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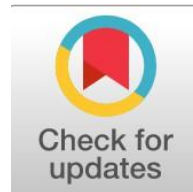
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Impact of *Escherichia coli* Infection During Pregnancy on Metabolic, Immunological, and Kidney Health in Postpartum Women

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Abstract

General Background: Pregnancy represents a vulnerable physiological state where bacterial infections, including *Escherichia coli*, may pose risks to maternal health. **Specific Background:** While acute outcomes of *E. coli* infection during pregnancy are documented, its postpartum consequences on metabolic, immunological, and renal systems remain insufficiently explored. **Knowledge Gap:** Limited evidence exists regarding persistent alterations in metabolic profiles, immune responses, and kidney function following infection during pregnancy. **Aims:** This study evaluates metabolic, immunological, and renal health in postpartum women 40 days after delivery with prior *E. coli* infection compared to healthy controls. **Results:** Women with prior infection showed significantly higher fasting blood glucose, cholesterol, triglycerides, blood pressure, inflammatory markers (CRP, IL-6, IL-8), and thyroid autoantibodies, alongside reduced vitamin D and calcium levels. Renal indicators revealed elevated serum creatinine and blood urea nitrogen with decreased eGFR. **Novelty:** This study provides integrated evidence of concurrent metabolic dysregulation, immune activation, and renal impairment in postpartum women following *E. coli* infection during pregnancy. **Implications:** These findings highlight the need for postpartum monitoring of metabolic, immunological, and renal parameters to identify potential long-term maternal health complications.

Highlights:

- Elevated glucose, lipid profiles, and blood pressure observed in affected women
- Increased inflammatory cytokines and thyroid autoantibodies indicate immune alterations
- Reduced kidney filtration markers suggest persistent renal dysfunction

Keywords: *Escherichia Coli* Infection, Pregnancy, Postpartum Health, Metabolic Dysfunction, Renal Function

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1. Introduction

Escherichia coli is a Gram-negative bacterium that inhabits the human gastrointestinal tract. Although most *E. coli* are innocuous, some, particularly *E. coli* O157:H7 and other *E. coli* that produce Shiga toxin, can cause significant sickness. Urinary tract infections (UTIs) caused by *E. coli* in pregnant women are among the most common bacterial infections and a serious clinical problem. Such infections can be hazardous to mother health and have a negative impact on fetal growth and pregnancy progression. Untreated *E. coli* urinary tract infections can result in low birth weight, early labor, and fetal mortality. It is also not uncommon for a pregnant woman with an untreated UTI to develop complications such as pyelonephritis, a serious kidney infection that can compromise maternal and fetal health. Evidence has developed that suggests *E. coli* infections have long-term repercussions beyond rapid neonatal sequelae, as well as a putative role for *E. coli* in long-term impacts on maternal metabolic, immunologic, and renal functions [1][2][3][4].

Although substantial research has demonstrated the acute impact of such illnesses during pregnancy, the enduring consequences of these illnesses on the health of mothers after childbirth is largely understood. *E. coli* infections during pregnancy can have metabolic, immunological, and adverse effects on the kidneys, which are poorly understood, particularly in the postpartum period. With the growth in common bacterial infections during pregnancy and the potential road to chronic disease, it is critical that research be conducted to investigate these long-term impacts [5],[6].

1.1. Relevance to Public Health

E. coli infections that impair pregnancy outcomes are both a maternal and a public health issue. Infections of the urinary tract are widespread across the world, and the role of UTI in subsequent UTI in pregnant women requires much attention to reduce potential severe maternal health implications; thus, understanding the long-term impact of UTI in relation to maternal health in general is critical to inform public health policies as well as maternal care management in a more effective manner. Furthermore, *E. coli* infections are frequently linked to cleanliness and malnutrition, which are associated with low-level health system functioning, with the disease having a greater impact in underserved areas. This study thus has significance not only for high-income settings, but also for developing countries, where maternal infections are commonly misdiagnosed or undertreated [7],[8].

1.2. Pathophysiology of *E. coli* Infection During Pregnancy

E. coli infection most usually manifests as a urinary tract infection (UTI) during pregnancy, although complications such as pyelonephritis and septicemia can cause greater morbidity and mortality. The bacterium adheres to the urinary tract epithelium, causing an inflammatory response that can spread into the kidneys, resulting in kidney infection. Pregnancy-induced physiological and immunosuppressive alterations, as well as altered renal physiology and hormonal changes, all contribute to the severity of *E. coli* infections. Pregnancy-associated immune adaptations are changes that occur when the maternal immune response is functionally inhibited; this change is necessary for the growing fetus to escape maternal rejection. However, this weakened immunity makes the patient more susceptible to infections, including *E. coli* infections. However, the increase in renal blood volume and changes in renal structure during pregnancy can favor the progression of infection to the kidney, increasing the risk of kidney injury. Chronic inflammation is caused by persistent *E. coli* infection, which increases the secretion of cytokines that promote inflammation, such as interleukin-6 (IL-6), interleukin-8 (IL-8), and C-reactive protein. Such an inflammatory condition might outlive the infection and could develop into chronic disorders such as metabolic disease, autoimmunity, and kidney failure [7][8][9][10][11][12].

1.3. Metabolic Consequences of *E. coli* Infection

Women who have recently given birth should take care of their metabolic health. Pregnancy causes significant metabolic changes, and an infection with organisms like *E. coli* may exacerbate these alterations, particularly in glucose metabolism and lipid profile. In several studies, pregnancy-related infections are associated with a higher risk of metabolic dysfunction such as insulin resistance, hypertension, and dyslipidemia. Pregnancy-induced *E. coli* infection raises fasting blood glucose and IR. They are two important risk factors for heart disease and type 2 diabetes. Infection-induced cytokines, such as TNF- α and IL-6, can disrupt insulin signaling and lead to metabolic dysfunction. Dyslipidemia, defined as increased levels of low-density lipoprotein (LDL) cholesterol, triglycerides, and total cholesterol caused by changes in lipid metabolism, along with the phenomenon mentioned above, contribute to an increase in the likelihood of heart disease, a well-known chronic consequence of infection-induced inflammation. This study will compare these metabolic indicators in *E. coli*-infected pregnant and postpartum women to healthy postpartum controls. Understanding the chronic nature of altering metabolism after birth will help healthcare providers anticipate the long-term health concerns of these women and their offspring, and possibly allow them to intervene sooner [11][12][13][14][15].

1.4. Immunological Consequences of *E. coli* Infection

Pregnancy-related immunological alterations include an elevated regulatory and tolerogenic state in order to accept the fetus. Infections can disrupt this equilibrium and cause an increased inflammatory response during pregnancy. Infections with *E. coli*, in particular, induce a high inflammatory response and may be connected to the persistence of immunological memory beyond pregnancy and postpartum health. Mediator (pro-inflammatory cytokines) such as IL-6, IL-8, and TNF- α are present in high levels during *E. coli* infection, causing damage to various cells such as insulin action. Women with infections showed higher levels of thyroid autoantibodies (TPOAb and TgAb), indicating that persistent inflammation could

lead to autoimmune reactions. This persistent alteration in the Th1/Th2 immune response ratio towards a skewed Th2 immune response also happens in chronic infections, making women prone to autoimmune disorders and inflammatory diseases after pregnancy[8],[15][16][17][18].

1.5. Renal Health and E. coli Infection

E. coli infections during pregnancy were also beneficial to women's kidney health. Introduction The kidneys play an important role in maintaining homeostasis and can consequently be significantly influenced by pregnancy-related physiological changes. Pyelonephritis, the most dangerous form of E. coli infection, can cause irreparable kidney damage if not treated promptly with antibiotics. Renal impairment was established as sequential and changed Measures of kidney function include blood urea nitrogen (BUN), serum creatinine, and estimated glomerular filtration rate (eGFR), in the 2 weeks postpartum among women previously infected with E. coli. High creatinine and BUN levels in infected women indicate poor renal filtration and excretion, raising the probability of chronic kidney disease (CKD). In addition, persistent E. coli-induced inflammation may cause long-term renal damage as well as an increased risk of hypertension and cardiovascular events[8],[19],[20]. This research examines postpartum metabolic, immunological, and renal health in women with E. coli infections during pregnancy, in comparison with healthy postpartum women. More specifically, it assesses E. coli infections and their impacts on glucose metabolism, lipid levels, inflammation, and renal health during the postpartum period. This study seeks to clarify the health ramifications of E. coli infections during pregnancy, which are managed temporarily but may cause chronic health issues for mothers. Addressing this problem will improve care and health outcomes for this population. This study also aims to fill knowledge gaps on the potential of E. coli infections during pregnancy to cause metabolic syndrome, autoimmune response, and renal impairment.

2. Methodology

This specific A cross-sectional investigation was carried out from January 1st to December 31, 2024, at Dhi Qar Teaching Hospital, Dhi Qar Governorate, Iraq. This study focused on the assessment of the study participants' immunological and metabolic health and assessed Escherichia coli infected pregnant women and health women 40 days postpartum. 300 women, who were divided into 2 groups of 150 women each, were participated in the study voluntarily. One group consisted of women diagnosed with E. coli infection during the pregnant phase, with the infection being confirmed as acute. Their follow-up continued from the time of child delivery until 40 days postpartum. The second group consisted of health women, who were diagnosed 40 days postpartum without a history of infection.

