A Cross-Sectional Study to Determine Urinary Tract Infections and Antibiotic Susceptibility Patterns among Pregnant Women attending Antenatal Clinic at Kawempe National Referral Hospital, Uganda.

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Abstract

Background:
Urinary Tract Infection (UTI) is a disease of urinary system. This type of infection involves urethritis, pyro nephritis or cystitis. Symptoms can be pelvic pain, increased urge to urinate, pain on passing out urine and blood in urine (blander infections). Kidney UTI may cause back pain, nausea vomiting and fever.

Methods:
This study was cross sectional-quantitative study carried out among 300 pregnant mothers attending ANC at Kawempe regional referral hospital in August 2021. Questionnaires were administered to get bio data of Participants. Urine samples were collected using sterile containers. Urine culture was performed, urine chemistry using ten parameter strip then urine microscopy was done. Chemistry was done using ten parameter strips, urine microscopy and then later culture and sensitivity was done on urine samples with proteinuria.

Results:
Urine samples with proteinuria were 5.7 % (n=17), more than half of the Urine Samples 52%(n=156) had positive White blood cell cells and 48 %(n=144) had no abnormality detected.
Culture on urine samples showed the following isolation, *Escherichia.coli* 24.3 %(n=9), *Klebsiella pneumonia* 21.6 %(n=8), *Pseudomonas euroginosa* 18.9 %(n=7) *Staphylococcus aureus* 16.22 %(n=6) *Enterococcus spp* 2.7% (n=1) and *Candida albicans*16.2 %(n=6).

Conclusion:
UTI is an infection of some part of your body's urinary system which may include: kidneys, ureters, bladder and urethra. Organisms causing UTIs in pregnancy are the same uropathogens which commonly cause UTI in non-pregnant patients with *Escherichia coli* being the most commonly isolated organism. Other bacteria include: *klebishella pneumoniae, staphulococuus, streptococcus, enterococcus* and *pseudomonas.*

Recommendations:[a]
Kawempe National Referral Hospital. Should improve the Laboratory to perform microbiology tests.

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1 Background

Pregnancy is associated with structural, physiological and functional changes in urinary tract which most often results in ascending of pathogens into urinary bladder, causing urinary tract infections.(Belete and Saravanan, 2020).

Urinary Tract Infection (UTI) is a disease of urinary system. This type of infection involves urethritis, pyro nephritis or cystitis. Symptoms can be pelvic pain, increased urge to urinate, pain on passing out urine and blood in urine (blander infections). Kidney UTI may cause back pain, nausea vomiting and fever. (Belete and Saravanan, 2020).

UTI is a health problem to pregnant women. It causes morbidity during pregnancy worldwide. The most causative agents of UTI are: F*ungi and proteus mirabilis , Escherichia coli, Enterobacter species, Klebsiella species,*Coagulase Negative *Staphylococci, Enterococcus* species , *Staphylococcus aureus*, Non-hemolytic Streptococci, *Pseudomonas aeruginosa,* Citrobacter speciesamong others, (Belete and Saravanan,2020).

Globally, the prevalence of UTI in pregnancy ranges between 13% - 33% with symptomatic (1% - 18%) while asymptomatic (2% - 10%) of pregnant women. The most common agent implicated in symptomatic and asymptomatic UTI are enterobacteriaceae spps organisms,(Onyango, Ngugi et al., 2018).

Studies that have looked at the urinary bacterial profile and susceptibility have shown varied results. A study done in Nigeria, 200 urine samples were cultured and 112(56%) isolates of bacteria were identified as follows: *Eschericia coli* 52(26%), *Klebsiella aerogenes* 16(8%), P*seudomonas aerogenes* 10(5%) *Staphylococcus aureus* 20(10%)and *Proteus mirabilis*14(7%) out of 200 urine samples, (Nwachukwu, Onyebuchi *et al.,* 2018).

