic status (Tchente *et al).*

Another one is marital status of the mother as this usually gives an insight on if the pregnant mother has regular sexual intercourse that is known to increase the movement of uropathogens to the urethra which can lead to ASB as seen in a study conducted in Egypt (Elzayat *et al.*) that found the highest prevalence of ASB (65%) was found in pregnant women who had higher sexual activity of greater than twice per week.

The risk factors of ASB in pregnant women vary from region to region due to a number of factors as seen above and it is therefore important to identify the risk factors for ASB in pregnant women at Kisugu health center III to be able to know how to advise and teach pregnant women on how to mitigate these risk factors.

CHAPTER THREE: METHODOLOGY

3.0 Introduction

This chapter describes the study design,study area, population, selection criteria, sample size determination, data collection and analysis.

3.1 Study design

This study was a descriptive cross-sectional study.

3.2 Study area

This study was conducted at Kisugu health center III a hospital found in Namuwongo a suburb located in Kampala district.

3.3 Study population

The study population was pregnant women attending antenatal clinic at Kisugu health center III.

3.4 Selection criteria

Inclusion criteria

Pregnant women between 15-49 years that presented at the antenatal clinic at Kisugu health center III without signs and symptoms of UTI consenting to participate in the study were included.

Exclusion criteria

Pregnant women that presented at the antenatal clinic at Kisugu health center III without signs and symptoms of UTI but did not consent were excluded.

Pregnant women with vaginal bleeding were also excluded.

Pregnant women who had taken antibiotics two weeks prior to the study were not included.

3.5 Sample size estimation

The sample size for this study was estimated using the Kish and Leslie (1965) formula.

n=Z²p (1-p)/ e²

Where **n** = the sample size to be calculated, **Z**= the confidence level at 95% confidence which is 1.96, **p**= the estimated proportion of pregnant women at Kisugu health center III with ASB, **(1-p)** = the estimated proportion of failure and **e**= possible random error to be tolerated.

P=13% (a study done in at Mulago hospital in Uganda by Andabati *et al*., 2010)

e= 5%.

Therefore n= 1.96²x 0.13(1-0.13)/0.05²

n=173

My sample size for the study was therefore 173.

3.6 Sampling

Consecutive sampling method was employed to get participants for the study whereby if a pregnant woman was not eligible to be included in the study the next one was included until the sample size was reached.

3.7 Data collection

3.7.1 Questionnaire

The questionnaire that was self-administered to the participants was used to get information on the socio-demographic characteristics of the pregnant mothers like maternal age, marital status, level of education and occupational status (see appendix II).

The questionnaire was also used to get medical information on the pregnant mother like obstetric factors and medical history of the pregnant mother.

3.7.2 Laboratory methods

Laboratory methods described below were used to collect data on the prevalence of asymptomatic bacteriuria and common causative bacteria.

3.7.2.1 Sample collection

A mid-stream clean catch urine sample was used. The pregnant women were given clear instructions on how to collect the urine sample in sterile urine containers (see appendix III). The urine samples were then transported to the lab within 1 hour of collection at temperatures of 2-4˚C.

3.7.2.2 Sample analysis

All samples on arrival at the laboratory were inoculated on CLED and blood agar plates and incubated at 37∘c for 18-24 hours. They were then checked for colony formation. Gram staining was done to check for microscopic appearance of the bacteria and there after biochemical tests such as indole, catalase, coagulase and oxidase for identification of the bacteria isolated.

Urine chemistry and microscopy followed immediately after culture.

3.8 Data management

Data was entered and data analysis was done using SPSS (Statistical Package for Social Sciences) version 20.0 for descriptive statistics.

A bivariate analysis was done to determine the risk factors associated with asymptomatic bacteriuria among pregnant women at Kisugu health center III.

The p value of less than 0.05 was considered significant.

3.9 Quality control

The participants of the study were instructed on how to collect the mid-stream clean catch urine samples.

The questionnaires that were administered to the participants were pre-coded and pre-tested.

Quality control tests; E.coli ATCC 25922 and Staphylococcus aureus ATCC 25923 were done for culture to ensure that the tests are accurate and precise.

3.10 Ethical consideration

A consent form was given to the participants of the study explaining the aim, nature and purpose of the study.

Privacy and confidentiality of the participants of the study was ensured by making sure no names were used as the questionnaires were coded with identification numbers. The participants were also interviewed in a separate room away from other patients.

Ethical clearance to conduct the study was given by Clarke International University Research Ethics Committee andKisugu health center III administration.