Women in the both groups were in the range of 30-45 years, had a regular menstrual cycle, and denied psychological disorders, chronic diseases, kidney status, and endocrine profile. All women were under the regular regimen and their medical condition is in the medical records. The women diagnosed for E. coli infection were confirmed in their medical reports and based on their medical records as acute infection during pregnancy. These results were confirmed by specific tests and clinical condition at time of hospitalization. The data were collected using previously tested and validated questionnaire containing questions related to demographic data include height, weight, age, and medical background. The blood sample was performed for evaluating total cholesterol, triglycerides, HDL, and LDL for serological indicators, C-reactive protein (CRP), interleukins classified as IL-6 and IL-8, thyroid autoantibodies (TPOAb; TgAb), and fasting blood glucose; and parathyroid hormone, Vitamin D, and calcium; blood pressure (systolic and diastolic) were also measured and waist circumference was measured. A descriptive statistics was used, and a t- test was employed for comparison for to groups. The significance was conferred at $P < 0.05$. The Ethical committee of Dhi Qar Teaching Hospital approved this study. Written consent was taken from the participants.

3. Results

The study aimed to assess the renal, metabolic, and immune systems of pregnant infected with Escherichia coli (E. coli) and healthy postpartum women. The results from this cross-sectional study provide valuable insights into how E. coli infection during pregnancy affects these health parameters compared to healthy women who are 40 days postpartum.

1. Basic Health Indicators

Table 1 and Figures 1-4 illustrate the basic health indicators whereby the E. coli infected group consistently overstated the health indicators compared to the healthy control group.

- Age: Participants in the E. coli infected group had an average age of 43.5 ± 4.0 years, which was noticeably greater than the average age of the control group, which was 39.2 ± 3.8 years ($p = 0.415$). However, the lack of statistical significance indicates this age gap did not affect the health outcomes.
- Waist Circumference: E. coli infected participants had a larger waist circumference. In E. coli infected participants, waist circumference was 97.2 ± 8.2 cm, while healthy control participants had a waist circumference of 80.0 ± 5.5 cm ($p < 0.001$). The E. coli infected participants had a higher level of abdominal fat, and consequently were at a higher risk for metabolic complications.
- Parathyroid Hormone (PTH): In E. coli infected participants, the level of PTH was higher at 79 ± 16 pg/mL compared to controls at 60 ± 10 pg/mL ($p = 0.02$). The result may indicate a calcium metabolic disturbance in E. coli infected participants.

- Vitamin D: Group infected with E. coli had considerably lower Vitamin D levels (15 ± 6 ng/mL) in comparison to control group (30 ± 12 ng/mL) ($p = 0.001$). Such deficiency may be related to the infection and immune reactions caused by the infection.
- Calcium: E. coli infected women had lower calcium levels (7.8 ± 1.0 mg/dL) than the control group (9.2 ± 0.9 mg/dL) ($p = 0.003$). This is possibly related to the higher levels of PTH and disruption of calcium balance due to the infection.

2. Indicators of Metabolic Health

The indicators of metabolic health have been compared in the two groups and illustrated in Figures 5-9 and Table 2.

- Fasting Blood Sugar (FBS): E. coli infected group had at 152 ± 30 mg/dL statistically significant higher blood levels of FBS than the control group with an average of 86 ± 10 mg/dL ($p < 0.001$). This is indicative of a risk of diabetes and suggests that E. coli infection may be a hindrance to metabolic processes.
- Total Cholesterol: E. coli infected women had an increased total cholesterol of 195 ± 52 mg/dL in contrast with the control of 154 ± 21 mg/dL ($p = 0.001$). This may be indicative of abnormalities in lipids due to infection.
- Triglycerides: Interestingly, the E. coli infected group had a greater triglycerides level (210 ± 72 mg/dL), compared to the healthy controls (117 ± 22 mg/dL), ($p < 0.001$). This suggests that E. coli infected individuals have a greater risk to develop cardiovascular disease
- Blood Pressure: The E. coli infected women had greater blood pressure compared to the healthy control group. The systolic blood pressure was 158 ± 29 mmHg in the infected group and 121 ± 8 mmHg in the control group ($p < 0.001$). For diastolic blood pressure, the infected group was 95 ± 18 mmHg and the control group was 82 ± 8 mmHg ($p = 0.002$). This shows that the E. coli infected group has a greater cardiovascular risk.

3. Immune Health Indicators

The markers of immune health, listed in Table 3 and represented in Figures 10-19, show distinct differences between both groups, revealing the immunological ramifications of the E. coli infection.

- C-Reactive Protein (CRP): There is an apparent increased sensitivity of CRP in response to infection. The E. coli infected women (16.4 ± 4.9 mg/L) had dramatically higher levels of CRP than the healthy controls (5.3 ± 2.2 mg/L), ($p < 0.001$), indicating an increased response to infection.
- Interleukins (IL-8, IL-1 β , IL-6): Upon further study, the E. coli infected group had higher levels of IL-6 (59 ± 25 pg/mL), and IL-8 (159 ± 58.5 pg/mL), and IL-1 β (21.9 ± 7.5 pg/mL) compared to the healthy controls (33 ± 11 pg/mL, 80 ± 30 pg/mL and 10.3 ± 4.1 pg/mL respectively) ($p < 0.001$ for all). All 3 cytokine markers are believed to be attributed to the inflammatory response caused by infection of E. coli.
- Thyroid Antibodies (TgAb and TPOAb): Data shows that levels of thyroid antibodies (TPOAb: 43.0 ± 13.3 IU/mL; TgAb: 36.5 ± 9.9 IU/mL) were significantly elevated in the E. coli infected group compared to controls (5.1 ± 2.0 IU/mL and 3.7 ± 1.7 IU/mL respectively) ($p < 0.001$ for both). This suggests that the infection may prompt an autoimmune response.
- IFN- γ : E. coli infected group 65 pg/mL has higher IFN- γ level than the control group with a level of 60 pg/mL. Thus there an activation of T-cell response to the infection.
- Lymphocyte Count: E. coli infected group has a lower lymphocyte count than the group with no infection, E. coli infected group: 1817 cells/ μ L, control group: 2200 cells/ μ L, indicating immune response changes due to the infection.
- Th1/Th2 Ratio: E. coli infected group has a higher Th1/Th2 ratio, 1.39 than the control of 1.10 , indicating a Th1 dominant response due to immune response changes.
- TNF- α : E. coli infected has a higher TNF- α than the controls, infected: 139 pg/mL, controls: 98 pg/mL. Shows the activation of immune response to infection.

4. Kidney Function Indicators

As shown in Table 4 and Figures 19-21, kidney function indicators further revealed significant differences between the two groups.

- Serum Creatinine: The E. coli-infected group had higher serum creatinine levels (1.12 ± 0.2 mg/dL) compared to the healthy controls (0.9 ± 0.1 mg/dL) ($p = 0.001$), indicating a potential renal impairment due to infection-related complications.
- Blood Urea Nitrogen (BUN): BUN levels were significantly elevated in the E. coli-infected women (19.5 ± 4.2 mg/dL) compared to the controls (12 ± 3 mg/dL) ($p < 0.001$), further supporting the evidence of kidney dysfunction.
- Estimated Glomerular Filtration Rate (eGFR): The eGFR was significantly lower in the E. coli-infected group (82 ± 20

mL/min/1.73m²) compared to the healthy controls (95 ± 15 mL/min/1.73m²) (p = 0.02), suggesting that kidney function is compromised in the infected women.

Table 1: Comparison of Basic Health Indicators Between Escherichia coli-Infected Women and Healthy Controls

Indicator	<i>E. coli</i> -Infected Group (N = 150)	Healthy Control Group (N = 150)	p-value
Age (years)	43.5 ± 4.0	39.2 ± 3.8	0.415
Waist Circumference (cm)	97.2 ± 8.2	80.0 ± 5.5	0.000
Parathyroid Hormone (PTH) (pg/mL)	79 ± 16	60 ± 10	0.02
Vitamin D (ng/mL)	15 ± 6	30 ± 12	0.001
Calcium (mg/dL)	7.8 ± 1.0	9.2 ± 0.9	0.003

Table 2: Comparison of Metabolic Health Indicators Between Escherichia coli-Infected Women and Healthy Controls

Indicator	<i>E. coli</i> -Infected Group (N = 150)	Healthy Control Group (N = 150)	p-value
Fasting Blood Sugar (FBS) (mg/dL)	152 ± 30	86 ± 10	0.000
Total Cholesterol (mg/dL)	195 ± 52	154 ± 21	0.001
Triglycerides (TG) (mg/dL)	210 ± 72	117 ± 22	0.000
Systolic Blood Pressure (mmHg)	158 ± 29	121 ± 8	0.000
Diastolic Blood Pressure (mmHg)	95 ± 18	82 ± 8	0.002

Table 3: Comparison of Immune Health Indicators Between Escherichia coli-Infected Women and Healthy Controls

