Prevalence of Bacterial Urinary Tract Infection among Pregnant Women in Wasit Province in Iraq

Hayder Abdullah Kadhim Al-Sarray[1]

[1]*Department of Medical Laboratory Technologies, Middle Technical University, Iraq. E. mail: Karraralattaby@mtu.edu.iq*

KEYWORDS
Pregnancy, Urinary tract infection (UTI), Eschirishia coli, Gram negative bacteria, Trimester

ABSTRACT
Background: Urinary tract infections (UTIs) are the most common type of infection during pregnancy. UTI include a spectrum of disorders, ranging from those affecting the lower urinary tract, like asymptomatic bacteriuria and cystitis, to those affecting the kidney, such as pyelonephritis. In pregnancy UTI can lead to preterm labor, anemia and septicemia. Escherichia coli is the most common pathogenic microorganisms associated with UTI and counting up to 60–80% of all UTIs.
Objective: The aim of this study is to determine the prevalence of urinary tract infection (UTI) among pregnant women in wasit province.
Materials and Methods: Mid-stream urine samples from 100 pregnant women who attending to Al-Shaheed Fairuz hospital and private clinics in wasit province between the periods of March 2024 to July 2024 with the age range of (16-35) years. The urine samples were cultured on MacConkey and blood agars then examined by Macroscopic and Microscopic examination by Gram's stain. The colonies were examined by biochemical tests (Oxidase, catalase, manitol salt agar, novobiocin tests, IMViC) and confirmatory tests (API 20E and API Staph) for isolates.
Results: The results showed that the percentage of bacterial growth culture among the pregnant women was 33%. Gram negative bacteria were the higher percentage with (73%). Eschirishia coli bacteria were the most frequently isolated organism (40%) while, the lower percentage for Streptococcus spp. (3%). UTI in pregnant women was commonest in the age group 20-24 years (42%). According to trimesters of pregnancy, the highest percentage of UTI was in third trimester (43%) followed by second trimester (39%), while the the first trimest was the the lowest percentage with (18%).
Conclusions: Urinary tract infections (UTIs) are common during pregnancy. Untreated UTIs can lead to complications such as preterm labor, low birth weight and sepsis. E.coli is the predominant pathogen presently causing urinary tract infections at all stages of pregnancy. Urine culture and sensitivity tests are mandatory for all pregnant women during the different trimesters.

1. Introduction

Urinary tract infections (UTIs) are the second most common medical condition complicated pregnancy after anemia and it's the most common type of infection during pregnancy (1). About 5-10% of women develop some type of UTI during pregnancy (2) which can lead to important complications in new-born of such mothers in case of inappropriate diagnosis and treatment (3).

In pregnancy, Urinary tract infections include a spectrum of disorders ranging from those affecting the lower urinary tract, like asymptomatic bacteriuria and cystitis to those affecting the kidney such as pyelonephritis (4). Asymptomatic bacteriuria is usually benign in non pregnant women, but the risk of developing pyelonephritis increases during pregnancy (5). Pyelonephritis in pregnancy can lead to anemia, septicemia, preterm labor, respiratory insufficiency and rarely maternal death (6,7,8). UTIs in pregnancy are also associated with pre-eclampsia and birth defects (9,10,11).

The prevalence of UTIs in pregnancy may ranges from (13-33%) with asymptomatic bacteriuria occurring in (2-10%) (12). The majority of urinary tract infection among pregnant women is well-known in age group 26-30 years, followed by 21-25 and 31-35 years. The youngest among those studied was 18 years and oldest 45 years (13).

Escherichia coli (E.coli) is the most common pathogenic microorganisms associated with UTI and counting up to (60–80%) of all UTIs (14). Other microorganisms also included in UTI in pregnant women such as Staphylococcus saprophyticus (5% to 15%) of cases (15), Gardnerella vaginalis, Chlamydia trachomatis, Klebsiella pneumoniae, Proteus spp., Pseudomonas aeruginosa, Enterococcus spp. (5% to 10%) (16).