In western Uganda, Mbarara Regional Referral hospital 400 urine samples were cultured and 140 urine samples had a positive culture of both gram negative and gram positive organisms as follows with the prevalent (73%) for gram negative bacteria: *Klebsiella pneumoniae* 52(37.41%), *Escherichia coli* 40(28.78%), *Pseudomonas aeruginosa* and *Proteus mirabilis* 7(5.04% each), *Citrobacter freundii* 1(1%) and for gram positive organism isolated was *Staphylococcus aureus* 33(23.57%). The antimicrobial susceptibility profile for gram negative organisms were as follows: ampicillin 95.7%, amoxicillin 95.0%, amoxicillin/clavulanic acid 95.0%, and ceftazidime/clavulanic acid 72.9%. Majority of the bacterial isolates were sensitive to ciprofloxacin82.9%, ceftriaxone 81.4%„ nitrofurantoin78.6%„cefotaxime66.4% and gentamicin65.7% Prevalence of extended-spectrum beta-lactamases producing *Enterobacteriaceae* was 29.0% while that of methicillin-resistant *Staphylococcus aureus* was 33.3%. Multi-drug resistance (resistance in >2 drugs) was seen in 100% of the isolated bacteria..(Bahati, Stephen et al. 2020).

The aim of this study is to determine the urinary microbial profile and antimicrobial susceptibility patterns among pregnant women attending antenatal clinic at Kawempe National Referral Hospital.

2 METHODOLOGY

2.1 Study site

The study was carried out at Kawempe National Referral Hospital located in Kawempe division Kampala district in the central part of Uganda. It has a target population of approximately 290,500 people in the informal settlements of Kawempe division. Kawempe Division is the largest division in Kampala, with an estimated population in excess of 338,665 (Uganda bureau of statistics) according to the 2014. Kawempe Division has a high mortality and morbidity burden compared to the other four divisions in the city. A survey in 2013, ranked it highest in HIV/AIDS transmission and STIs out of the five divisions within Kampala. Kawempe National Referral Hospital offers a range of maternal services among which include ANC services with a total of 28,759 ANC visits per year. The ANC services offered at Kawempe National Referral Hospital are; Prevention of maternal and neonatal tetanus, Prevention and case management of maternal malaria, Prevention of maternal anemia and malnutrition, Prevention of STIs and mother to child transmission of HIV. However Kawempe national referral hospital does not only offer services of ANC to people staying only in Kawempe division but also acts as a referral for ANC related cases from various parts of the country. The study participants were recruited , enrolled into the study and data collection done from 24th, August,2021 to 21st September, 2021. Data analysis was done from 28th September 2021 to 12th October, 2021.

2.2 Study design.

A cross-sectional study design was employed for this research project where participants who were clerked by clinicians (medical officers, clinicians, midwives among others) and consented to the study. Participants were guided on how to collect urine samples, urine microscopy and chemistry was done and then later culture and sensitivity was done to assess microbial profile and antimicrobial susceptibility patterns among microbes isolated.

2.3 Study population:

Study population targeted pregnant women attending ANC at Kawempe National Referral Hospital

2.4 Sample selection criteria.

The study recruited pregnant women with signs and symptoms UTI attending ANC at Kawempe National Referral hospital

2.5 Inclusion criteria

All pregnant women who were screened by the physicians and consented to the study were included.

2.6 Exclusion criteria:

All pregnant women who were screened by the physicians and did not consent to the study were excluded.

Sample size estimation:

Kish and Leslle, (1986) formula was adopted to determine the sample size as follows;

n = $\frac{pqz^2}{d^2}$

Where; Z-confidence limits at 95% confidence interval (1.96)

P - affected people (25%) (Johnson et al., 2021)

q - Percentage of people not affected

d - Absolute sampling error that can be tolerated (5%)

n - sample size

Therefore, N= $1.96^2P\ (1\text{-}P)/d^2$

$=1.96^2$x 25% (100-25%)/$5\%^2$

= 288 pregnant women.

Ethical considerations:

Permission and clearance to carry out this study was obtained from the faculty of medicine research committee and Mbarara University of Science and Technology Research and Ethics Committee. National Referral Hospital administration and ethic board gave us permission to carry out this study. Participants consented to be included in the study. All information gathered from the study participants was held with a high degree of confidentiality and privacy.

2.7 Sampling procedure:

All pregnant women attending ANC at Kawempe National Referral Hospital with or without signs and symptoms of UTIs were screened by the physicians and consented to enroll into the study.

Simple random sampling method was used in this study.

2.8 Study variables:

The study documented trimesters of the pregnant women attending antenatal clinic at KNRH.

2.9 Materials of data collection:

The materials used during data collection included; Sterile Wide Mouthed Urine Containers, cool box for transporting specimens to the laboratory, a laboratory register for recording results, sterile culture media , Blood agar, MHA, CLED, MAC, Autoclave, Distilled water, Sterile loops, Flame for sterilizing loops, Incubators, Ten Parameter Urine Strips, Drug discs, Study bench book, glass slides, cover slips and a microscope.

