Detection of bacteria in urinary tract infection among prenatal patients in hospitals, Karbala, Iraq

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Abstract

Background: A study of the Bacteria in UTI among antenatal patients attending clinics at Imam Hussein Medical City, Karbala, Iraq was conducted between October, 2022 and July, 2023.

Patients and Method: Two hundred consenting symptomatic and asymptomatic pregnant women were recruited into the study and clean-catch midstream urine samples were collected from them. Structured questionnaires were also administered to the subjects to obtain relevant socio-demographic data from them.

Results: The results showed that 98(49%) out of the 200 samples had significant bacteria growth, 22 (11%) yielded growth of Candida albicans, 30 (15%) yielded no significant growth, 14 (7%) yielded mixed growth of contaminants, while 44 (22%) yielded no bacteria growth. Microscopically, the presence of Trichomonas vaginalis was detected in 8 (4%) of the samples. Thirty (28.8%) of the samples yielded growth of Escherichia coli, Klebsiella spp 28 (26.9%), Staphylococcus spp 22 (21.2%), Pseudomonas spp 10 (9.6%), Proteus spp 6 (5.8%) and Streptococcus spp 2 (1.9%).

Conclusion: Statistical analysis of the result reveal that there's an association between Bacteria UTI and subjects' socio-economic status. It was more prevalent in subjects with low socio-economic status, was highest in subjects in first trimester and lowest in the third trimester. Antibiotic susceptibility testing shows that the isolates had high sensitivity to peflacine, gentamicin, nitrofurantoin, rocephin and cloxacillin. They had fairly good sensitivity to ciprofloxacin and nalidixic acid, whereas they had moderate sensitivity to chloramphenicol and zinacef. They were however resistant to tetracycline, cotrimoxazole, colisitn, streptomycin, ampicillin and penicillin.

Keywords: *Urinary tract, bacteria, infection, Bacteria.*

INTRODUCTION

The term "bacteria" is used to describe the presence of several types of bacteria during an illness, particularly a urinary tract infection in pregnant women. The presence and development of bacteria anywhere in the urinary system results in an illness known as a urinary tract infection (UTI), It may be the most prevalent bacterial illness in human history[1] .

Bacteria is a phenomenon used to express the occurrence of varieties of bacteria in the course of infection especially urinary tract infection in

pregnant women. A urinary tract infection (UTI) is an illness brought on by the existence and development of bacteria anywhere in the urinary system, It is conceivably the most prevalent bacterial illness in human history [2].

The urinary system is made up of the kidney, ureter, bladder, and urethra, which are the organs that store and discharge urine from the body. UTIs have been recorded in people of all ages and both sexes, and they are among the most prevalent bacterial infections in humans, both in community and hospital settings [3]. It is the primary cause of Gram-negative bacteriaemia, a major health issue impacting millions of individuals each year. Additionally, UTIs are the main factor in morbidity and medical expenses for people of all ages. As much as 35% of nosochomial infections are now hospital acquired infections, and UTIs are the second most prevalent cause of bacteremia in hospitalized patients [4]. In clinical microbiology laboratories, UTIs make up a sizable portion of the workload, and enteric bacteria, particularly Escherichia coli, continue to be the most common cause of UTIs [5].

According to several accounts, UTI can happen to both sexes at any age, with urine bacterial counts as low as 100 colony forming units per millimeter [6]. Patients with acute urethral syndrome symptoms, men with chronic prostatitis, and people using indwelling catheters are all at risk for this [7]. However, it is thought that males are less harmed than females, unless life is at its most severe [1]. Pregnant women who have untreated upper urinary tract infections run the well-documented risk of morbidity and, in rare cases, fatality [8]. Young women who are sexually active are disproportionately affected. UTIs were found to have occurred in almost 40% of women at some time in their life [9]. A UTI is typically brought on by bacteria, which

can also exist in the urethra (the opening to the urinary system), the vagina, and the digestive tract. Most frequently, these germs pass through the urethra and end up in the kidneys and bladder. The body often gets rid of the bacterium with no symptoms. A burning sensation when urinating, frequent or strong desires to pee, even when there is little urine to pass, lower back or abdominal discomfort, murky, black, bloody, or strange-smelling urine, and a fever or chills are some of the symptoms (National Institutes of Health ,2004). Because germs may enter the bladder more easily in women than in men, women tend to have UTIs more frequently than men. This is partly because the female urethra is shorter and broader and is located close to the anus. Infections can be readily caused by bacteria that quickly ascend the urethra from the rectum [1].