3.11Dissemination of results

The research will be presented to Clarke International University for the award of Bachelor's degree in medical laboratory science.

A copy of the research will also be given to Kisugu health center III for the administration to evaluate their approach to asymptomatic bacteriuria in pregnant women. The results will be published in a peer reviewed journal and at conferences.

3.12Limitations

There were no limitations encountered in the study.

CHAPTER FOUR: RESULTS

4.0 Introduction

Findings from the study to determine prevalence of asymptomatic bacteriuria among pregnant women at Kisugu health center III will be presented in this chapter.

4.1 Social demographic factors and obstetric factors of participants of the study

A total of 173 pregnant women were enrolled in the study with a 100% response rate. The table below presents the recorded social demographic factors and obstetric factors of the pregnant women in this study.

Table 1: Social demographic and obstetric factors of pregnant women (n=173)

Variable	Categories	Frequency (N)	Percentage (%)
Social demographic factors			
Age group (Years)	<20	14	8.1
	20-25	60	34.7
	26-30	49	28.3
	31-39	30	17.3
	>40	20	11.6
Educational level	Primary	54	31.2
	Secondary	99	57.2
	Tertiary/University	20	11.6
Marital status	Married	100	57.8
	Single	73	42.2
Occupation	Formal	18	10.4
	Informal	72	41.6
	Unemployed	83	48.0
Obstetric factors			
Gravidity	Primigravida	132	76.3
	Multigravida	41	23.7
Parity	Primiparity	132	76.3
	Multiparity	41	23.7
Gestation period	First trimester	73	42.2
	Second trimester	66	38.2
	Third trimester	34	19.7

Majority of the pregnant women belonged to the age group of 20-25 (34.7%). Most of them were married (57.8%), in their first trimester (42.2%) and were having their first child (76.3 %). 57.2 % of these women highest form of education was secondary school and 48 % were unemployed.

4.2 Prevalence of Asymptomatic bacteriuria

Out of 173 participants that were recruited for the study, only 29 were positive for asymptomatic bacteriuria. The prevalence of ASB was therefore 16.8% (CI 1.78-1.89) as can be seen in fig 1.2. ASB was recorded mostly in women that were in the 20-25 age group, married, in their first trimester and had a previous history of UTI as seen in table 2 below.
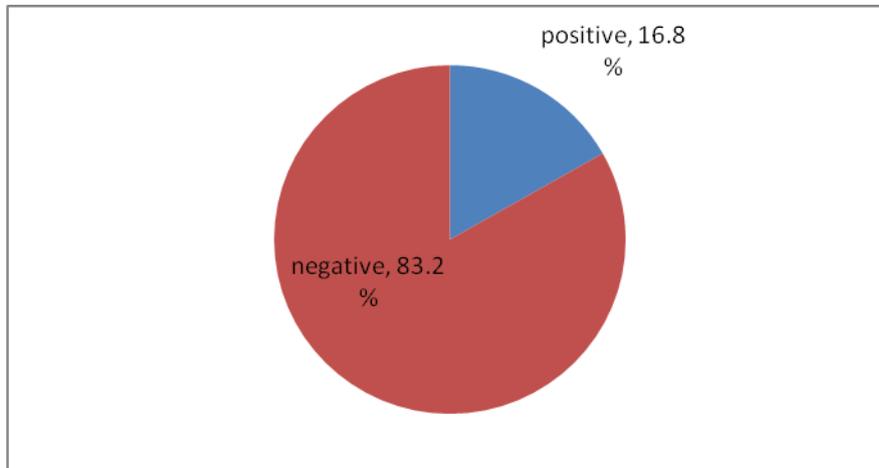
Figure 2: showing Prevalence of Asymptomatic bacteriuria

Table 2: Prevalence of Asymptomatic bacteriuria in pregnant women (n=173)

Variable	Category	Asymptomatic bacteriuria	
		Positive	Negative
Age group (Years)	< 20 20-25 26-30 31-39 >40	1 12 7 4 5	13 48 42 26 15
Educational level	Primary Secondary Tertiary/University	7 21 1	47 78 19
Marital status	Married Single	25 4	75 69
Occupation	Formal Informal unemployed	3 11 15	15 61 68
Gravidity	Primigravida Multigravida	19 10	113 31
Parity	Primiparity Multiparity	19 10	113 31
Gestation period	First trimester Second trimester Third trimester	12 11 6	61 55 28
Number of sexual partners in the last two years	One Two More than two	21 7 1	104 32 8
Sexual intercourse in a week	0-1 times a week ≥2 times a week	4 25	130 14
History of UTI infection	Yes No	24 5	83 61

4.3 Causative bacteria of asymptomatic bacteriuria among pregnant women at Kisugu health center III

Gram negative bacteria that were isolated included *E.coli, Klebsiella pneumoniae and Enterococcus spp* while *t*he gram positive bacteria that were isolated included *Staphylococcus aureus, Staphylococcus epidermidis and Streptococcus agalacticae.* Gram negative bacteria were the most common isolates.