3 Methods:

Urine samples were collected from pregnant women attending ANC at Kawempe National Referral Hospital who consented to participate in the study. Urine samples were transported to the laboratory to be cultured, examined microscopically and urine chemistry was determined using a ten parameter strip following sops at clinical microbiology laboratory (department of microbiology college- of health sciences Makerere University). Identification of pathogens was determined using both chemical and enzymatic reactions. Drugs susceptibility tests were determined.

3.1 Sample collection :

A clean catch urine was collected into a sterile wide mouthed container following the steps below.

Labeled a sterile wide mouthed urine container with the participant's study number, type of specimen, and date of collection, the client washed hands with soap provided, the client was instructed

to gently separate the folds over the urinary opening after washing hands, the participant was instructed to first pee out and collect the mid-stream urine into the sterile wide mouthed container and then pee the rest of the urine out and wash hands thereafter and deliver the sample to the laboratory.

3.2 Transportation:

Samples were transported to the laboratory immediately using a cool box.

3.3 Accessioning and registered:

All urine samples were both electronically and manually registered into the laboratory Data base and recorded into laboratory registers respectively to obtain the laboratory number. The laboratory number was assigned to the urine sample and the request form. The urine samples were taken for both Urinalysis and Culture. The request forms were filed into the request form file.

3.4 Culture and sensitivity:

A mid-stream fresh urine sample, well mixed, was cultured onto Blood Agar (BA), Cysteine lactose electrolyte deficient agar (CLED) and Macconkey agar(Mac) using a 10 ul wire loop.

Cultured plates were labelled with the participant's identity laboratory number and incubated at 37^{o}c for 18-24 hours.

Plate reading and interpretation of culture colony morphology was described and recorded into the laboratory book.

The 10^5 CFU/ML of a given culture growth was identified and drugs susceptibility was determined.

Gram staining and other tests like catalase and oxidase shall be performed.

The Kirby-Buer method disc diffusion was used where the organisms were emulsified into a standard normal and 0.5 MacFarland (0.5 MacFarland was prepared by mixing 0.05 ml of 0.175 % barium chloride dehydrates with 9,95 mls of 1% sulphuric acid).

A sterile swab was immersed into the mixture, excess was removed by squeezing the swab onto the sides of the tubes and we spread the organisms onto dried sterile MHA and incubated.

The zone of clearance was measured, recorded and using a SLSI was used to determine the drugs which are; Resistant, Intermediate or Sensitive.

The isolates were stored for feature use.

Plates were autoclaved after the culture was done.

3.5 Urinalysis:

Macroscopic examination of urine was performed and results recorded.

Urine chemistry was performed using a ten parameter strip by dipping the Uristix into the urine sample and the findings were read after one minute.

A wet preparation on urine was performed to look for White blood cells, Red blood cells, Crystals, Yeast cells, Bacteria, Casts, Flagellates among others.

3.6 Quality control:

Freshly collected urine in a sterile container was transported in a cool box to the laboratory and cultured as soon as possible.

Quality control of the performance and sterility of culture media was performed by quality controlling the autoclave system, use of sterile distilled water, storing media in the fridge at 2-8^{0} C, batching the media, quality controlling the drug discs using standard bacterial strains, using a McFarlan standard of 0.5 microgram, gram stain controls of both gram positive and gram negative organism were performed, both quality control for chemical and enzymatic identification tests were performed using standard organism(ATCC strains tests).

Participant's reports were verified through cross checking with the primary source (laboratory work book)

4 Data analysis:

We used the primary data sources like the consent forms, and participants' request forms to get their details.

Results from culture and Sensitivity and urinalysis were recorded in the laboratory working bench books.

A test result template was used to establish the susceptibility of the bacterial uropathogens affecting pregnant women in Kawempe National Referral Hospital.

The data from primary sources was entered into computer using Microsoft excel and analyzed using SPSS version 18.0. The results of urinary bacterial profile and susceptibility patterns were combined to get a complete data set for the study.

The bacterial profile and fungal infections affecting pregnant women in Kawempe National Referral Hospital were determined by the percentage of a given bacteria or fungi isolated from a given positive urine culture.

4.1 Data management:

The research assistants are to ensure that participants' samples are properly labeled with unique numbers to avoid mixing of samples. The researchers also ensured that both soft and hard copies of data are properly kept to avoid loss of information.