Furthermore, pregnancy and sexual activity are the greatest risk factors for bacteriuria in married women (National Institutes of Health ,2004). The likelihood of bacterial infection of the female urethra rises with sexual activity. Because germs can be forced into the urethra during sexual activity, UTIs in women may also result from it. The female urethra is anatomically connected to the vagina, making it vulnerable to injury during sexual activity and to bacterial massage of the urethra and bladder during pregnancy and childbirth [10].

Urine samples make up the biggest single category of specimens analyzed in the majority of medical microbiology laboratories, and UTI is the second most frequent clinical reason for empirical antibiotic therapy in primary and secondary care [2].

UTI is difficult due to the high number of infections that occur each year as well as the fact that the diagnosis of UTI is not always simple [10]. The patient and the situation

heavily influence the criteria for the diagnosis of UTI.

In the hospitals in Karbala, Iraq, this study focuses on the bacteria and the prevalence of UTI in pregnant women.

METHODOLOGY

Study Area

A city in central Iraq, Karbala or Kerbala is roughly 100 kilometers (62 miles) southwest of Baghdad. There are around 700,000 people living there, making it one of the most significant holy cities (2015) [11].

Study Population

Two hundred pregnant women between the ages of 21 and 40 had urine samples taken. All of these people were present in the Karbala Hospitals' antenatal clinic. The ladies came from different socioeconomic statuses—low, medium, and high. The ladies included both those with and without urinary tract infection symptoms.

Sample collection

200 pregnant women's clean catch mid-stream pee samples were gathered. The patients were told to properly wash their hands, spread their labia, clean their vulva with a light soap, and rinse with warm water. Without pausing micturition, the initial portion of the urine was voided out, and the middle portion was then placed into a sterile universal bottle and voided out.

Through the distribution of questionnaires to the patients, the samples were correctly labeled, and all essential data, including name, age, employment, parity, and stages/duration of pregnancy, were gathered.

SAMPLE ANALYSIS

Culture

Using a wire loop made to supply 0.01ml of urine, the semi-quantitative semi-quantitative approach was used to grow the samples. Blood agar plates were infected after the loop had been placed. The plates were incubated overnight at 370C, and the following day a colony count was performed.

Microscopy

The samples were well mixed several times without shaking, and then 7ml of each sample was put into centrifuge tubes and spun for 15 minutes at 3000 rpm. Wet preparations were created from the deposits after the supernatant fluids were decanted. Then, the cellular and non-cellular components of these were looked at utilizing the X10 and X40 objectives.

All of the isolates' distinct colonies were injected into peptone water, which was subsequently flooded over sterile DST agar plates with the antibiotic's discs. The plates were incubated at 370C overnight.

Escherichia coli NCTC 1041 S and Staphylococcus aureus_ NCTC 6571were used as control organisms.

RESULTS

Total number of pregnant women examined

200

Number with significant bacteriuria

98(49%)

Number with non-significant bacteriuria

30(15%)

Number with mixed growth

24(7%)

Number without growth

44(22%)

Out of the 200 samples examined 22 (11%) yielded viable growth of Candida albican and 8(4%) had Trichomonas vaginalis infections. Control samples from non-pregnant women who were under child bearing age were also examined alongside with the test samples, these patients were known to be healthy individual selected from karbalai community. The result showed that only 2(5%) samples out of the 40 control samples processed yielded the growth of E. coli, Candida albican 8(20%). Out of 40 samples processed as control, 24(60%) yielded no growth while 6(15%) yielded non-significant bacterial growth.

As shown in Table 2, Escherichia coli had a higher prevalence of 30(28.8%), this was followed by Klebsiella spp. 28(26.9%), Staphylococcus spp 22(21.2%), Candida albican 22(21.2%), Pseudomonas spp Proteus spp 6(5.8%) while Streptococcus faecalis; had the least prevalence of 2(1.9%). It was also noted that infection rate was highest during the first trimester 36(81.8%) and lowest in the third trimester 40(40.8%) (see Table 3). Table 4 reveals that infections rate was higher in primigravida 40(57.1%) while it's a little bit lower in multigravida 70(53.8%).