E.coli was the most common bacteria identified among the positive sample for ASB as seen in fig 3 below followed by *Klebsiella pneumoniae*.
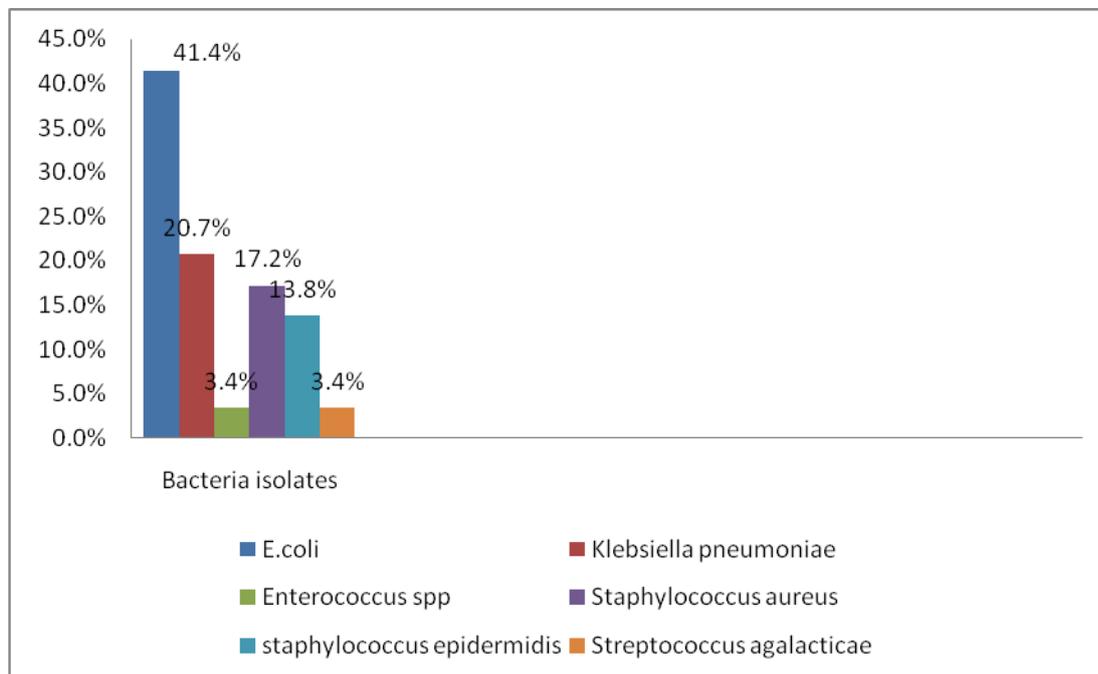

Figure 3: Showing bacteria identified among the positive cases (n=29)

4.4 Associated risk factors for Asymptomatic bacteriuria

Table 3:Associated risk factors for asymptomatic bacteriuria among pregnant women at Kisugu health center III

Variable	Category	Frequency (N)	Percentage (%)
Number of sexual partners in the past two years	one Two More than two	125 39 9	72.3 22.5 5.2
Sexual intercourse in a week	0-1 times a week ≥2 times a week	134 39	77.5 22.5
History of UTI infection	Yes No	107 66	61.8 38.2

Majority of the women had one sexual partner in the previous two years (72.3%), had sexual intercourse 0-1 times a week (77.5%) and had a past history of UTI (61.8%).

4.5 Bivariate analysis of socio-demographic factors, obstetric factors and associated risk factors of asymptomatic bacteriuria.

Table 4:Bivariate analysis of socio-demographic, obstetric and associated risk factors of ASB among pregnant women at Kisugu health center III.