2. Methodology

Mid-stream urine samples from 100 pregnant women who attending to Al- Shaheed Fairuz hospital and private clinics in wasit province between the periods of March 2024 to July 2024 with the age range of (16-35) years were collected in sterile containers and then transported to the laboratory for bacterial analysis. Pregnant women who had been receiving antibiotics the day before admission were excluded because of the possibility of affecting the urine culture results. The urine samples were cultured on plates of MacConkey medium and blood agars were aseptically inoculated with 2-3 drops of the urine and then incubated for 24-48 hours.

The positive growth samples were examined by Macroscopic characteristics of the colonies and Microscopic examination by Gram stain. Then, the colonies were examined by using standard biochemical tests (i.e., Oxidase, catalase, manitol salt agar, novobiocin tests, IMVIC) and confirmatory tests (i.e., API 20 E and API Staph) systems for isolates.

Ethical Considerations: This study carried out with the moral standards set forth in the Declaration of Helsinki. Before a sample was taken, it was done with the patient's informed consent.

Statistical analysis

The data were statistically analyzed by using SPSS/PC version 20 software (SPSS, Chicago). Chi square test was used to reveal the significant comparison among percentages in this study. Where similar letters refers to non significant difference ($P>0.05$) between groups while different letters refers to significant difference ($P<0.05$).

3. Results and discussion

The results of the present study shown that the percentage of bacterial growth culture among the pregnant women was 33%, while the negative growth culture was 67% as shown in figure (1).

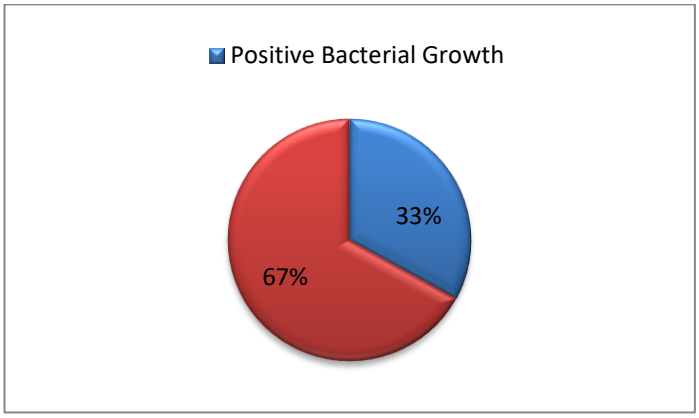

Figure (1): The percentage of bacterial UTI growth in this study.

This study shown that the higher percentage were for gram negative bacteria with (73%), while lower percentage were for the gram positive bacteria with (27%). The results demonstrated that there was a significant increase ($P<0.05$) for gram negative than gram positive bacteria as shown in figure (2).