In relation to Tables 5, 7 and 8 shows the effect of socio-economical factors on the prevalence of urinary tract infection in antenatal patients at karbala Hospitals, iraq. All strains of bacterial isolates were susceptible to peflacine. Many of the isolates were also sensitive to rocephin, cloxacillin, gentamycin, fortum, nalidixic acid and nitrofurantoin, also moderately sensitivity was exhibited to zincef, chloramphenicol. All isolates show high resistance to tetracycline, cotimoxazole, colistin, streptomycin and ampicillin. Penicillin was highly resistance to gram positive cocci.

Table 1 Showing the Summary of Bacteria in Urinary Tract Infection in Antenatal Patient at Imam Hussein Medical City in Relation with the Control

Details Analysis Samples	Test Samples	%	Control	%
Number of Samples Process	200	100	40	Ioo
Number of Samples Yielding Significant Bacteria Growth	98	46	2	5
Number of Samples with Nonsignificant Bacteria Growth	30	15	6	15
Number of Sample with Mixed Growth of Probable Contamination	14	7	-	-
Number of Samples Without Growth	44	22	24	60
Number of Samples Yielding Growth of Candida Albican	22	11	8	20
Number of Samples With presence of Trichomonas vaginalis	8	4	-	-

Table 2 Showing Frequency of Occurrence of the Bacteria Isolated

	Organism Isolated	Number Isolated	
1	Escherichia coli	30	28.8
2	Klebsiella spp	28	26.9
3	Staphylococcus spp	22	21.2
4	Candida alb ican	22	21.2
5	Pseudomonas spp	10	9.6
6	Proteus spp	6	5.8
7	Streptococcus faecalis	2	1.9

Table 3: The Influence of Gestational Age on Bacteria (UTI) in Pregnant Women

Pregnancy Duration	Number Examined	Number Showing % Significant Bacteriuria	
1st Trimester	44	36	81.8
2nd Trimester	58	29	50.0
3rd Trimester	98	40	40.8

Table 4 distribution of age of Bacteria urinary tract infection in pregnant woman

Parity	Number Examined	Number Showing Significant Bacteriuria	%
Primigravida			
15-19	6	4	66.6
20-24	44	24	54.3
25-29	66	28	42.4
30-34	58	30	51.7
35-39	24	14	58.3
40 and above	2	-	-

Table 5 The Occupational Influence of Bacteria UTI in Pregnant Women

Occupation	Number Examined	Number Showing Significant Bacteriuria	%
Full Time-house Wife	12	8	66.7
Students	40	24	60.0
Trading	78	42	53.8
Civil Servant	70	34	48.5

Table 6 The Influence of Household Population on Bacteria Urinary Tract Infection in Pregnancy

Number in Household	Number Examined	Number Showing Significant Bacteriuria	%
1-4	126	62	49.2
5-8	64	38	59.4
9 and above	8	6	75-0

Table 7 Summary of White Blood Cell Count in Relation to Significant Bacteria

WBC	Number Examined	Number In the Range	Number Showing Significant Bacteriuria	%
0-2	200	78	14	23.0
3-5	200	56	56	64.3
6-8	200	32	32	18.8
9-12	200	14	8	57.1
13 and above	200	20	18	90.0

TABLE 8A The Antibiotic Sensitivity Pattern of Bacteria (UTI) Isolated (Gram Positive Organisms)

Antibiotics	Number Sensitive	%	Number Resistant	%
Peflacine	24	100	-	-
Rocephin	20	83	4	16.7
Cloxacillin	18	75.0	6	25.0
Gentamycin	17	70.8	7	29.2
Zinacef	15	62.5	9	37.5
Fortum	14	58.3	10	41.7
Erythromaycin	14	58.3	10	41.7
Chloramphenicol	11	45.8	13	54.2
Ampicillin	9	37.5	15	62.5

Penicillin	9	37.5	15	62.5
Tetracycline	9	37.5	15	62.5
Streptomycin	7	29.2	17	70.8