Variable	P value	Confidence intervals (95%)
Age	0.592	2.72-3.07
Marital status	0.01	1.35-1.50
Highest level of education	0.922	1.71-1.90
Occupation	0.737	2.28-2.48
Gestation period	0.885	1.66-1.88
Parity	0.136	1.17-1.30
Gravidity	0.136	1.17-1.30
Sexual partners in the last two years	0.884	1.24-1.42
Sexual intercourse in a week	0.000	1.16-1.29
History of UTI infection	0.011	1.31-1.45

Significance at p=0.05 at 95% confidence interval

The bivariate analysis carried out as seen in table 4 above shows the association between the prevalence of asymptomatic bacteriuria and the socio-demographic, obstetric and associated risk factors. Marital status ($p=0.01$), sexual intercourse in a week ($p=0.000$) and history of UTI infection ($p=0.011$) were the variables that showed a statistically significant association with ASB.

Logistics regression and multivariate analysis was performed on the above mentioned variables and results recorded as seen in table 5 below.

Table 5: Multivariate and logistics regression analysis

Variable	Categories	*p* value	Odds ratio (OR)
Sexual intercourse in a week	0-1 times a week	0.000	0.02 (0.005-0.071)
Marital status	married	0.310	2.118 (0.498-9.009)
History of UTI infection	yes	0.028	4.385 (1.175-1.639)

From the analysis above, it shows that pregnant women who had sex 0-1 times a week were 0.02 times less likely to have ASB than pregnant women who had sex ≥ 2 times a week. Pregnant women that were married were 2.1 times more likely to have ASB than women who were single. Women that had a previous history of UTI infection were also 4.4 times more likely to have ASB than women who had no previous history of UTI infection.

CHAPTER FIVE: DISCUSSION

This study revealed a prevalence of 16.8% of asymptomatic bacteriuria among pregnant women at Kisugu health center III that is slightly higher than the global prevalence reported to be between 2-15% (WHO). This prevalence is similar to previous studies done in Egypt that reported a prevalence of 10-15% (Elzayat *et al.,* 2017). However, the reported prevalence was higher than previously reported in other studies done in Iran; 8.7% (Azami *et al.,* 2019), Bangladesh; 4.5% (Lee *et al.,* 2019) and India; 7.3% (Sujatha *et al.,* 2014). Previous studies done in Uganda also reported a lower prevalence; 13.3% at a study done at Mulago hospital (Andabati *et al.,* 2010) and 3.75% at a study done at Mbale regional referral hospital (Nteziyaremye *et al.,* 2020). It is however, lower than what was reported in Nigeria; 29.5% (Izuchukwu *et al.,* 2017), Ethiopia; 21.2% (Kahsay *et al.,* 2018) and Kenya; 21.5% (Ayoyi et al., 2018). This could be due to differences in sample sizes as this study had a smaller sample size. It can also be attributed to different geographical locations and social practices that in turn affect the associated risk factors for asymptomatic bacteriuria.

Higher prevalences are recorded in African countries because majority of them are low-middle income countries with limited capability for screening and treatment. The reason for the prevalence being higher in this study when compared to other studies previously done in Uganda can be attributed to the fact that the pregnant women in this study were of low socioeconomic status living in Namuwongo a suburb in Kampala that has a slum with poor hygiene. Nteziyaremye *et al.,*also attributed the low prevalence to the fact that pregnant women in his study area were self-medicating with antibiotics. It is however important to note that this study had a smaller sample size of 173 when compared to previous studies done in Uganda that had sample sizes of 584 (Nteziyaremye *et al.,* 2020) and 218 (Andabati *et al.,* 2010).

With pregnant women being more susceptible to Urinary tract infections due to the physiological and anatomical changes they undergo, it is important that pregnant women are screened for Asymptomatic bacteriuria as it is a risk factor for UTIs that cause increased maternal morbidity and adverse pregnancy outcomes like pyelonephritis, low birth weight and preterm birth (Lee *et al.,* 2019). 25% of untreated ASB cases in pregnant women will progress to symptomatic UTIs (Habak*et al.,* 2020).Iran reported a lower prevalence of ASB in pregnant women when compared to previous studies due to the fact that the government introduced urinalysis and urine culture as part of the first prenatal visit that made identifying and treating ASB/UTIs easier (Azami *et al.,* 2019). It is also recommended that culture and sensitivity is performed in pregnant women during one of their first initial visits for antenatal care during early pregnancy by Infectious diseases society of America (Nicolle *et al.,*2019).