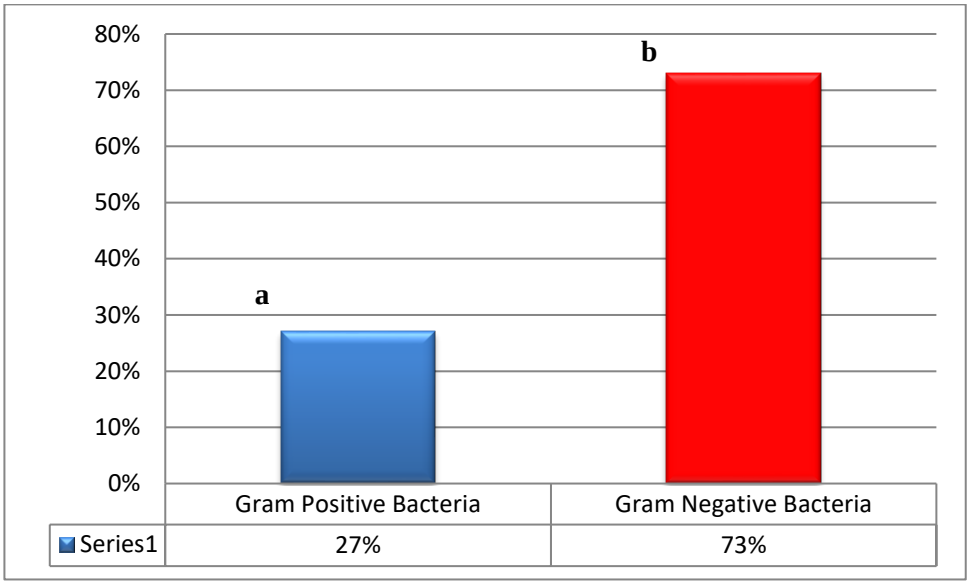

Figure (2): Percentage of bacteria isolates according to gram stain.

*Different letters refer to significant difference (P<0.05).

Eschirishia coli bacteria was the most frequently isolated organism (40%) followed by *Staphylococcus spp.* and *Klebsiella spp.* (15%), the percentage of *Enterococcus spp.* was (9%), while the lower percentage was for *Proteus spp.* and *Streptococcus spp.* with (6%) and (3%) respectively.

Eschirishia coli appeared a significant increase (P<0.05) than other species that isolated from pregnant women. While, *Streptococcus spp.* appeared a significant decrease (P<0.05) than other species except *Enterococcus spp* and *Proteus spp.* The results shown that there was non significant differences (P>0.05) among the species of *Proteus spp.*, *Pseudomonas spp.*, *Klebsiella spp.*, *Staphylococcus spp.* and *Enterococcus spp.*, as shown in figure (3).

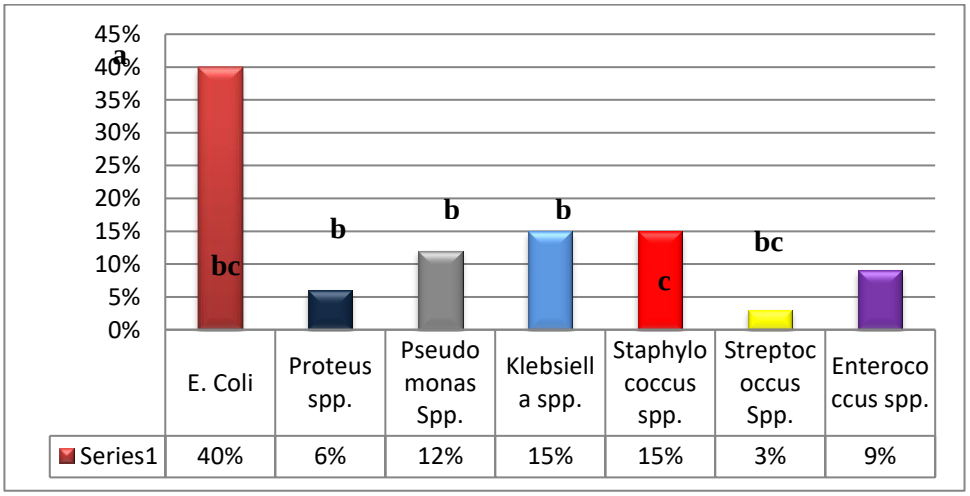

Figure (3): Percentage of bacterial isolates from urine of the pregnant women.

*Different letters refer to significant difference (P<0.05).