TABLE 8B The Antibiotics Sensitivity Pattern of Bacteria (UTI) Gram Negative Organisms

Antibiotics	Number Sensitive	%	Number Resistant	%
Peflacine	74	100	-	-
Nalidixic acid	64	86.4	10	13.5
Forum	63	85.1	11	14.9
Rocephine	58	78.4	16	27.6
Nitrofuration	52	70.3	22	29.7
Zinacef	41	55.4	33	44.6
Gentamycin	37	50.0	37	50.0
Tetracycline	29	39.2	45	60.8
Cotrimoxazole	26	35.1	48	64.9
Colistin	21	28.4	53	71.6
Setreptomycin	18	24.3	56	75.7
Ampicillin	16	21.6	58	78.4

DISCUSSION

The only other natural instance of a healthy normal individual accepting a foreign tissue transplant for several months occurs during pregnancy. According to research, the mother's immune system actively increases the likelihood that her fetus will survive by stimulating the development of immunoregulatory and non-specific suppressor cells, which protect the placenta and fetus instead of leading to their rejection [12]. Pregnancy also seems to favour the growth of pathogen, some of which may have been introduced unknowingly at it is onset. The result of this project research is in accordance with above statement.

The goal of the study project was to evaluate the most prevalent types of urinary tract infections in pregnant patients, as well as the prevalence of these infections among pregnant women who attended prenatal clinics at Imam Hussein Medical City in Karbala, Iraq. This is crucial because we believe that it is crucial to understand the variables that lead to pregnancy difficulties that may be identified in prenatal clinics in order to have a complete picture of the effectiveness of maternal care. We went to give open and truthful evaluations of the factors affecting the occurrence and prevalence of bacterial infections of the urinary tract in prenatal care.

The result showed that out of 200 pregnant women recruited for the research project work 98 of them were having significant bacterial infection and this represent 49% while 22 presented with candida infection and this

represent 11%. It was quite noticeable that 30 patients out of these 200 examined are with non-significant bacterial infection and these represent 15%, while those with mixed growth were about 14 and this represent 7%. It is noteworthy that only 44 patients were without bacterial growth and this figure represented 22% but with the control setup i.e. non-pregnant women was examined along with their counterpart who were pregnant, the result shows that out of 40 non-pregnant health patients who were under child bearing age and also sexually active stage: 2(5%) had significant bacterial growth, had non-significant bacterial growth, none of the control patients presented with mixed growth, 8(20%) had Candida albican isolated while 24(60%) was without growth. None of them had Trichomonas vaginalis detected in their urine.

Given that there were statistically significant variations in the incidence of urinary tract infections between pregnant and non-pregnant control women (P 0.05), it is clear that the prenatal patients had a high prevalence of urinary tract bacterial infection. The causative organisms isolated were Escherichia coli_30(28.8%), Klebsiella spp 28(26.9%), Proteus spp 6(5.8%) and Streptococcus faecalis 2(1.9%) see table 2.

The occurrence of bacteriuria was highest at the first trimester period of pregnancy, out of 44 patients examined at this stage 36(81.8%) was having significant bacteriuria, this was attributed to the fact the changes such as dehydration which is secondary to vomiting, increased excretion of nutrients like glucose, vitamin — B complex which form a good culture medium for bacterial growth, this was in accordance with the work of both, this condition also favored bacterial multiplication in the bladder leading to cystitis. The rate of bacteriuria decreases as pregnancy progressed,

out of 58 patients examined at the stage of second trimester 29(50.0%) was having significant bacteriuria and lowest at the third trimester, 98 patients were examined at this stage and 40 (40.8%) was with significant bacteriuria, this finding was in agreement with the work. The low bacteriuric pregnant women at the third trimester is due to frequency in urination at this stage of pregnancy which will not give enough time for bacterial multiplication to occur before urine is voided out. It is noteworthy that not only bacterial infections affections affect the antenatal patient, table I Out of the 200 pregnant women screened, 22 (11%) had candidiasis, demonstrating that it is one of the microorganisms causing urinary tract infections during pregnancy.