*Escherichia coli*was the most common bacteria identified in this study. This is similar to what is reported globally (Azami *et al.,* 2019) as well as other countries such as Bangladesh (Lee e*t al.,* 2019), Ethiopia (Kahsay *et al.,* 2018), Kenya (Ayoyi *et al.,* 2017) and Uganda (Nteziyaremye e*t al.,* 2020). Gram negative bacteria are the most common uropathogenic bacteria isolated in ASB/UTI cases because they have a more enhanced structure that helps them attach and adhere strongly to the uroepithelium preventing them from being washed away as is evidenced by the most common bacteria isolated in this study that were *E.coli*(41.4%) and *Klebsiella pneumoniae*(20.7%).

Other bacteria isolated from this study were *Staphylococcus aureus* (17.2%), *Staphylococcus epidermidis* (13.8%), *Streptococcus agalacticae* (3.4%) and *Enterococcus* spp (3.4%). These isolates were also isolated in other studies done in India (Sujatha *et al.,* 2014), Ghana

(Karikari*et al.,* 2020), Nigeria (Izuchukwu *et al.*) and Uganda (Andabati *et al.* and Nteziyaremye *et al*)

Asymptomatic bacteriuria was recorded mostly in women that were married and had sexual intercourse twice/more than twice a week. This is similar to previous studies done in Egypt (Elzayat *et al.,* 2019). The reason can be attributed to the fact that married women are believed to have regular sexual intercourse that increases the movement of uropathogens to the urethra predisposing them to have ASB/UTIs as can be seen in this study where married women were 2.1 times more likely to have ASB than women who were not married.

Pregnant women that had a previous history of UTI were found to be 4.4 times more likely to have asymptomatic bacteriuria than women who had no previous history of UTI. This is similar to what was reported in Kenya (Ayoyi *et al.,* 2017), Cameroon (Tchente *et al.,* 2019) and Iran (Ghafari *et al.,* 2016). The reason for this is because some women are more predisposed to UTIs due to anatomical predisposition and genetic propensity (Tchente *et al.,* 2019).

Asymptomatic bacteriuria was also mostly recorded in pregnant women that were in the 20-25 age group as they usually have early and intensive sexual intercourse that can cause some minor urethral trauma and increased transfer of bacteria into the bladder from the perineum as reported in Egypt (Elzayat e*t al*) and India (Sujatha *et al.,* 2014)*.* Pregnant women that were in their first trimester also had a higher prevalence of ASB when compared to women to in their third trimester as seen in previous studies done in Iran (Azami *et al.,* 2019) and India (Sujatha *et al.*) with this being attributed to the fact that there is lack of screening for UTIs before pregnancy while during pregnancy pregnant women are screened for UTIs/ASB. This

was seen at Kisugu health center III where urinalysis is done with each antenatal visit (although culture and sensitivity is not performed as part of the screening).

It is however important to note that in this study parity, gravidity, maternal age, gestational age, highest level of education and occupation did not have any statistical significant influence on asymptomatic bacteriuria. This may be because this study employed a low sample size and therefore statistical significance could not be found.

CHAPTER SIX: CONCLUSION AND RECOMMENDATIONS

6.0 Introduction

This chapter will include conclusions and recommendations for this study.

6.1 Conclusion

There is a high prevalence of asymptomatic bacteriuria among pregnant women at Kisugu health center III. *E.coli* and *Klebsiella pneumoniae* were the most common bacteria isolated in this study. Previous history of UTI and having sex more than twice a week were the identified risk factors for asymptomatic bacteriuria among pregnant women for this study. Other known risk factors like maternal age, gestational period and parity did not show statistical significance to asymptomatic bacteriuria as seen in previous studies due to the fact that this study had a smaller sample size than previous studies.

6.2 Recommendations

I would recommend for culture to be included as part of screening in pregnant women for urinary tract infections and asymptomatic bacteriuria as it gives more accurate diagnosis than relying on urinalysis alone.

I would also recommend another study that includes antibiotic susceptibility testing to test for antibiotic resistance of the causative bacteria for asymptomatic bacteriuria among pregnant women at Kisugu health center III.

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APPENDIX 1: CONSENT FORM

Informed Consent to Participate in Research

I am **Nabawanda Nodrine** a student from Clarke International University asking you to take part in a research study called:**Prevalence of Asymptomatic Bacteriuria Among Pregnant women at Kisugu Health Center III** being conducted in Kampala district.

Purpose of the study

The purpose of this study is to:

- To determine the prevalence of Asymptomatic Bacteriuria among pregnant women at Kisugu health center III.

- To determine the common causative bacteria of Asymptomatic Bacteriuria among pregnant women at Kisugu health center III.

- To determine the risk factors associated with Asymptomatic Bacteriuria among pregnant women at Kisugu health center III.

