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# Bacterial Urinary Tract Infections Among Pregnant Women in Al-Diwaniyah City: Prevalensi dan Faktor Risiko Placenta Previa pada Wanita yang Melakukan Operasi Caesar

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## Abstract

**General Background** Schiff base ligands are widely studied in coordination chemistry due to their strong chelating ability and structural versatility. **Specific Background** Pyrazolone-derived Schiff bases are of particular interest because they readily form stable complexes with transition metals such as Cu(II) and Co(II). **Knowledge Gap** Despite extensive experimental reports, integrated experimental and theoretical investigations of these complexes remain limited. **Aims** This study aimed to synthesize a new Schiff base ligand and its Cu(II) and Co(II) complexes and to characterize them using spectroscopic, magnetic, and density functional theory methods. **Results** The synthesized complexes were confirmed by FTIR, UV–Vis, magnetic susceptibility, and elemental analysis, while DFT calculations supported the proposed coordination geometry and electronic structure. **Novelty** The study combines experimental characterization with theoretical calculations for newly synthesized complexes based on a pyrazolone Schiff base. **Implications** These findings contribute to a deeper understanding of structure–property relationships in Schiff base metal complexes and support future coordination chemistry research.

**Keywords:** Schiff Base Ligand, Copper Complexes, Cobalt Complexes, Density Functional Theory, Coordination Chemistry

**Key Findings Highlights:**

1. Successful preparation of new transition metal complexes from a pyrazolone-based ligand
2. Consistency between spectroscopic observations and calculated molecular parameters
3. Structural interpretation supported by combined experimental and theoretical analysis

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## Introduction

Preterm birth and low birth weight are among the issues that can result from bacterial (UTIs), which are common during pregnancy. Fever, hazy urine, and painful or frequent urination are some of the symptoms [1]. Since pregnant go through many physiological changes, early evaluation and treatment are critical using antibiotics which are necessary specially for kidney infection (pyelonephritis) [2].

10.7% of maternal fatalities globally during pregnancy which was the estimation of the (WHO) are caused by different illnesses. Recent studies shows that over 28% of these occur in the urinary tract [3]. Asymptomatic bacteriuria considered the predominant factor putting expecting women at risk for cystitis & pyelonephritis. More than 100,000 organisms/mL were taken on a clean catch urinalysis from a patient who is asymptomatic is known as asymptomatic bacteriuria [4]. Pregnancy-related UTI rates have been estimated to be over 25% if asymptomatic bacteriuria is left untreated. the prevalence of bacteriuria without symptoms. is 5% to 6% in women who are not pregnant, which is comparable to the 2% to 10% estimated rates among pregnant women. Parous women and women from lower socioeconomic backgrounds are more likely to have asymptomatic bacteriuria. Asymptomatic bacteriuria is also more common in women who carry sickle cell trait [5,6].

Most prenatal guidelines advise screening for asymptomatic bacteriuria, either in the first or second trimester, due to the high incidence and probable severity of pyelonephritis [7]. The most common method for doing this is a clean catch urine culture. In the past, it was believed that treating UTIs would reduce the clinical infection rate to 3% to 4%. It is interesting to note that more current research shows little proof that treating UTIs lowers the risk of low birth weight and preterm birth. More research is required in this field [1,7].

One to two percent of pregnant women develop cystitis [8]. Additionally, 1% to 2% of pregnant women get pyelonephritis, usually in the second trimester. Serious infections, such as septic shock, are frequently caused by pyelonephritis in pregnant individuals. The majority of prenatal medical hospitalizations are due to it [9]. Pregnancy-related pyelonephritis risk factors include, low socioeconomic position ,obesity, smoking, nulliparity, young age, diabetes and a history of recurrent UTIs [8]. In one study, UTIs accounted for 3.5% of antepartum admissions. Similar to bacteriuria, certain patients may have a history of pyelonephritis, cystitis, or bacteriuria and may be at risk for infection. Up to 25% of instances of pyelonephritis may be bilateral, although it usually affects the right side. Uropathogens which causes UTIs in pregnant patients are also responsible for UTIs in expecting women [9].

The most frequently isolated organism is *Escherichia coli* (*E. coli*)[10]. According to an 18-year retrospective investigation, *E. coli* was the cause of pyelonephritis in pregnant individuals in 60% to 82.5% of cases. Additional bacteria that could be observed include *Proteus* (5%), *Staphylococcus*, *Streptococcus*, *Enterococcus* species, and *Klebsiella pneumonia* (11%). *Gardnerella vaginalis* and Ureaplasma can be isolated, specifically in women who have underlying kidney disease. Group B *Streptococcus* in the 3rd trimester of pregnancy is considered more prevalent than *E.coli* & identified from urine cultures.[11,12].