This predisposition has been ascribed to glycogen deposition in the vaginal epithelium, and to be under the influence of oestrogen. Also, there is an increase in glycogen content in vaginal and increase frequency of fungus infection during pregnancy as opposed the nonpregnant patient, the increase in candidia's infection in non-pregnant women to the available vaginal glycogen observed in the luteal phase of the menstrual cycle.

Influence of bacteriuria among pregnant women was found to be high, this trend towards a reduced level of bacteriuria with parity has been attributed to the increase in immunity that would be expected with an increase in age, this findings above complies with the work of [13] has suggested the general belief that material growth ceases during pregnancy.

The result above was also subjected to data analysis using one way analysis of variance (ANOVA) and the result was found to be statistically significant (P<O.05), this suggested that pregnancy duration as well s

parity were important factors in determining susceptibility to bacteriuria, this was in agreement with the work of [14].

Samples were from patients of different age groups, it could be seen from TABLE 4 that age range of 15-19 was having the highest prevalence rate of 4(66.6%) while the age range of 20-24 was with 24(54.3%) prevalence, this age range was convincingly the active sexual stage of normal healthy human life.

It also corresponded to the schooling age and students are particularly known to be involved in high level of sexual immoralities especially the female students, this was due to the fact that during sexual intercourse, any organisms present in the vaginal is massaged up the urethra.

Moreover the occurrence of no growth at the range of 40 years and above can be as a result of colonization of lactobacilli in the vaginal which bring about the production of lactic acid and thereby making the environment uncondusive for bacterial growth, not much work has been done on this. the above data was found to be statistically not significant (P>O.05) when tested. This then suggested that ages did not necessarily influenced the rate of prevalence of bacteriuria in pregnancy.

Findings made in this present study showed that bacteriuria in pregnancy may not be totally linked with occupation and household seize, this was subjected to statistical analysis using one-way analysis of variance (ANOVA) and it was found to be statistically not significant (P>0.05), but with the present statistic obtained from TABLE 5.

It was noticed that students were with high percentage of bacteriuria with 24(60%), this would have been best explained based on the rate of sexual activity of the Nigerian students

nowadays and since this act encourages bacteriuria then it can be linked with it, full time house wife was having 8(66.7%), this would have been best explained based on the rate of sexual activity of the Nigerian students nowadays and since this act encourages bacteriuria then it can be linked with it, full time house wife was having 8(66.7%), it is observed that most of the people who were low-socio-economic class and most of them do not maintain good hygiene ! and this can be attributed to the high incidence of bacteriuria in them.

The women's level of education is the abiding by the clinicians' instructions on antibiotics drugs and continuing the use of the drugs throughout the cause of the treatment, this was because women with high knowledge of bacteriuria are more likely to use antibiotics than those with low knowledge.

It was noted that Christians were having highest number of bacteriuria with 86(56.6%) while the Muslim counterpart are of 22(45.8%), the low level of bacteriuria in Muslim patient can be linked with their custom of worshipping which laid more emphasis on physical tidiness and good body hygiene which involved washing and clearing of private part before prayer at least this was carried out five times daily, in line with this it can be easily suggested that the mode of worshipping of Muslim helps reduces the prevalence of bacteriuria among them.

Significant pyuria (which is the presence of more than 3 pus cells in the centrifuged urine) was discovered in one hundred and twenty-two samples (122), 78 had pus cells in the range 0-2 pus cells/phf and was taken as not significant. It was not all cases of pyuria that showed significant bacteriuria (see TABLE 7) out of the 122 samples, only 64 had significant

bacteriuria. the other 58 samples had no growth of bacteriuria. It is thus evident that not all cases of bacteriuria are accompanied with pyuria. Pyuria is a good index of underlying renal diseases [15]. A bacterial pyuria has also been reported to be as a result of tuberculosis.

All isolates were subjected to antibiotics sensitivity testing based on their gram reaction, it was found that all isolates of both gram-positive organisms and gram-negative organisms were totally sensitive to peflacine (Fluoroquinolone), the reason for it is high sensitivity is not far fetch, this might be due to being new in the market and therefore has not yet grossly abused [16]. It is quite noticeable that all the isolates show good sensitivity pattern to Rocephin, Cloxacillin, Gentamycin, Fortum, Nalidixic acid and nitrofurantion. All isiolate shows high resistance to Tetracycline, Cotrimoxazonle, Colistin, Streptomycin and Ampicillin. Penicillin was applied to the Gram-positive cocci and some strains were also resistant (TABLE 8A and TABLE 8B). The above findings are in agreement with the works of [17].