Study Procedures

You are being asked to participate in this study, as you are a Ugandan pregnant woman who can help us to better understand the burden of Asymptomatic Bacteriuria in pregnant women attending this hospital.

If you take part in this study, you will be asked to:

- Take part in filling in a questionnaire that will be provided to you.

- Filling in the questionnaire will take approximately 15 minutes.

- To collect a urine sample for laboratory testing.

Benefits

A benefit of participation in the study will be that you will be able to get your results from your sample in case it is positive. The information you will provide will be useful in planning and organizing for routine screening of Asymptomatic Bacteriuria in pregnant women.

Risks or Discomfort

This research is considered to be minimal risk. That means that the risks associated with this study are the same as what you face every day. There are no known additional risks to those who take part in this study.

Compensation

No research participants will be compensated.

Privacy and Confidentiality

I will keep your study records private and confidential. Certain people may need to see your study records. By law, anyone who looks at your records must keep them completely confidential. The only people who will be allowed to see these records are:

The researcher involved with the study.

I may publish what I have learnt from this study. If l do, l will not include your name. l will not publish anything that would let people know who you are.

Voluntary Participation / Withdrawal

You should only take part in this study if you want to volunteer. You should not feel that there is any pressure to take part in the study. You are free to participate in this research or withdraw at any time. There will be no penalty or loss of benefits you are entitled to receive if you stop taking part in this study.

You can get the answers to your questions, concerns, or complaints

If you have any questions, concerns or complaints about this study, or experience an adverse event or unanticipated problem, contact the researcher on 0756195286.

If you have questions about your rights as a participant in this study, general questions, or have complaints, concerns or issues you want to discuss with someone outside the research, call the CIUREC Chairperson Dr. Samuel Kabwigu on (0312307400) & the executive secretary of UNCST on (0414

-705500) respectively.

Assessment of understanding

Please check which box best describes your assessment of understanding of the above informed consent document:

□   I have read the above informed consent document and understand the information provided to me regarding participation in the study and benefits and risks. I give consent to take part in the study and will sign the following page.

□   I have read the above informed consent document, but still have questions about the study; therefore I do not give yet give my full consent to take part in the study.

Signature/ thumbprint of Study participant

…………………………………………

Date

…………………………………………...

CIUREC stamp

…………………………………………..

Research Authorization Date

…………………………………………..

Nabawanda Nodrine S

NABAWANDA NODRINE S

Okusabaolukusaokwetaba mu Kunoyereza

Nze Nabawanda Nodrine omuyiziwa Clarke International University nkusabaokwetabamukunonyerezakusomoelyaPrevalance of Asymptomatic Bacteriuria mu bakyalaabembuto e Kisugu Health Center III mu Kampala disutilikiti.

Ensongayokusoma

Ensongayokusomakunoeli;

- Okunonyeleza e nambayabakyalaabembutoabafunaekirwaddekya Asymptomatic Bacteriuria e Kisugu Health Center III

- Okunonyelezakukikaekyakawukaekivirakoekirwaddekya Asymptomatic Bacteriuria mu bakyalaabembuto e Kisugu Health Center III.

- OkunonyelezakubulabeobuyinzaokuviiraakokukirwaddekyaAsypmtomatic Bacteriuria mu bakyalaabembuto e Kisugu Health Center III.

Emitendera.

Osabibwaokwetaba mu kunonyelezakunong'omukyalaomunaugandaowo'lubutoanatuyambaokutegelaobulungiomugu gugw'ekirwaddekya Asymptomatic Bacteriuria mu bakyalaab'embutoabajanjabiwaku Kisugu health center III.

Wewenyigila mu kusomakunoogyakusabibwa;

- Okwetaba mu kudamu questionnaire enabaekuweldwa.

- Questionnaire ejakutwalangaedakikakuminatano.

- Okugyakoomusuloogw'okebezebwa mu laba.

Emiganyulo

Omuganyulogw'okwenyigira mu

kusomakunokulintiogyakubang'osobolaokufunalizaatisizosingazili positive.Data

gw'onatuwaajakubawamugaso mu ntekatekan'entegekayokukebelaekirwaddekya

Asymptomatic Bacteriuria mu bakyalaab'embuto.

Eby'obulabeobaebyerarikirza

Okunonyerezakunokutwalibangasibwabulabe.Kino kitegezantiobulabeobuvirako mu kwetaba

mu kusomakunobwebumungabwetusaanga mu

bulamubwabulijo.Tewalibulabebulalaobumanyidwa mu kwetaba mu kusomakuno.