B

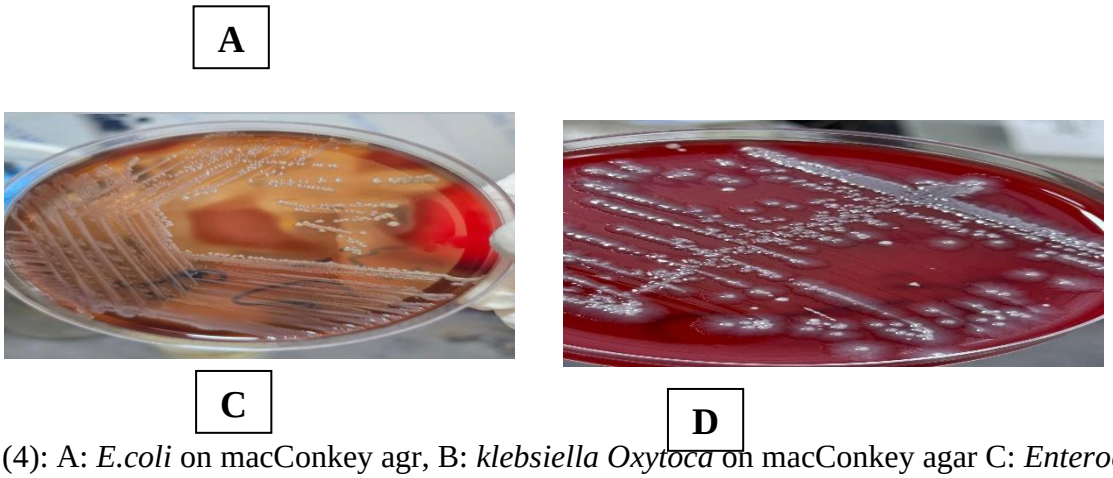

Figure (4): A: *E.coli* on macConkey agr, B: *klebsiella Oxytoca* on macConkey agar C: *Enterococcus Faecalis* on blood agar, D: *Proteus Mirabilis* on blood agar

According to the age group, the UTI in pregnant women was commonest in the age group 20-24 years (42%) followed by age group of 25-29 years with (27%), the age group of 30-35 years was (18%), while the lower percentage was in age group 20> with (12%).

The age group 20-24 years shown a significant increase (P<0.05) in UTI than age groups (20>) and (30-35) years while, there was non significant differences (P>0.05) when comparing it with age group 25-29 years. Also, the results appeared that there was non significant differences (P>0.05) between age group of (20>) and (30-35) years as shown in figure (5).

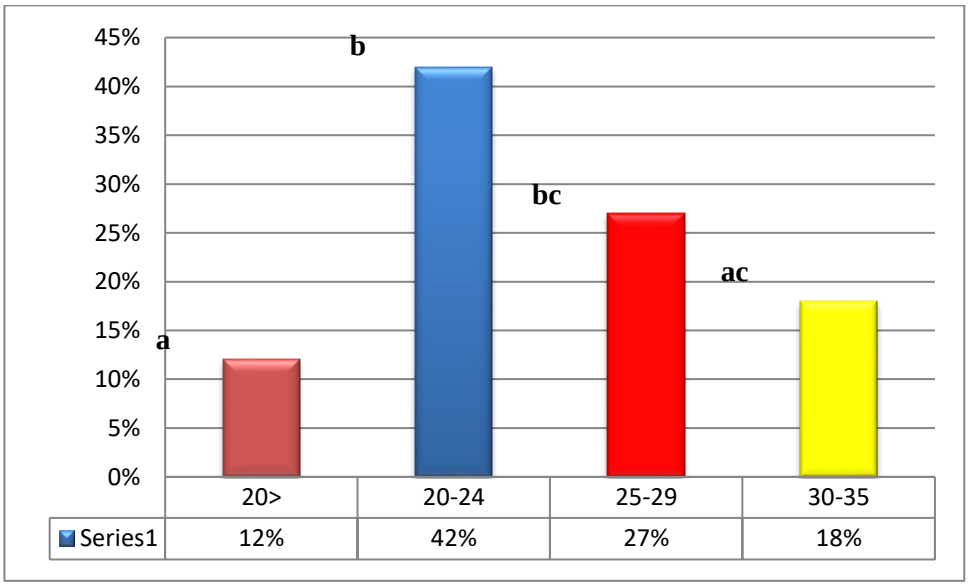

Figure (5): Distribution of UTI in pregnancy according to age group.

*Different letters refer to significant difference (P<0.05).