Conclusion and Recommendation

This finding supports earlier studies that point out that UTI occurs more frequently in girls than in males during adolescence and maturity [18]. The high frequency of UTI reported in this study may also be ascribed to conditions such as substandard housing, inadequate drainage systems, a lack of environmental and personal cleanliness, and genuine population vulnerability [12].

Therefore, between 12 and 16 weeks of gestation, pregnant women should have a urine culture performed to check for bacteriuria. The patterns and occurrence rates of the bacterial isolates discovered in this investigation are comparable to those previously reported.

Additionally, individuals with simple UT are most frequently infected with E. coli. Is [19], and other members of the Enterobacteriaceae family, such S. aureus, may have comparable needs[20].

A urinary tract infection may result from coliform colonization of the vagina, which is encouraged by vaginal micro-flora. Due to the stigma attached to these diseases, UTI not only pose a risk to one's health but also place a financial and social burden on society. The results of this investigation showed that the vaginal and perianal commensals. This necessitates improving personal hygiene [3].

This study has brought to light the need to increase UTIS awareness and to broaden services for prenatal prevention and care. However, it could be required to raise the standard of healthcare services offered in the community in order to do this efficiently. It is advised that routine UTI screening be performed on patients with unexplained fever sources and that the appropriate antibiotics be administered after sensitivity tests have been completed in order to prevent cases from later becoming symptomatic and leading to renal damage. This is because UTI can be both symptomatic and asymptomatic in the majority of cases (Atallah et al., 2019).

All women with persistent bacteriuria or recurrent infection should have follow-up cultures and a urologic evaluation after delivery. Pregnant women and those who are not pregnant should also receive education regarding preventive measures for UTI. Additionally, short-course therapy should be given to women with bacteriuria, and clearance of bacteriuria should be documented after therapy is complete. We recommend quantitative urine cultures for all prenatal patients, especially those from

socioeconomically deprived backgrounds, because to the substantial risks to mothers and fetuses.

Reference

Anis S Mokhtar*, Nurhayo Asib, A. R. R. . R. M. A. . (2022). Development of Saponin based Nano emulsion formulations from Phaleria macrocarpa to Control Aphis gossypii. Journal Of Advanced Zoology, 43(1), 43–55. Retrieved from http://jazindia.com/index.php/jaz/article/view/113

E. Soydan, S. Bıyık, C.T. Supuran, D. Ekinci, et al. "Carbonic anhydrase from Apis mellifera: purification and inhibition by pesticides", Journal of enzyme inhibition and medicinal chemistry., 32 (1), 47–50 (2017).

Faisal, H. T. ., Abid, M. K. ., & Abed, A. . (2022). Study Of Some Biochemical Parameters in Dose During Pregnancy in Goats. Journal Of Advanced Zoology, 43(1), 01–06. https://doi.org/10.17762/jaz.v43i1.109

Mokhtar, A. R. R. A. S. . (2022). Development Of Saponin Based Wettable Powder Formulation from Phaleria macrocarpa To Control Pomacea maculate. Journal Of Advanced Zoology, 43(1), 17–31. Retrieved from http://jazindia.com/index.php/jaz/article/view/111

M. Y. Ebie, K.-O. Y.T, A. J., and T. K.B., "EBIE, M., KANDAKAI-OLUKEMI, Y.T., AYANBADEJO, J., TANYIGNA, K.B, (2001): Urinary tract infections in a Nigerian Military Hospital. Nigerian Journal of Microbiology 15(1): 31-37.," Nigerian Journal of Microbiology, vol. 15, pp. 31–37, Jan. 2001.

M. G. Morgan and H. McKenzie, "Controversies in the laboratory diagnosis of community-acquired urinary tract infection," European Journal of Clinical Microbiology and Infectious Diseases, vol. 12, no. 7, pp. 491–504, 1993, doi: 10.1007/BF01970954.