Okusasula

Telieyenyigidemukunoyerezaagyakusasulwa.

Ebyama ne eby'obwananyirini

Ngyakumabyensomye mu buwandike mu by'obwananyinine mukyama.

Abantuabamubandyetaagaokulabaebiwandiko. Mu mateka

,buliatunulakubiwandikobyoayinaobikumangaby'akyama . Akozeokunonyelezakuno ye

yekaanakilizibwaokulabaebiwandikobyo.

Nyinzaokufulumyabye'jinze mu kusomakuno.Wenabifulumya,

sijakufulumyabimanyizaabantuntiwetabya mu kusomakuno.

Okwenyigira /okuva mu kunonyeleza.

Wenyigire mu kunonyelezakunobw'obaoyagala.Toyinakuwulilangagwebakaseokwetaba mu

kunonyerezakuno. Oliwadembeokwetabaobaokuva mu

kusomakunoobuddebwona.Tewalikyogendakufilwaobakyogendakugibwakobwolekelawookw

enyigira mu kusomakuno.

35

Osobolaokufunaokudibwamueliebibuzobyoobaebyokwemulugunyangaotukililaanuyolezaku 0756195286.

Bw'oban'ebibuzoebikwataganakudembelyongagweeyenyigide mu kunonyelezakunoobaebibuzoebikwataganakukunonyelezakunobyoyagalaokubuzaomuntualie bweluwokunonyerezakuno, kubila CIUREC chairperson Dr. Samuel Kabwiguku 0312307400 oba executive secretary wa UNCST ku 0414705500.

Entegerayokukunonyelezakuno

Tikinga aka

bokisiakasingaokunyonyolaentegerayokuebiwandikoebyowaguluebikwatakukunonyelezakun o.

Nnomyeekiwandikoekyowaguluekikwatakukunonyelezakunonentegeraebikwatakukwenyigira mu kusomakuno. Nzikirizaokwenyigira mu kunonyelezakuno no kusayiningaolupapulaoludako.

Nnomyeekiwandikoekyowagulunayenkyalinaebibuzoebikwatakukunonyelezakunonolwekyos inabakukirizakwetaba mu kusomakuno.

Sayiningawanookukirizaokwetaba mu kunonyerezakuno

…………………………………………………………………………….

Enakuzomwezi

…………………………………………………………………………

CIUREC stamp

Enakuz'omwezizokirizidwaokolaokunonyereza

Nabawanda Nodrine S

NABAWANDA NODRINE S

Questionnaire on the riskfactors associated with Asymptomatic Bacteriuria among pregnant women attending the antenatal clinic at Kisugu Health center III.

Tick/write where appropriate.

Part 1: Socio demographic factors of the pregnant women

1. What is your age? ……………….

2. What is your marital status?

   o   Married

   o   Single

3. What is your highest level of education?

   o   Primary level

   o   Secondary level

   o   Tertiary / university level

   o   Never went to school at all

4. What is your employment status?

   A. Employed ☐   B. Unemployed ☐

   If employed, what is your occupation?

   …………………………………………………

Part B: associated factors of the pregnant women

1.How far along are you in your pregnancy?

………………………………………….

2.Do you have children?

A. Yes ☐   B. No ☐

If yes, how many children do you have?

………………………………………..

3. How many sexual partners have you had in the past two years?

- o   One

- o   Two

- o   More than two

4. How often do you have sexual intercourse?

- o   Once a week

- o   More than once a week

- o   None

5. Have you been diagnosed with a urinary tract infection before?

A. yes ☐   B. No ☐

6. Do you self-medicate with antibiotics?

A. yes ☐   B. No ☐

Part C: Preventive strategies for Urinary tract infections/Asymptomatic Bacteriuria

1. Have you ever screened for a Urinary tract infection?

A. Yes ☐   B.No   ☐

2. Have you ever received health education on Asymptomatic Bacteriuria/ Urinary Tract Infections?

A. Yes ☐   B.No   ☐

3. If yes, from which source?

- o   Health care work

- o   Radio

- o   Newspaper

- o   church/mosque

- o   Others specify…………………

Thank you for participating in this study and for your valuable time

TRANSLATED QUESTIONNAIRE IN LUGANDA

EbibuzokubintuebiyinzaokuvirakoekirwaddekyaAsmptomatic bacteriuria mu bakyalaab'embutoabjanjabilwa e Kisugu health center III.

Tikingaobawandiikaewetagisibwa.