5 RESULTS

6 Introduction

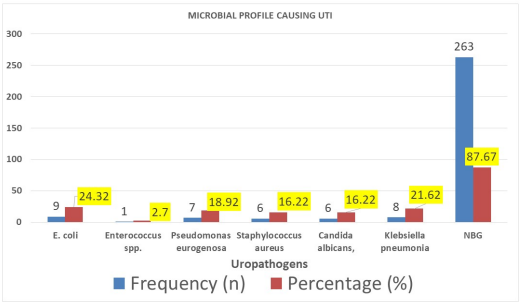
Data from 300 study participants was exported to STATA/SE 15.0 and analysed to ascertain the commonest bacterial and fungal uropathogenic profile and their susceptibility to different antibiotics.

Below are the results:

6.1 Demographic characteristics

The mean age was 29 years, SD 5.31

Figure 1: Microbial profile isolated causing UTIs among pregnant women.



87.67% (n=263) of the samples had no bacteria growth. The majority of urine samples were colonized by bacterial micro-organisms such as, Escherichia. Coli 24.3 %(n=9), *Klebsiella Pneumoniae* 21.6 %(n=8), *Pseudomonas euroginosa*18.9 %(n=7) and enterococcus 2.7 %(n=1)

And candida albicans 16.2 %(n=6) was the only fungal uropathogen in all the urine samples of study participants

6.2 Antimicrobial susceptibility patterns among microbes isolated

White blood cells were detected in more than half of the Urine Samples 52 %(n=156) and 48 % (n=144) had no abnormality detected.

94.3 %(n=283) of urine samples had no proteins and 5.7 %(n=17) of the urine samples had proteins.95.7 %(n=287) of the urine samples tested positive for nitrite and 4.3 %(n=13) tested negative. Leukocytes were 50% (n=150) positive and 50 %(n=150) negative. Urine samples with positive ketones were 0.7 %(n=2) and negative samples for ketones were 99.3 %(n=298)

7 Discussion:

This study aimed at determining urinary tract microbial profile and their respective antimicrobial susceptibility patterns among pregnant women attending antenatal clinic at Kawempe National Referral Hospital.

7.1 Microbial profile causing UTIs among pregnant women attending ANC at KNRH.

Out of 300 urine samples the most common bacteria was *E.coli* 24.3 %(n=9) which takes the biggest percentage followed by *Klebsiella Pneumoniae* 21.6 %(n=8) and *Pseudomonas euroginosa* 18.9 %(n=7).

A study conducted among pregnant women at Saint Paul's Hospital Millennium Medical College, Addis Ababa, Ethiopia revealed that from 290 study participants, 16.9% with 95 CI were positive for ASB. The predominant bacteria were *Escherichia coli* (43%) and *Staphylococcus aureus* (20%). Majority of *E. coli* (91.0%) were susceptible to nitrofurantoin and gentamycin, most of them were resistant to amoxicillin (86.4%) and cotrimoxazole (77.7%). The proportion of multi-drug resistance (MDR) isolates was 57.1%. Previous(Wabe, Reda et al. 2020)

A study conducted in Akure, Nigreria on urinary tract infections and antimicrobial susceptibility pattern among pregnant women showed a total of thirteen (13) bacteria species were isolated and identified. Ten (10) of the bacteria isolates were Gram-negative bacteria and three (3) were Gram-positive bacteria. There were mixed culture of two (2) species of bacteria in some samples. The results showed that the dominant bacteria isolates were

Table 1. *Pseudomonas* Susceptibility profile

Microbial Susceptibility (mm)	Drug tested
16mm(S)	CN
17mm(S)	AK
18mm(S)	CEP
22mm(S)	CIP, TPZ
25mm(S)	CAZ
26mm(S)	PRL
30mm(S)	IMP

The *Pseudomonas* was sensitive to all drugs set.

Table 2. *Escherichia coli* susceptibility profile

Microbial susceptibility (mm)	**Drug tested**
RESISTANT (16mm)	C
SENSITIVE (21mm)	PRL
SENSITIVE (24mm)	CAZ, TPZ
SENSITIVE (25mm)	IMP
SENSITIVE (26mm)	CIP, CRO, F
SENSITIVE (30mm)	AMC

Escherichia coli was resistant to only Chloramphenicol and sensitive to all the other drugs.