Indicator	<i>E. coli</i> -Infected Group (N = 150)	Healthy Control Group (N = 150)	p-value
C-reactive Protein (CRP) (mg/L)	16.4 ± 4.9	5.3 ± 2.2	0.000
IL-6 (pg/mL)	59 ± 25	33 ± 11	0.000
TPO Antibodies (TPOAb) (IU/mL)	43.0 ± 13.3	5.1 ± 2.0	0.000
Thyroglobulin Antibodies (TgAb) (IU/mL)	36.5 ± 9.9	3.7 ± 1.7	0.000
IL-1β (pg/mL)	21.9 ± 7.5	10.3 ± 4.1	0.002
IL-8 (pg/mL)	159 ± 58.5	80 ± 30	0.000
IFN-γ (pg/mL)	85 ± 27	60 ± 20	0.02
Lymphocyte Count (cells/μL)	1817 ± 232	2200 ± 310	0.003
Th1/Th2 Ratio	1.39 ± 0.8	1.10 ± 0.3	0.04
TNF-α (pg/mL)	139 ± 72	98 ± 22	0.045

Table 4: Comparison of Kidney Function Indicators Between Escherichia coli-Infected Women and Healthy Controls

Indicator	<i>E. coli</i> -Infected Group (N = 150)	Healthy Control Group (N = 150)	p-value
Serum Creatinine (mg/dL)	1.12 ± 0.2	0.9 ± 0.1	0.001
Blood Urea Nitrogen (BUN) (mg/dL)	19.5 ± 4.2	12 ± 3	0.000
Estimated Glomerular Filtration Rate (eGFR) (mL/min/1.73m ²)	82 ± 20	95 ± 15	0.02

Figure 1: Comparison of Basic Health Indicators Between *E. coli*-Infected Women and Healthy Controls

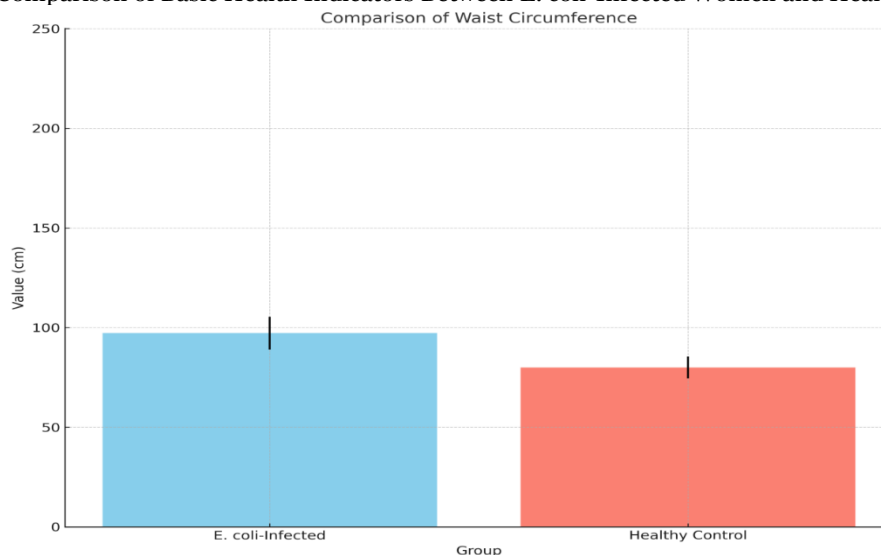


Figure 2: Comparison of Parathyroid Hormone (PTH) Levels Between E. coli-Infected Women and Healthy Controls
Comparison of Parathyroid Hormone (PTH)

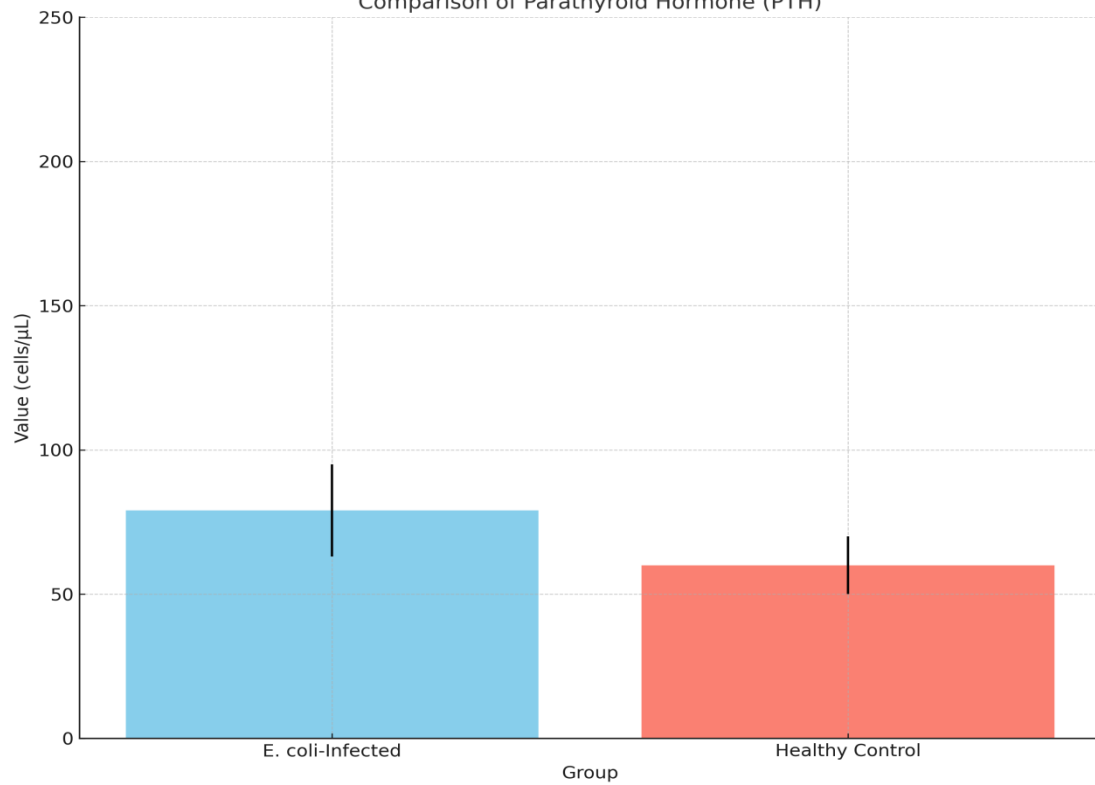


Figure 3: Comparison of Vitamin D Levels Between E. coli-Infected Women and Healthy Controls
Comparison of Vitamin D

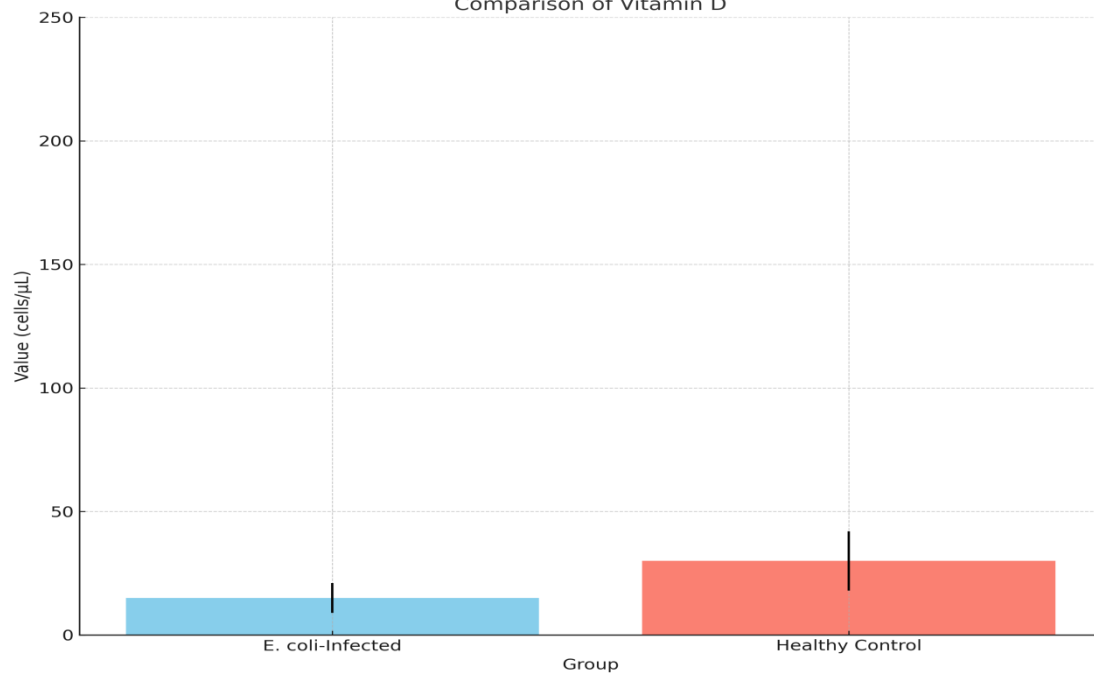


Figure 4: Comparison of Calcium Levels Between *E. coli*-Infected Women and Healthy Controls