Ekitunduekisoka

1. Olinaemyakaemeka?........................

2. Oli;

o Mufumbo

o single

3. Wasomakyenkanaki

o Primary

o Secondary

o University/tertiary

o Tewasomako

4. A. Okola   B. tokola

Bw'obaokola, okolamulimuki?

……………………………………………………

Ekitunduekyokubili

1. Olinaolubutolwamyeziemeka?

………………………….

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2. Olinaabana?

A. Yye   B. Nedda

Bw'obaolinaabana, olinaabanabameka?

………………………………………….

3. Walinaabagalanabameka mu myakaebiriegiyise?

o   Omu

o   Babiri

o   Basuka mu babiri

4. Otelakwegatamilundiemekano'omwagalawo.

   o   Mulundigumu mu wiki

   o   Okusukukaomulundigumu mu wiki

   o   Tokikolerakoddala

1. Waliozulidwamuekirwaddekya Urinary tract infection?

   A. Yye   B. Nedda

2. Wegyanjaba ne antibiotics?

   A. Yye   B. Nedda

Ekitunduekyokusatu: engerigyewewalaekirwaddekya   Asymptomatic   Bacteriuria/

Urinary tract infection

1. Waliokebedwaekirwaddekya Urinary tract infection?

   A. Yye   B. Nedda

2. Waliofunyeokusomesebwakukirwaddeekya Urinary tract infection oba Asymptomatic

   Bacteriuria?

   A. Yye   B. Nedda

BwobaozemuYye, okusomesebwawakufunawa?

- o Owebyobulamu

- o Ku laadiyo/Telefiina

- o Mu mpapulazamawulile

- o Mu kaniisa/ muzikiti

- o ewalala; …………………………..

Wewbalekwetaba mu kunoyelazakuno

Kampala, Monday 18th October 2021

Dear Sir/Madam,

RE: ASSISTANCE FOR RESEARCH

Greetings from Clarke International University formerly known as International Health Sciences University.

This is to introduce to you **Nabawanda Nodrine**, Reg. No. **2017-BMLS-FT-AUG-004** who is a student of our University. As part of the requirements for the award of a Bachelors Degree of Medical Laboratory Sciences of our University, the student is required to carry out research in partial fulfillment of her award.

Her topic of research is**: Prevalence of Asymptomatic Bacteriuria Among Pregnant Women Attending Kisugu Health Center III.**

This therefore is to kindly request you to render the student assistance as may be necessary for her research.

I, and indeed the entire University are grateful in advance for all assistance that will be accorded to the student.

Yours sincerely,

Dr. Okiria John Charles (PhD)

Professor / Dean IAHS

(0772409126 / 0752409126)

KCCA
KAMPALA CAPITAL CITY AUTHORITY
For a better City

KISUGU HEALTH CENTRE
KCCA-IDI PROJECT
BOX 7010 KAMPALA

17th-AUG-2021

Ms.NABAWANDA NODRINE
Reg.No:2017-BMLS-FT-AUG-004
Re: Approval toconduct researchat Kisugu H/C III-KCCA on the Research Topic
"Prevalence of asymptomatic bacteriuria among pregnantwomen at Kisugu Health
Centre III".

This is to acknowledge that the above student's research topic has been approved to be conducted at our facility with hope that the findings of this study will positively impact on the quality of health care offered to our expectant mothers.
The approval covers the protocol and the accompanying documents listed below
 ▪ Informed consent form
  ▪ Questionnaire
  ▪ Lab Data collection
This approval is subjected to the following terms and conditions.
1.The study will be monitored by the Laboratory supervisor /Manager at all times to ensure that the ethical concerns are followed.
2.No changes will be made and implemented in the protocol and study documents until they are revised and approved by the management and research supervisors.
3. You will abide by the regulations governing research in the country as set by the Uganda national council for science and Technology.
4.You will include Kisugu H/C III-KCCA in your acknowledgements in all your write ups /publications.

Wishing you the best in your Research.

Yours

Emmanuel Amalai
Lab-supervisor KCCA-Makindye
Lab Manager Kisugu H/C III KCCA
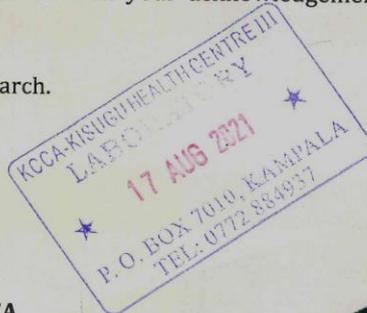
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