Table 3. *Klebsiella* Susceptibility profile

Microbial Susceptibility (mm)	**Drug tested**
Resistant(06mm)	SXT
Sensitive(18mm)	CN
Sensitive(19mm)	PRL
Sensitive(21mm)	F
Sensitive(23mm)	AMC
Sensitive(24mm)	TPZ
Sensitive(26mm)	CAZ
Sensitive (27mm)	CXM

Klebsiella Pneumoniae was only resistant to cotrimoxazole

Table 4. *Enterococcus* Susceptibility profile

Microbial Susceptibility (mm)	**Drug tested**
Resistant(06mm)	C, AMP, E
Resistant(11mm)	TE
Sensitive(15mm)	CN
Sensitive(19mm)	VA
Sensitive(21mm)	F
Sensitive(30mm)	CIP

Enterococcus spp. was sensitive to CIP(S=30mm) and resistant to C, AMP&E (R=06)

Table 5. Staphylococcus aureus profile

Microbial Susceptibility (mm)	Drug tested
RESISTANT(06mm)	FOX, P, SXT
RESISTANT(19mm)	TE
Resistant (08mm)	CD,E
SENSITIVE(17mm)	CN
SENSITIVE(21mm)	CIP
SENSITIVE(24mm)	C

Staphylococcus aureus was resistant FOX and therefore it was a MSA

Table 6. Showing summary of Urine Chemistry and microscopy results (n=300)

Variable	Frequency (n)	Percentage (%)
Urinalysis microcopy		
NAD	144	48.0
WBCs/HPF	156	52
Urine chemistry		
Leucocytes		
Negative	150	50.0
Positive	150	50.0
Nitrite		
Negative	287	95.7
Positive	13	4.3
Urobilinogen		
Negative	300	100.0
Positive	0	0
Protein		
Negative	283	94.3
Positive	17	5.7
Blood		
Negative	300	100
Positive	0	0
Ketones		
Negative	298	99.3
Positive	2	0.7
Bilirubin		
Negative	300	100
Positive	0	0
Glucose		
Negative	300	100
Positive	0	0

Escherichia coli 58 (31.7%), followed by *Klebsiella pneumoniae* 32 (17.5%), *Staphylococcus aureus* 27 (14.8%), *Proteus mirabilis* 14 (7.7%), *Klebsiella oxytoca* and coagulase negative *Staphylococci* (CoNS) 8 (4.4%). *Pseudomonas aeruginosa* and mixed culture of *S. aureus* and *K. pneumoniae* 6 (3.3%), *Citrobacter freudii* and *Providencia retgerri* 2 (1.1%), respectively, were minor(Simon-Oke, Odeyemi et al. 2019).

The study conducted showed that candida albicans 16.2 %(n=6) was the only fungal uropathogen in all the urine samples of study participants and Candida albicans was very sensitive to CAZ (S=30mm), C & AMC (S=27mm) and PRL was intermediate (I=14mm).

The sensitivity profile for the different isolates against the drugs was conducted as below; *Staphylococcus aureus* was sensitive to C(S=24mm) and highly resistant to FOX,P & SXT(R=06),*Enterococcus spp.* was sensitive to CIP(S=30mm) and resistant to C,AMP&E (R=06), *Candida albicans* was very sensitive to CAZ (S=30mm), C & AMC (S=27mm) and PRL was intermediate(I=14mm), *Klebsiella Pneumoniae* was highly sensitivity to CXM(S=27mm) and resistant to SXT(R=06mm). The most sensitive antibiotic to *E.coli* was amikacin (S=30mm). *E.coli* was resistant to ciprofloxacin (R=16mm), The most sensitive antibiotic to pseudomonas was imepinem (S=30mm).

The mid-stream urine culture samples revealed that 39/439 (10.6 %) and 9/45 (20 %) had significant bacteriuria in both symptomatic and asymptomatic pregnant women respectively with the p-0.10. The pathogen identified were *E. coli* 11.6 %, *Staphylococcus aureus* 20%, coagulase negative staphylococcus 16%, *Klebsiella pneumonia* 8%. Other noted organisms were *Pseudomonas aeruginosa Protues spp* and *Enterococcus spp.* 40 % and 60 % counted for both gram negative and gram positive organisms respectively. The antimicrobial was determined, for gram negative organisms (> 65 % of the isolated organism), 70% strains were sensitive to Amoxicillin-clavulanic acid (AMC), Chloramphenicol (C) 83.3%, Gentamycin (GN) 85 F 100% Cephalothin 95% and Trimethoprim sulphamethoxazole (SXT) 65 %. For gram positive organism (65 % of the isolated organisms), Chloramphenicol (C) 70%, Erythromycin (E) 80% Nitrofurantoin (F)100%, Gentamycin (GN) 85% and Trimethoprim sulphamethoxazole (SXT) 65 %. Multiple drug resistance of 74 % was observed.{Assefa, 2008 #18}