According to trimesters of pregnancy, the highest percentage of UTI was in third trimester (43%) followed by second trimester (39%), while the the first trimest was the the lowest percentage with (18%). The first trimester shown a significant decrease (P<0.05) in UTI when comparing it with third and second trimesters, while there was non significant difference (P>0.05) between third and second trimesters as shown in figure (6).

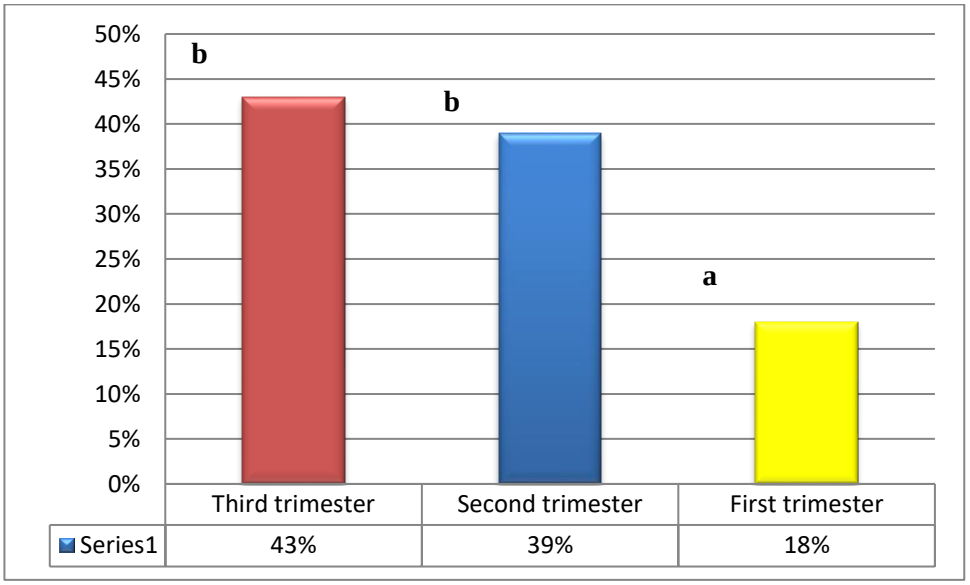

Figure (6): Urinary tract infection according to trimesters of pregnancy.

*Different letters refer to significant difference (P<0.05).

Discussion

The results of the present study shown that the percentage of bacterial growth culture among the pregnant women was 33%.This study similar to Al-Dujiaily *et al*. study in Iraq with 38% and to studies in other regions such as in Yemen by Al-Haddad study it was 30% and in Pakistan by Sheikh *et al*. study 28.5% (17,18,19). Also this study different from other studies that show the bacterial growth culture was about 8% and 7.7% (20). According to Obeagu *et al.* the risk factors associated with urinary tract infections during pregnancy including; the age, education level, socio-economic factors and obstetric factors play significant role in the occurrence of UTI during pregnancy (12).

This study shown that the higher percentage for gram negative bacteria were (73%), while lower percentage were for the gram positive bacteria with (27%). When comparing with other studies this result agree with the study done by Hussein *et al*. who found that the gram-negative bacteria were 80.95%, while gram-positive bacteria were 19.05% (21). On the other hand, the results disagree with the results reported by Naji and Awadh, who found Gram-positive bacteria were the predominant cause of UTI 66.7%, while Gram-negative bacteria were found 33.3% (22).

Regarding etiologic prevalence, the most frequent germ in this study was *E. coli* (40%) this finding agree with results of other researchers such as Al-Haddad study who reported that the most frequently isolated germ was *E. coli* 41.5% and to those reported by Balachandran *et al*. who reports *E. coli* isolates was 40% (18,23), While this results disagree with some studies as Al-Saadi *et al.* and Abd Al-Amir *et al.* who reported that *staphylococcus aureus* was the most frequently isolated germ in UTI in pregnant women (24,25). *E. coli* was considered as the most prominent urinary pathogenic bacteria due to a number of virulence factors specific for colonization and invasion of the urinary epithelium (26).