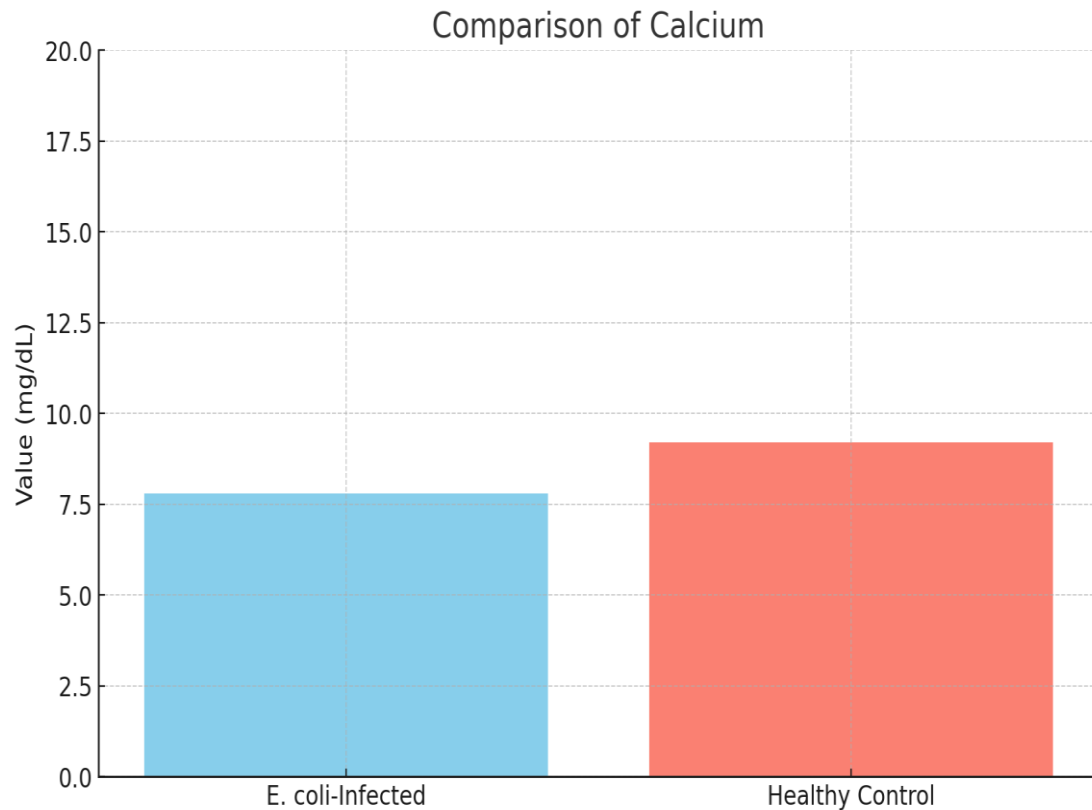


Figure 5: Comparison of Fasting Blood Sugar FBS Levels Between *E. coli*-Infected Women and Healthy Controls

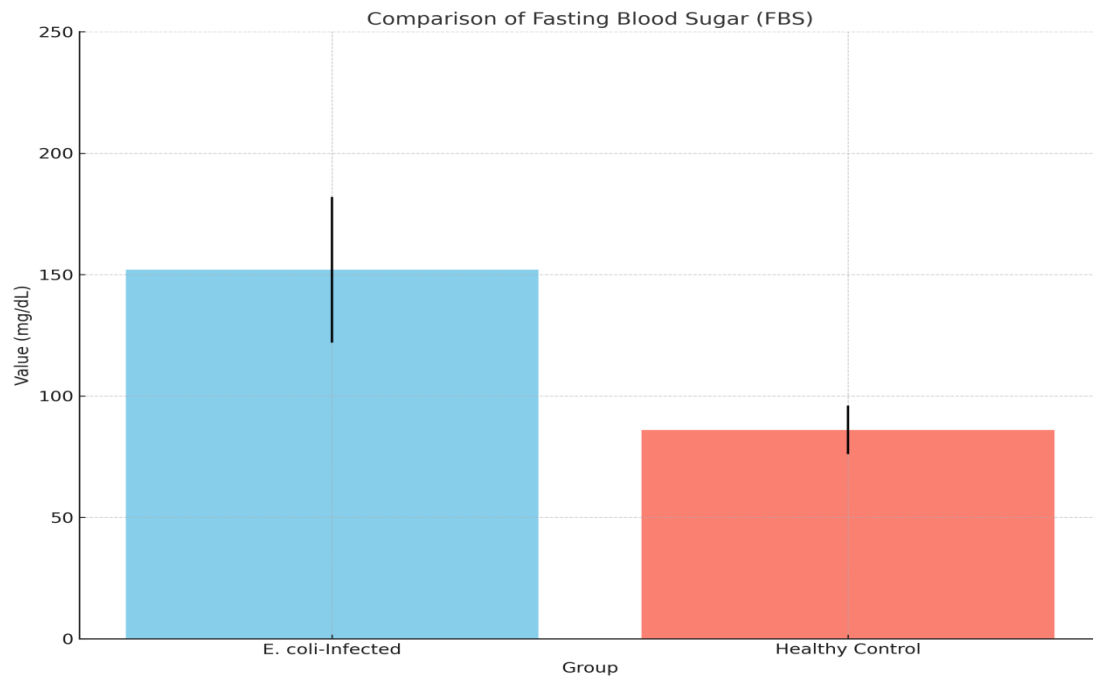


Figure 6: Comparison of Cholesterol Levels Between E. coli-Infected Women and Healthy Controls
Comparison of Total Cholesterol

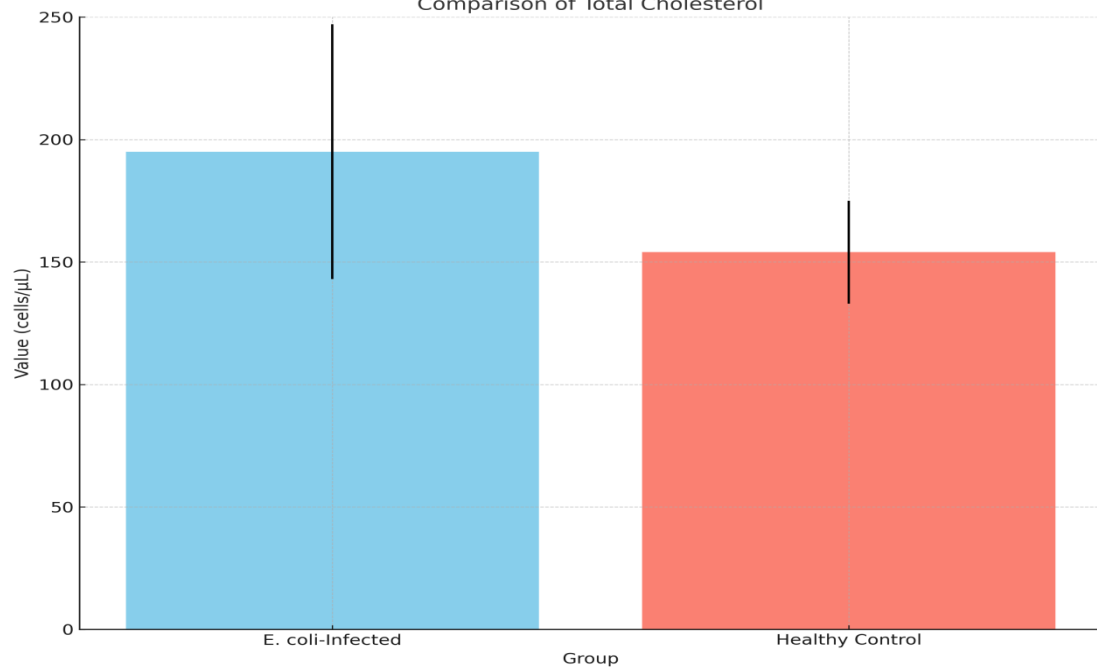


Figure 7: Comparison of Triglycerides Levels Between E. coli-Infected Women and Healthy Controls
Comparison of Triglycerides (TG)