According to a cross-sectional study that was done on the Antimicrobial Susceptibility Pattern, and Associated Factors of Urinary Tract Infections Pregnant and Non pregnant Women in Ethiopia showed that gram-negative bacterial isolates (n = 100) showed a resistance rate of 70% to trimethoprim-sulfamethoxazole, 61% to ciprofloxacin, and 60% to amoxicillin. *Escherichia coli* were 83.3% resistant to amoxicillin, 81% to ciprofloxacin, 78.6% to trimethoprim-sulfamethoxazole, and 57.1% to ceftriaxone, whereas 92.9% were sensitive to Ceftazidime, 83.3% to Cefoxitin, and 81% to Gentamicin. Proteus spp. were 87.5% resistant to ciprofloxacin and 56.2% to Trimethoprim-Sulfamethoxazole, while 100% were sensitive to Ceftazidime, 93.8% to Cefoxitin, and 87.5% to Ceftriaxone. Klebsiella spp. were 86.7% resistant to Amoxicillin and 73.3% to Trimethoprim-Sulfamethoxazole but 93.3% were sensitive to Ciprofloxacin, 73.3% to Ceftazidime, and 66.7% to Ceftriaxone(Abate, Marami et al. 2020)

7.2 STRENGTH:

This study was conducted form a national referral hospital that gives you the advantage of getting clients from different parts of the country since it's a national referral hospital.

The facility would also ease data collection due to the fact that it is a high volume facility with a very active ANC department given the nature of it being a national referral hospital.

8 LIMITATIONS:

Inadequate consultations prior to selecting the health care center that would be used in our study delayed our study.

The facility at the time of data collection had so many ongoing research activities that forced us to extend the time we had allocated for data collection.

The COVID-19 pandemic that also affected one of our college for over a month led to delay in some of the aspects of data collection.

The Research ethical committee for Kawempe delayed to grant us permission to start, as it sits only quarterly.

The samples transportation from Kawempe National Referral Hospital to Makerere microbiology

Laboratory could affect temperature which would also affect sample integrity.

SOURCE OF FUNDING:

The study had no funding other than the authors themselves(Private funded)

9 CONCLUSION:

UTI is an infection of some part of your body's urinary system which may include: kidneys, ureters, bladder and urethra. Organisms causing UTIs in pregnancy are the same uropathogens which commonly cause UTI in non-pregnant patients with Escherichia coli being the most commonly isolated organism. Other bacteria include: klebishella pneumoniae, staphulococuus, streptococcus, enterococcus and pseudomonas. UTIs present with burning of painful urination, cloudy urine, pelvic or lower back pain among others hence pregnant women need to adhere to the ANC schedule in order to detect UTIS at an early stage. Severe UTIs can lead to kidney infection, respiratory problems and sepsis, which can then lead to preterm labour and a possibility of low birth weight.

All gram negative organisms isolated were sensitive to most of drugs set except resistant to Cotrimoxazole

Kawempe National Referral Hospital. should improve the Laboratory to perform microbiology tests.

10 Acknowledgement:

Sincere and heartfelt appreciation goes to our beloved supervisor Mr. Ndarubweine Joseph for the guidance, corrections and encouragement throughout the entire research process.

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More gratitude to Dr Deo Byaruhanga, Grace Kampololo Elizabeth Mutesi, Namiremba Sarah, and all the staff of KNRH for the cooperation, warm welcome and care accorded to us during data collection process and analysis.

11 Definition of Terms:

ANTIBIOTIC: A drug that kills or stops the growth of bacteria.

ANTIMICROBIAL RESISTANCE: The ability of a microbe (germ) to resist the effects of a drug.

ANTIBIOTIC RESISTANCE TESTING: (Also known as antimicrobial susceptibility testing) laboratory testing performed on bacteria to find out if it's resistant to one or more antibiotics.

ANTIMICROBIAL: A substance, such as an antibiotic, that kills or stops the growth of microbes, including bacteria, fungi, or viruses.

BACTERIURIA: Presence of bacteria in the urine.

CULTURE AND SENSITIVITY TEST: Is a method of multiplying microbial organisms by letting them reproduce in a predetermined culture media in a controlled laboratory conditions.Test checks to see what kind of medicine, such as an antibiotic, will work best to treat the illness or infection.

MULTIDRUG-RESISTANT (MDR) ISOLATE:

Refers to an isolate that is resistant to at least one antibiotic in three or more drug classes.

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