This study appeared that, the UTI in pregnant women was commonest in the age group 20-24 years (42%). This result agree with some studies that shown the age from 21-25 recorded the highest percentage of UTI in pregnancy such as studies of Tamalli *et al*. and Bandyopadhyay *et al*. (27,28). This can be explained by the fact that women's reproductive activity increases during this period; therefore, they are most prone to sexual activity which predisposes them to the introduction of microorganisms to the urinary tract and infection (29).

4. Conclusion and future scope

Urinary tract infections (UTIs) are common during pregnancy and can have significant implications for both the mother and the developing fetus due to physiological and hormonal changes that affect the urinary tract. Untreated UTIs can lead to complications such as preterm labor, low birth weight and sepsis. Eschirishia coli is the predominant pathogen presently causing urinary tract infections at all stages of pregnancy. Urine culture and sensitivity tests are mandatory for all pregnant women during the different trimesters. Health education with regular antenatal care plays a significant role in reducing the incidence of this infection.

Reference

[1] Amiri M, Lavasani Z, Norouzirad R, Najibpour R, Mohamadpour M, Nikpoor AR, Raeisi M, Zare Marzouni H. Prevalence of urinary tract infection among pregnant women and its complications in their newborns during the birth in the hospitals of Dezful City, Iran, 2012–2013. Iran Red Crescent Med J, 2015, 17, e26946.

[2] Souza RB, Trevisol DJ, Schuelter-Trevisol F. Bacterial sensitivity to fosfomycin in pregnant women with urinary infection. Braz J Infect Dis, 2015, 19, 319-323.

[3] Nwosu DC, Obeagu EI, Amajioyi O, *et al*. Prevalence Of Bacterial and Parasitic Urinary Tract Infections In Female Students of Imo State University. World J Pharm Pharm Sci. 2015;4 (5):152-67.

[4] Stein G, Fünfstück R: [Asymptomatic bacteriuria] . Med Klin (Munich). 2000, 95:195-200. 10.1007/pl00002106

[5] Whalley P. Bacteriuria of pregnancy. Am J Obstet Gynecol. 1967;97:723-38. https://doi.org/10.1016/0002-9378(67)90458-9

[6] Hill JB, Sheffield JS, McIntire DD, Wendel GDJ: Acute pyelonephritis in pregnancy. Obstet Gynecol. 2005;105:18–23. [PubMed: 15625136]

[7] Jolley JA, Kim S, Wing DA: Acute pyelonephritis and associated complications during pregnancy in 2006 in U.S. hospitals. J Matern Fetal Neonatal Med. 2012;25:2494–2498. [PubMed: 22725624]

[8] Wing DA, Fassett MJ, Getahun D: Acute pyelonephritis in pregnancy: an 18-year retrospective analysis. Am J Obstet Gynecol. 2014;10:219.e211–219.e216.

[9] Feldkamp ML, Arnold KE, Krikov S, *et al*.: Risk of gastroschisis with maternal genitourinary infections: the US National Birth Defects Prevention Study 1997–2011. BMJ Open. 2019;9:e026297.

[10] Easter SR, Cantonwine DE, Zera CA, Lim KH, Parry SI, McElrath TF: Urinary tract infection during pregnancy, angiogenic factor profiles, and risk of preeclampsia. Am J Obstet Gynecol. 2016;214:387.e381–387.e387. [PubMed: 26450405]

[11] Howley MM, Feldkamp ML, Papadopoulos EA, *et al*.: Maternal genitourinary infections and risk of birth defects in the National Birth Defects Prevention Study. Birth Defects Res. 2018;110:1443–1454. [PubMed: 30402975]

[12] Obeagu EI, Ofodile AC, Okwuanaso CB. A review of urinary tract infections in pregnant women: Risks factors. J Pub Health Nutri. 2023;6(1):137

[13] Care A, Alrass C, Qassim A, *et al*. The Prevalence of Urinary Tract Infection among Pregnant Women Attending Antenatal Clinic at, 2016;5(5):23-7.