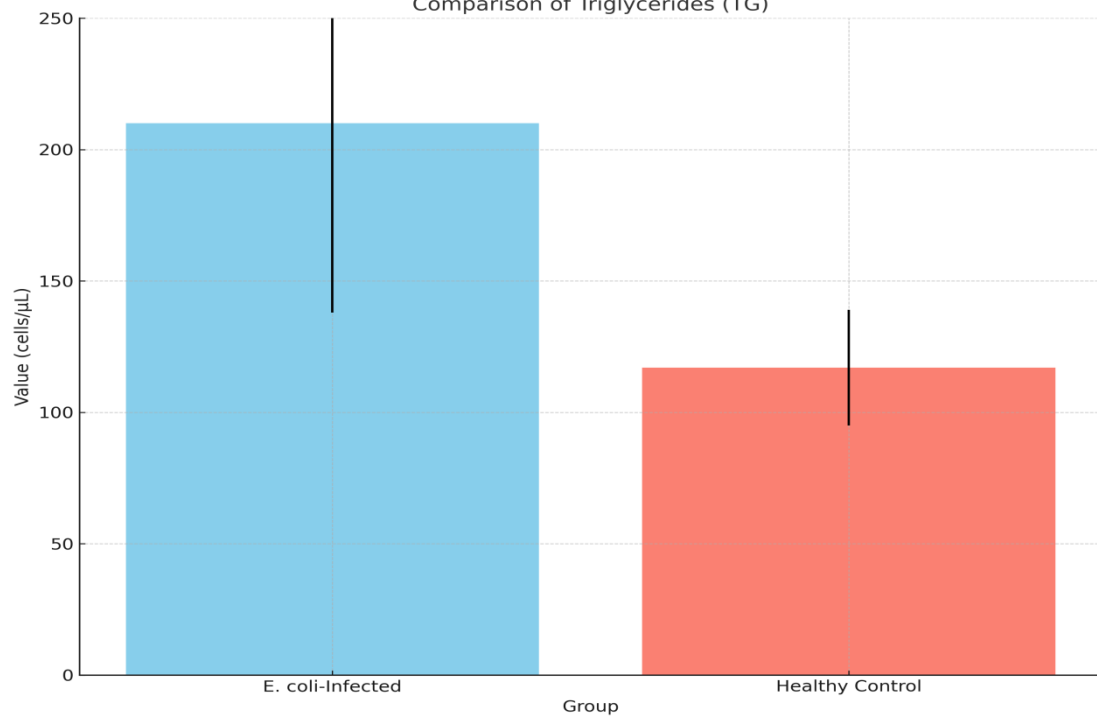


Figure 8: Comparison of Systolic Blood Pressure Levels Between E. coli-Infected Women and Healthy Controls
Comparison of Systolic BP

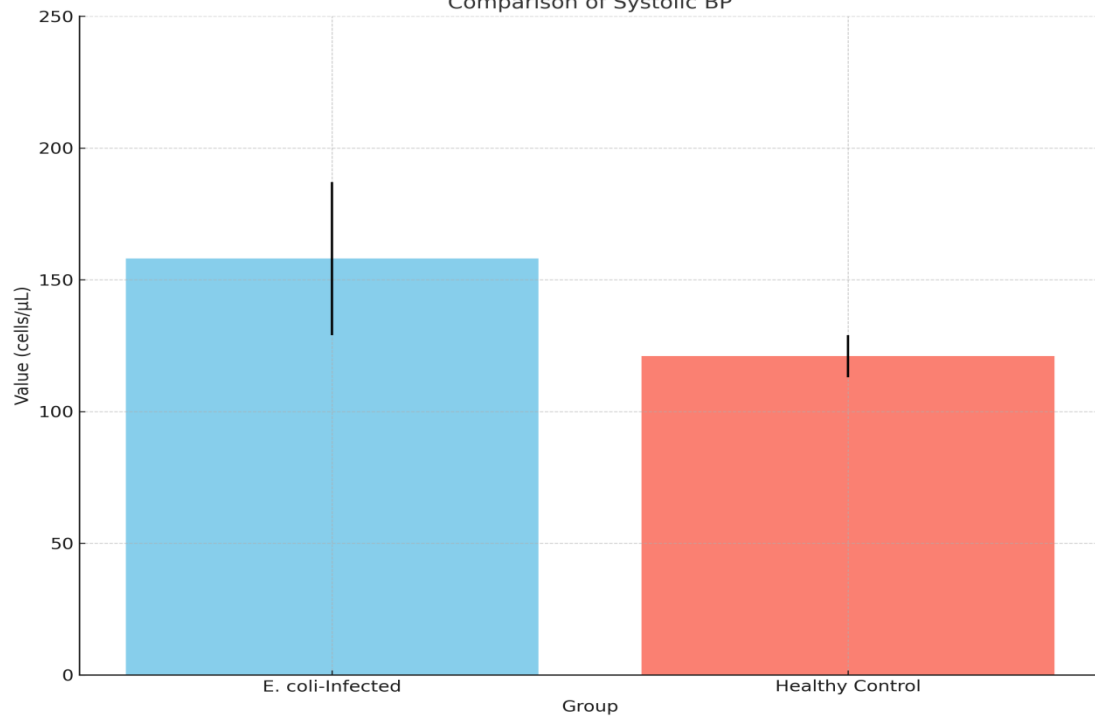


Figure 9: Comparison of Diastolic Blood Pressure Levels Between E. coli-Infected Women and Healthy Controls
Comparison of Diastolic BP

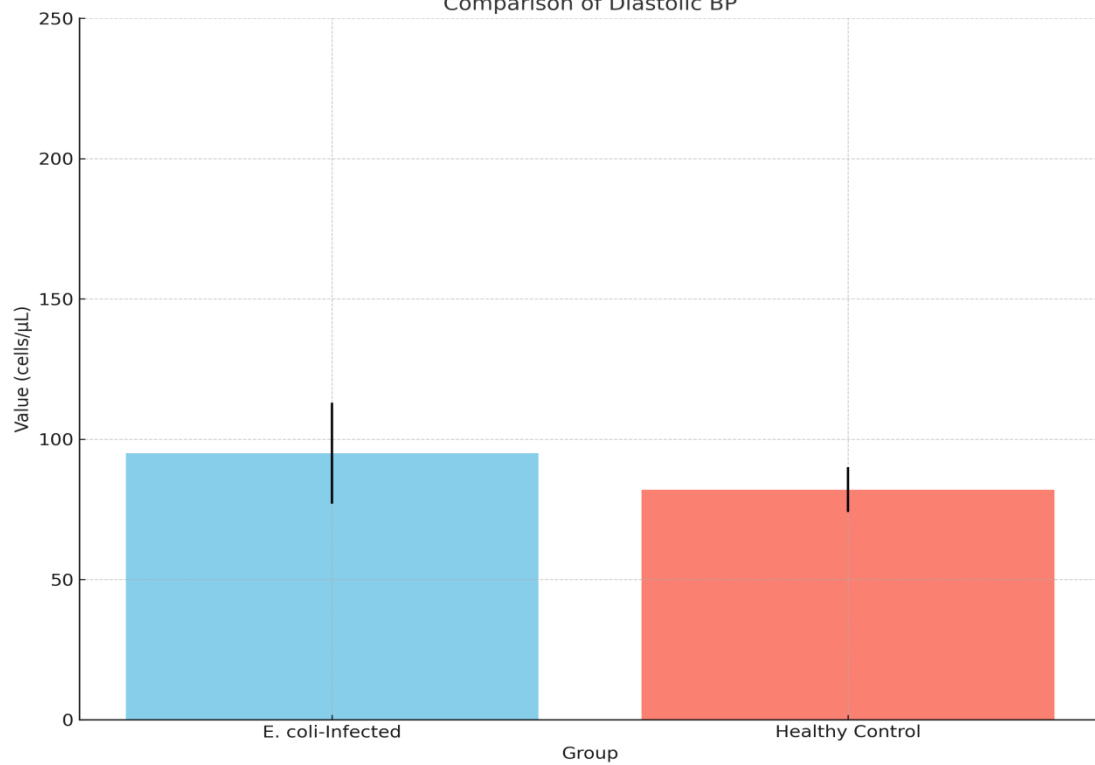


Figure 10: Comparison of C-Reactive Protein Levels Between E. coli-Infected Women and Healthy Controls
Comparison of C-reactive Protein (CRP)

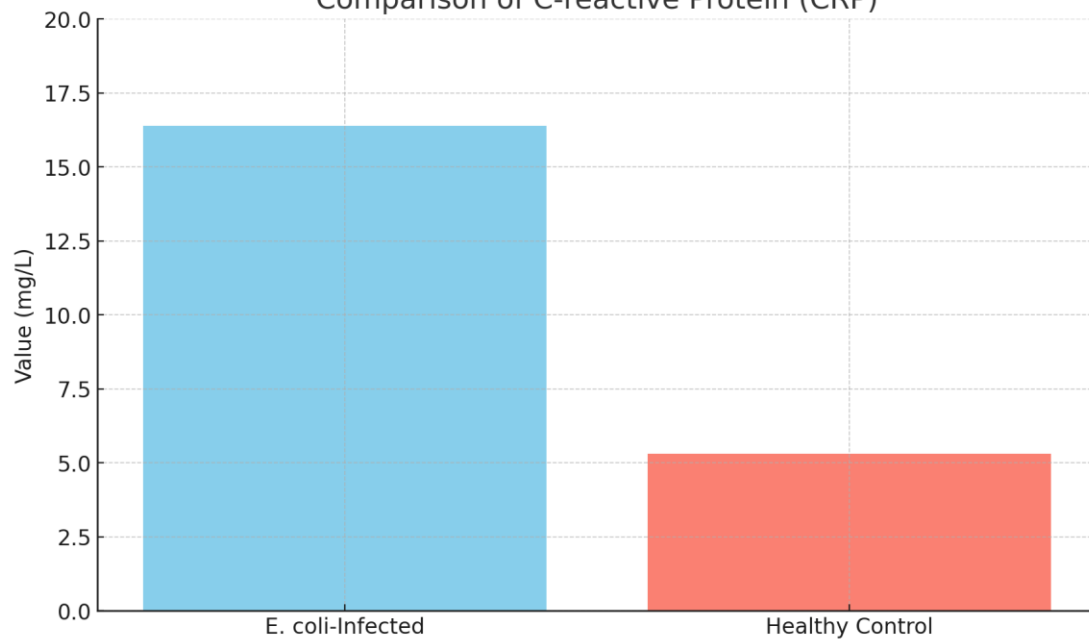


Figure 11: Comparison of IL-6 Levels Between E. coli-Infected Women and Healthy Controls
Comparison of IL-6