T. M. Hooton, C. Winter, F. Tiu, and W. E. Stamm, "Randomized Comparative Trial and Cost Analysis of 3-Day Antimicrobial Regimens for Treatment of Acute Cystitis in Women," JAMA, vol. 273, no. 1, pp. 41–45, Jan. 1995, doi: 10.1001/jama.1995.03520250057034.

W. E. Stamm, "Scientific and clinical challenges in the management of urinary tract infections," Am J Med, vol. 113, no. 1, pp. 1–4, 2002.

I. S. Akpan and F. A. Ehimen, "An Appraisal of Bacteriological Profile and Antibiogram Patterns among Elderly with Urinary–Tract-Infection: A Retrospective Study," Asian Journal of Medicine and Health, pp. 71–78, 2022.

N. S. Lázaro, A. Tibana, E. M. F. Reis, D. P. Rodrigues, B. R. Quintaes, and E. Hofer, "Antimicrobial susceptibility pattern and plasmid profile in Salmonella Muenster isolated from swine and abattoir environment, Brazil," Pesquisa Veterinária Brasileira, vol. 24, pp. 65–70, 2004.

K. C. Carroll, D. C. Hale, D. H. von Boerum, G. C. Reich, L. T. Hamilton, and J. M. Matsen, "Laboratory evaluation of urinary tract infections in an ambulatory clinic," Am J Clin Pathol, vol. 101, no. 1, pp. 100–103, 1994.

L. E. Nicolle, "Asymptomatic bacteriuria: when to screen and when to treat," Infectious Disease Clinics, vol. 17, no. 2, pp. 367–394, 2003.

N. F. Abou Heidar, J. A. Degheili, A. A. Yacoubian, and R. B. Khauli, "Management of urinary tract infection in

women: A practical approach for everyday practice," Urol Ann, vol. 11, no. 4, p. 339, 2019.

A. S. Kolawole, O. M. Kolawole, Y. T. Kandaki-Olukemi, S. K. Babatunde, K. A. Durowade, and C. F. Kolawole, "Prevalence of urinary tract infections (UTI) among patients attending Dalhatu Araf Specialist Hospital, Lafia, Nasarawa state, Nigeria," International journal of medicine and medical sciences, vol. 1, no. 5, pp. 163–167, 2009.

D. Seddon, A political and economic dictionary of the Middle East. Routledge, 2013.

N. Patel, A. Farooqi, M. Callaghan, and U. Sethuraman, "Urinary Tract Infection in Febrile Children with Sickle Cell Disease Who Present to the Emergency Room with Fever," J Clin Med, vol. 9, no. 5, p. 1531, 2020.

R. S. Bray and M. J. Anderson, "Falciparum malaria and pregnancy," Trans R Soc Trop Med Hyg, vol. 73, no. 4, pp. 427–431, 1979.

F. E. Hytten and I. Leitch, "The physiology of human pregnancy.," The physiology of human pregnancy., 1964.

K. F. Fairley et al., "Site of infection in acute urinary-tract infection in general practice," The Lancet, vol. 298, no. 7725, pp. 615–618, 1971.

A. H. Atallah, S. R. Al-Saedi, and A. M. Khudaier, "Study The Effect of Healthy Biological Extracts Compared with Antibiotics on Some Bacteria Isolated from Infected Patients with Urinary Tract Infection.," Indian J Public Health Res Dev, vol. 10, no. 8, 2019.

J. Villar, M. Widmer, M. Lydon‐Rochelle, A. M. Gülmezoglu, and A. Roganti, " Duration of treatment for asymptomatic bacteriuria during pregnancy," Cochrane Database of Systematic Reviews, no. 2, 2000.

R. Ibeawuchi and I. T. Mbata, "Rational and irrational use of antibiotics," Afr Health, vol. 24, no. 2, pp. 16–19, 2002.

G. Kahlmeter, "An international survey of the antimicrobial susceptibility of pathogens from uncomplicated urinary tract infections: the ECO· SENS Project," Journal of antimicrobial Chemotherapy, vol. 51, no. 1, pp. 69–76, 2003.

D. Tena, A. González-Praetorius, J. A. Sáez-Nieto, S. Valdezate, and J. Bisquert, "Urinary tract infection caused by capnophilic Escherichia coli," Emerg Infect Dis, vol. 14, no. 7, p. 1163, 2008.