[14] M.A. Belete, & M. A. "Saravanan, Systematic Review on Drug Resistant Urinary Tract Infection Among Pregnant Women in Developing Countries in Africa and Asia; 2005-2016" . *Infect Drug Resist*, vol. 18(13),pp.1465-1477, 2020.

[15] Mittal P, Wing DA. Urinary tract infections in pregnancy. Clin Perinatol.2005, 32: 749-764.

[16] Amer H, Almasri A. Urinary Tract Infections among Pregnant Women at Tripoli. Int Arch Med Microbiol.2023, 5:019. doi.org/10.23937/2643-4008/1710019

[17] Al-Dujiaily AA *et al*. Urinary tract infection during pregnancy in Tikrit. *Medical Journal of Tikrit*, 2000, 6:220–4.

[18] Al-Haddad AM. Urinary tract infection among pregnant women in Al-Mukalla district, *Yemen. Eastern Mediterranean Health J, 2005*, 11(3):505-511.

[19] Sheikh MA *et al*. Incidence of urinary tract infection during pregnancy. *Eastern Mediterranean health journal*, 2000, 6(2–3):265–71.

[20] Mikhail MS, Anyaegbunam A. Lower urinary tract dysfunction in pregnancy: a review. *Obstet. Gynecol Surv.*1995, 50: 675-683.

[21] Hussein, Tahsein, M., Al-fattah, Munther, N., Thamir, T., Ibrahim, Radhwan, H., & Ibrahim, Radhwan, H. Assessment of Nursing Students' Knowledge toward Preventive Measures of Urinary Tract Infections in Mosul Teaching Hospitals. Medico-Legal Update.2021, 21(1), 1070–1074.

[22] Safa A. Naji and Halah A. Awadh. A Study of Urinary Tract Infections Prevalence, Antibiotics Resistance, and Biofilm Formation Capability of the Bacterial Causal Agents", *Tikrit Journal of Pure Science*, 2022, 27(6), pp. 11–17.

[23] Balachandran L, Jacob L, Al Awadhi R, *et al*. Urinary Tract Infection in Pregnancy and Its Effects on Maternal and Perinatal Outcome: A Retrospective Study. Cureus, 2022, 14(1): e21500. DOI 10.7759/cureus.21500

[24] M. A.Al-Saadi, N. M.Al-Hilli, &N. A.Sheriff, "Association of TLR4 Polymorphisms with Susceptibility to Urinary Tract Infection Caused by Gram Positive Bacteria in Pregnant Women". *Indian Journal of Public Health*, vol.11,pp. (2), 1941,2020.

[25] Abd Al-Amir H Tamarah and Mousa M Hind. Bacterial Infections in Urinary Tract among Pregnant Women in Nassiriyah City, Iraq. *UTsci*, 2023, 10 (1)*: 116-121*.

[26] Lavigne JP, Boutet-Dubois A, Laouini D, Combescure C, Bouziges N, Mares P, and Sotto A. Virulence potential of *E. coli* strains causing asymptomatic bacteriuria during pregnancy. J ClinMicrobiol, 2011. 2011;49(11):3950–3.

[27] Tamalli M., Alghazal M. A., Bioprabhu S. Urinary tract infection during pregnancy at Al-khoms, Libya. *International Journal of Medicine and Medical Sciences*. 2013;3(5):455–459.

[28] Bandyopadhyay, S., Thakur, J. S., Ray P., Kumar, R. High prevalence of bacteriuria in pregnancy and its screening methods in North India. *J Indian Med Assoc;2005,* 103: 259-262, 266.

[29] Tütüncü L, Ardıç N, *et al.* Urinary Tract Infection in Pregnancy. Perinatal J. 2005;13(4):47.