The current study aims to identify the bacterial isolates causing urinary tract infections in pregnant women in the city of Diwaniyah and to identify some of the factors associated with the infection that increase the severity of the infection. Perhaps this study will contribute to finding appropriate treatments for this problem that is currently worsening among pregnant women.

## Methods

**PatientsandSpecimens:** Data and samples were collected from pregnant women diagnosed with (UTIs) infections by a physician and laboratory at the Maternity and Child Teaching Hospital in Diwaniyah between October 2024 and February 2025. Data collected included patient age, month of pregnancy, presence or absence of symptoms, and whether or not the patient had a history of UTIs before pregnancy. Official consent was obtained from both the hospital and the patients before data collection. Samples included blood and urine, which were immediately transported to the laboratory for testing.

**Isolation of pathogenic bacteria:** Midstream urine samples were taken using a calibrated loop (0.01 ml) and sterile containers in order to make the final diagnosis of a urinary tract infection. The midstream urine sample was cultivated in sterile circumstances at 37 °C on MacConkey agar, Eosin-methylene blue, and blood agar medium. After 18 to 24 hours, samples were deemed positive for urine infection if the number of colonies that had developed was 100,000 CUF/ml or greater. Biochemical assays and differential culture media, including urease, Voges–Proskauer, methyl red (methyl red), triple sugar iron agar, lysine decarboxylase and indole synthesis and motility (sulfide indole motility), were employed to identify the bacterium [13].

**Complete blood count:** complete blood count carried out by RUBY automatic system (USA) to determine Red blood cells (RBCs) and white blood cells (WBCs).

**C-reactive protein (CRP) and Procalcitonintest:** C-REACTIVE PROTEIN TEST kit (USA) and Procalcitonin Kit (pioneer) are a rapid immunochromatographic device for the semi-quantitative detection of CRP and Procalcitonin in whole blood samples.

**Proteinuria test:** Proteinuria is tested by urine dipstick test, which uses a reagent strip impregnated with a pH indicator

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(tetrabromophenol) and a buffer to keep the pH at 3.0. The pH indicator dye changes color as proteins attach to it. The pH of the urine has no bearing on this shift.

**General urine test:** General urine examination preformed by direct test urine on sterile slide under light microscope. Mucous, pus, red blood cells and bacteria used in determine severity of UTIs.

**Severity of UTIs:** Determined by uropathologist doctor who was depended on UTI location and the presence of symptoms in addition to results of general urine examination.

**Statistical analysis:** The data was explained using descriptive analysis. Standard and mean deviation was used to characterize Continuous variables. The categorical variables were described using frequency and percentage. To evaluate the relationship between the variables under study, the chi-square test ($X^2$) was employed. If an estimate's computed P value was less than 5%, it was deemed statistically significant. SPSS was used for all statistical analyses (v.22).

## Results

The current study is a quarterly cross-sectional study that included collecting 170 urine and blood samples from pregnant women suffering from urinary tract infections. The ages of the patients varied between 17 and 46 years, with an average age of 24.88 years. Most of the pregnant women with urinary tract infections were in the age group from 17 to 26 (47%), followed by the age group from 27 to 37 (36%). The fewest infections were among older pregnant women, where the $X^2$ (P value) was equal to 9.15 (0.033), as shown in Table (1).

According to clinical and laboratory examinations, specialist doctors classified the severity of urinary tract infections as shown in Table 2. Most patients suffered from mild and moderate infections at a rate of 42% and 28% respectively, while very severe infections constituted the lowest percentage (10%).

Our study results showed that urinary tract infections clearly increase (P value = 0.037) as pregnancy progresses, with the percentage being 21% in the first trimester, 33% in the second, and 46% in the third, as shown in Figure (1). Furthermore, Figure 2 described that the majority of infections (69%) were recent bacterial infections not present before pregnancy (P value = 0.027).

| Charateria | Patients data |
|---|---|
| Age range (years) | 17 - 46 |
| Age Mean | 24.88 |
| Standard deviation | ± 3.57 |
| Standard error | 0.30 |
| Total number | 140 |
| Age groups (years) | N (%) |
| 17-26 | 66 (47%) |
| 27-37 | 50 (36%) |
| 38-46 | 24 (17%) |
| $X^2$ (P value) | 9. 15 (0.033) |

Table 1. **T able ( 1 ) : A ge d istribution for patients**
Difference at P<0.05

| | Severity of infection | .No | % |
|---|---|---|---|
| + | Mild | 45 | 42% |
| ++ | Moderate | 38 | 28% |
| +++ | Severe | 33 | 20% |
| ++++ | Very severe | 24 | 10% |
| P value | | 0.042 | |
| Total | | | |

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