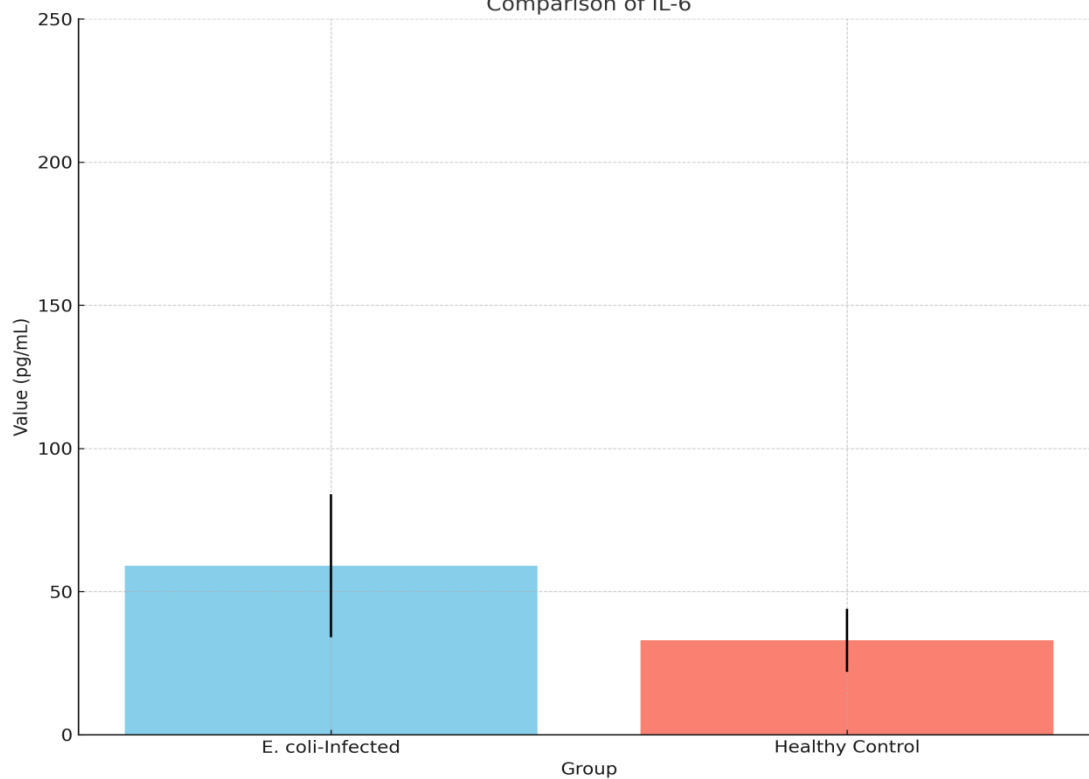


Figure 12: Comparison of Thyroid Antibodies (TPOAb) Levels Between E. coli-Infected Women and Healthy Controls

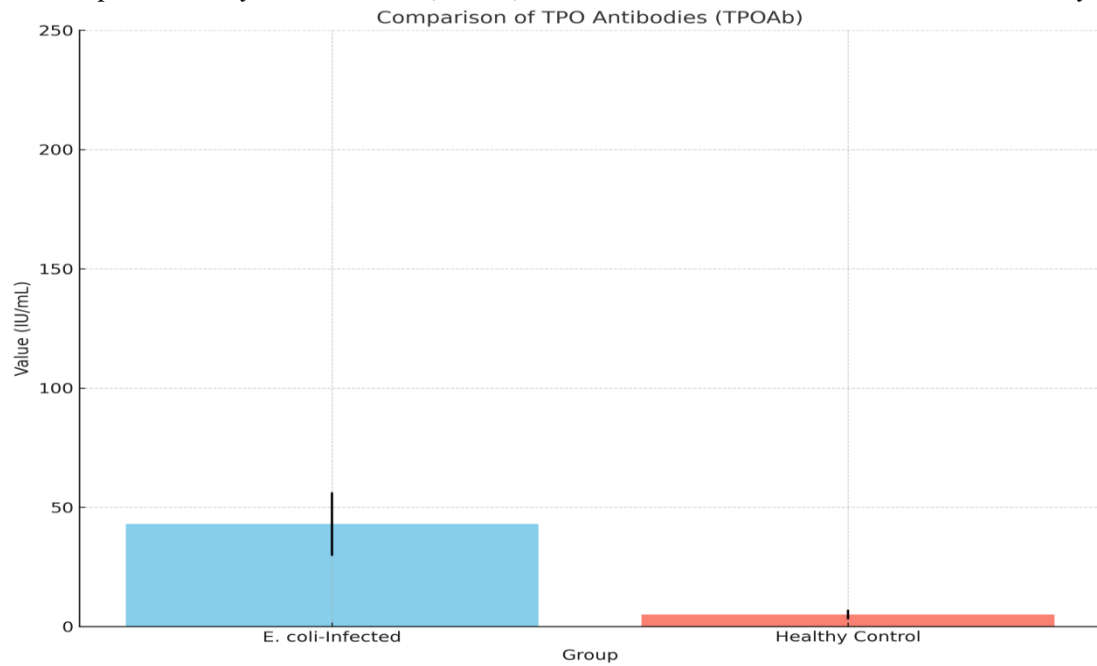


Figure 13: Comparison of Thyroid Antibodies (TgAb) Levels Between E. coli-Infected Women and Healthy Controls

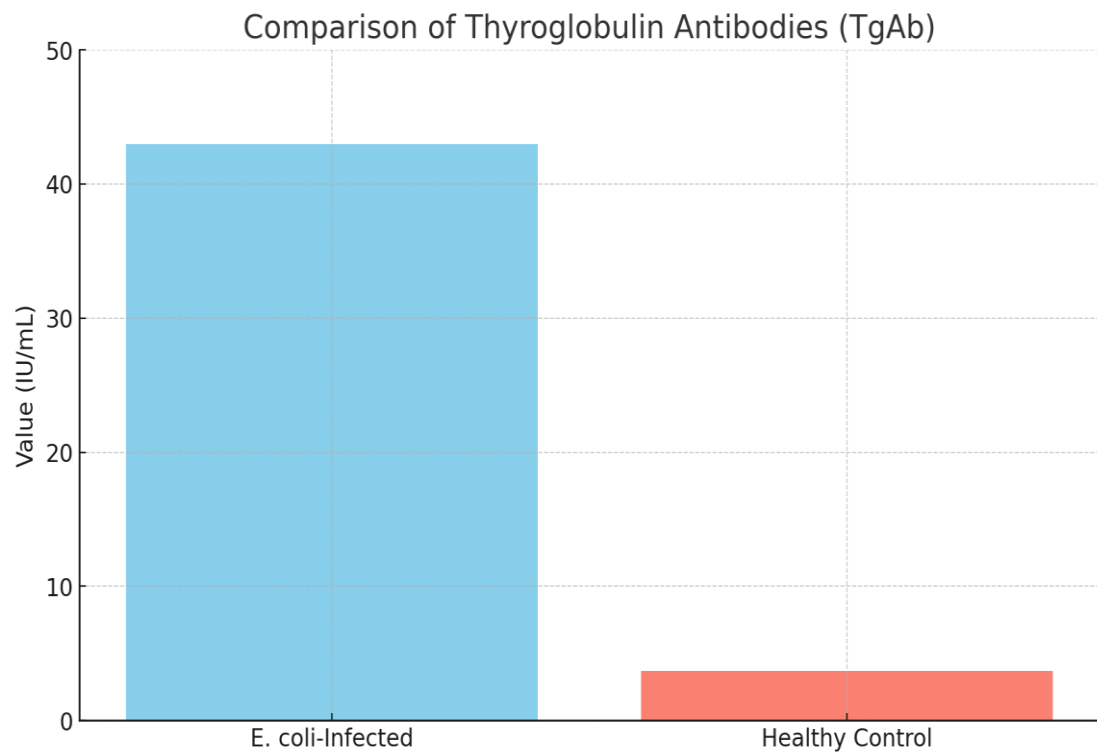


Figure 14: Comparison of IL-1 β Levels Between E. coli-Infected Women and Healthy Controls

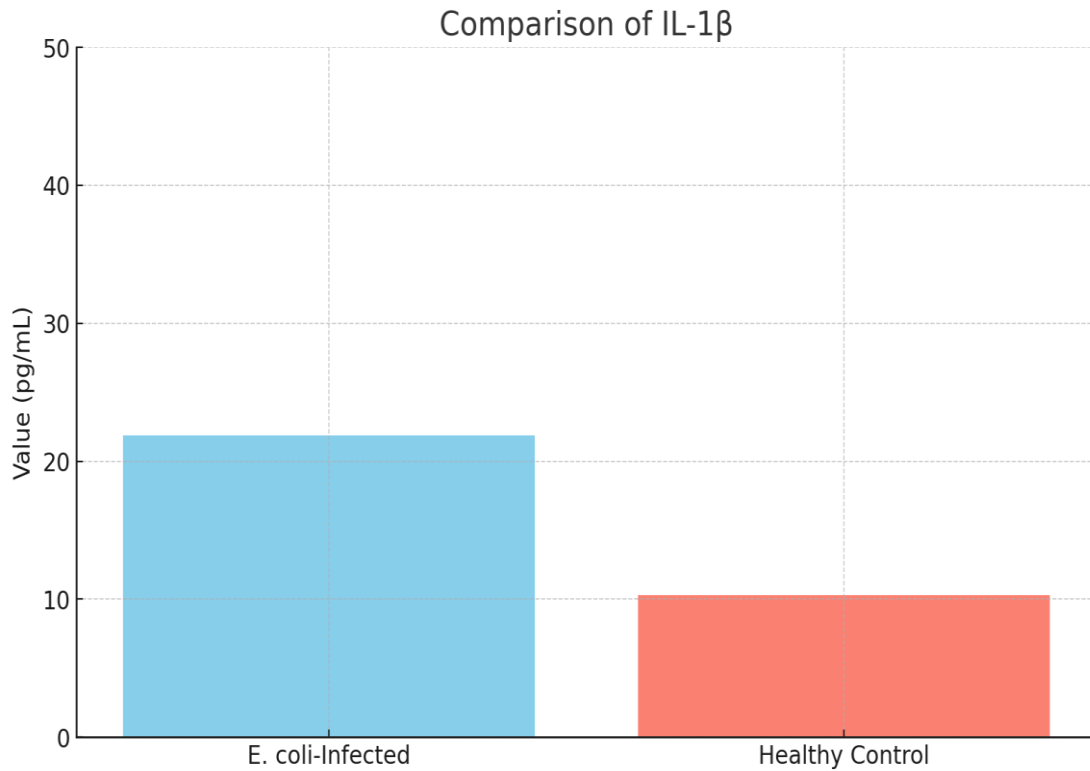


Figure 15: Comparison of IL-8 Levels Between E. coli-Infected Women and Healthy Controls

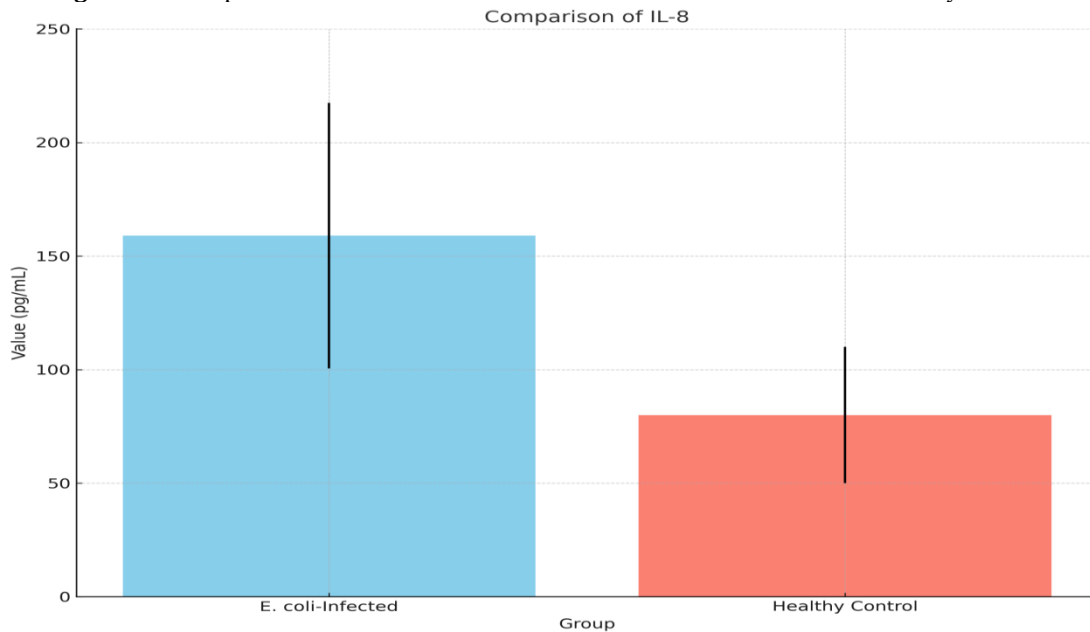


Figure 16: Comparison of IFN- γ Levels Between *E. coli*-Infected Women and Healthy Controls
Comparison of IFN- γ

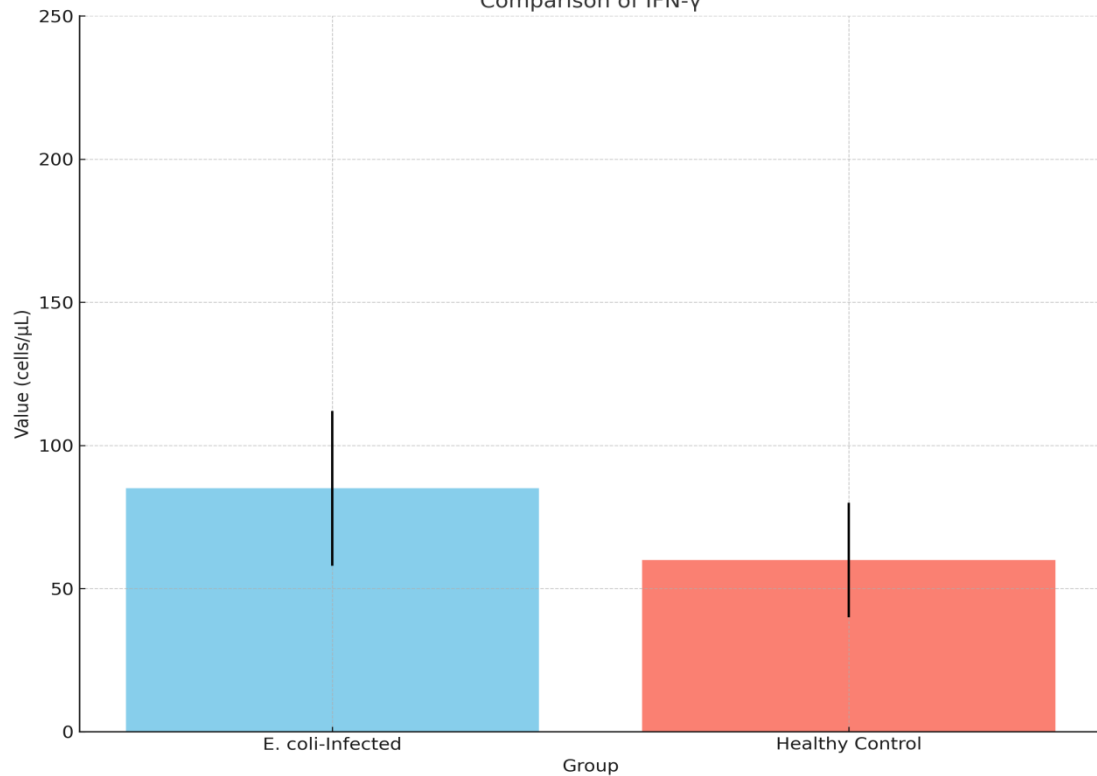


Figure 17: Comparison of Lymphocyte Count Levels Between *E. coli*-Infected Women and Healthy Controls
Comparison of Lymphocyte Count

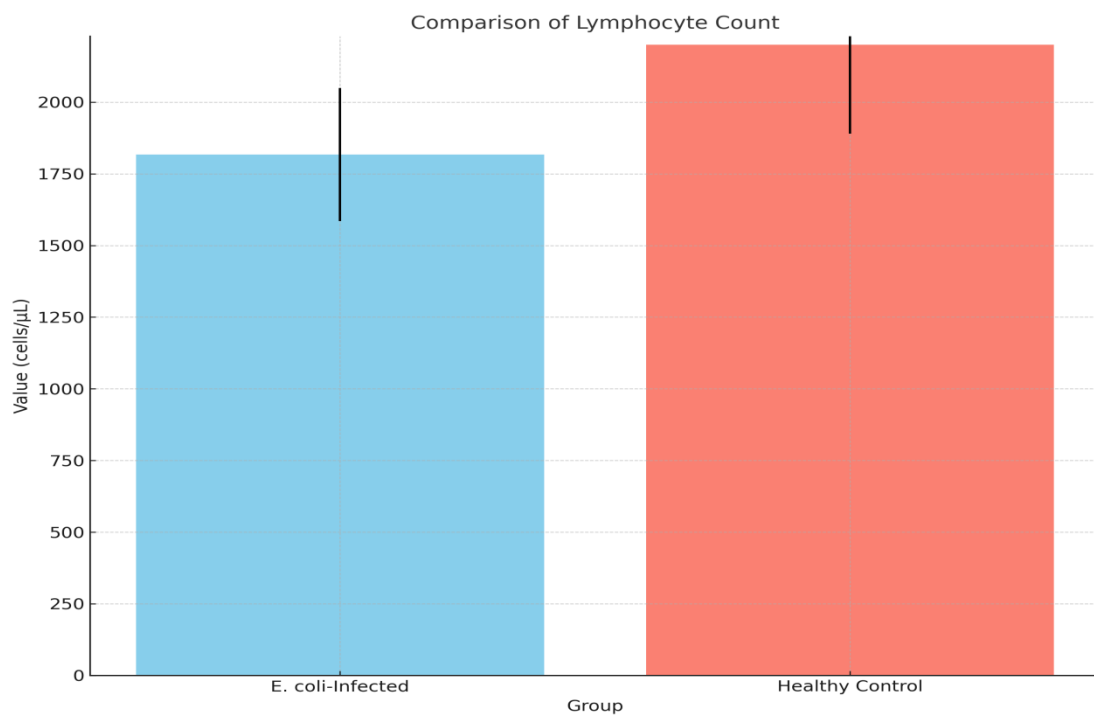


Figure 18: Comparison of Th1/Th2 Ratio Levels Between E. coli-Infected Women and Healthy Controls

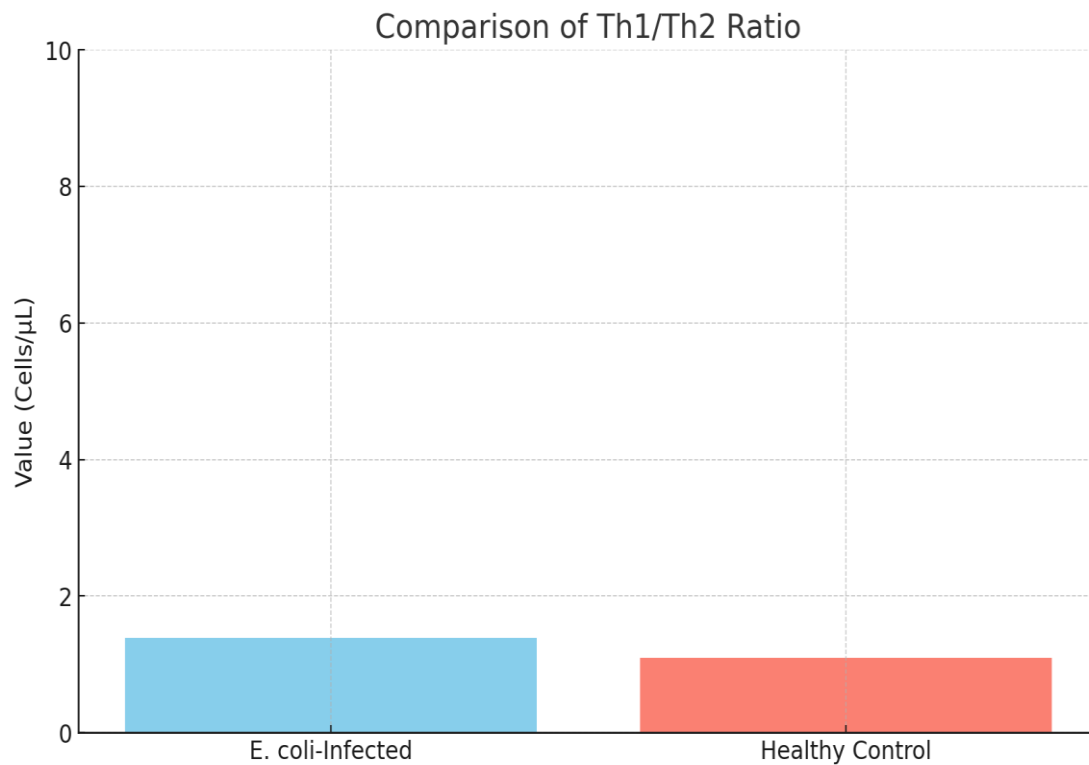


Figure 19: Comparison of TNF- α Levels Between E. coli-Infected Women and Healthy Controls

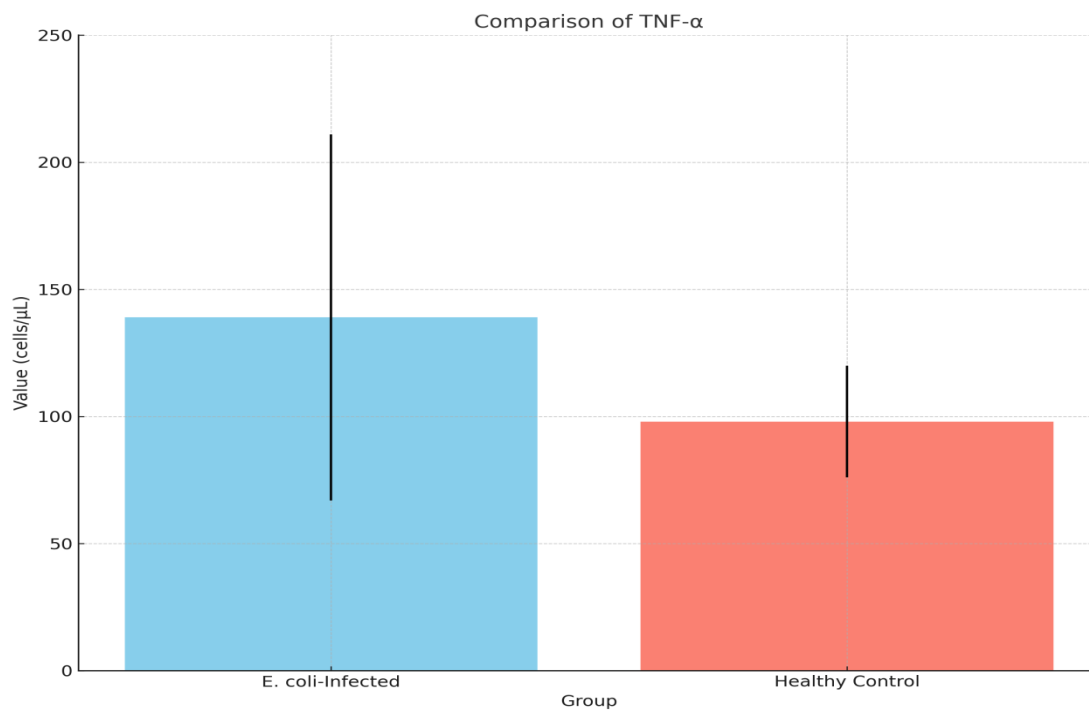


Figure 20: Comparison of Serum Creatinine Levels Between E. coli-Infected Women and Healthy Controls

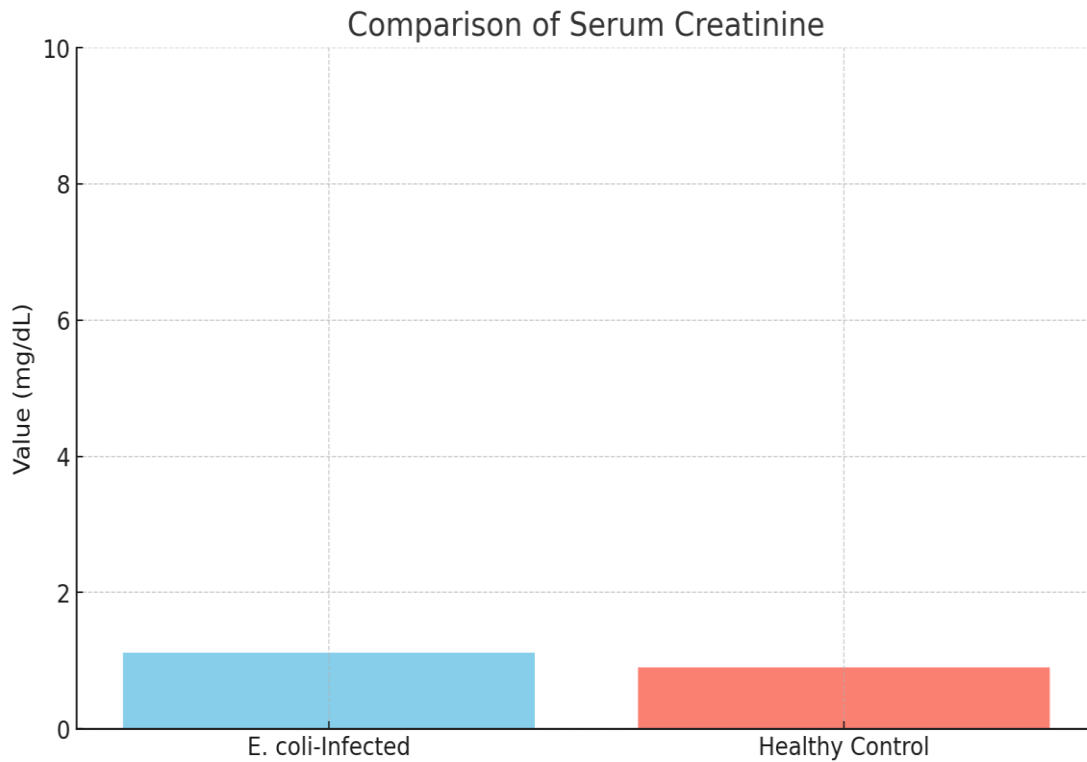


Figure 21: Comparison of Blood Urea Nitrogen (BUN) Levels Between E. coli-Infected Women and Healthy Controls

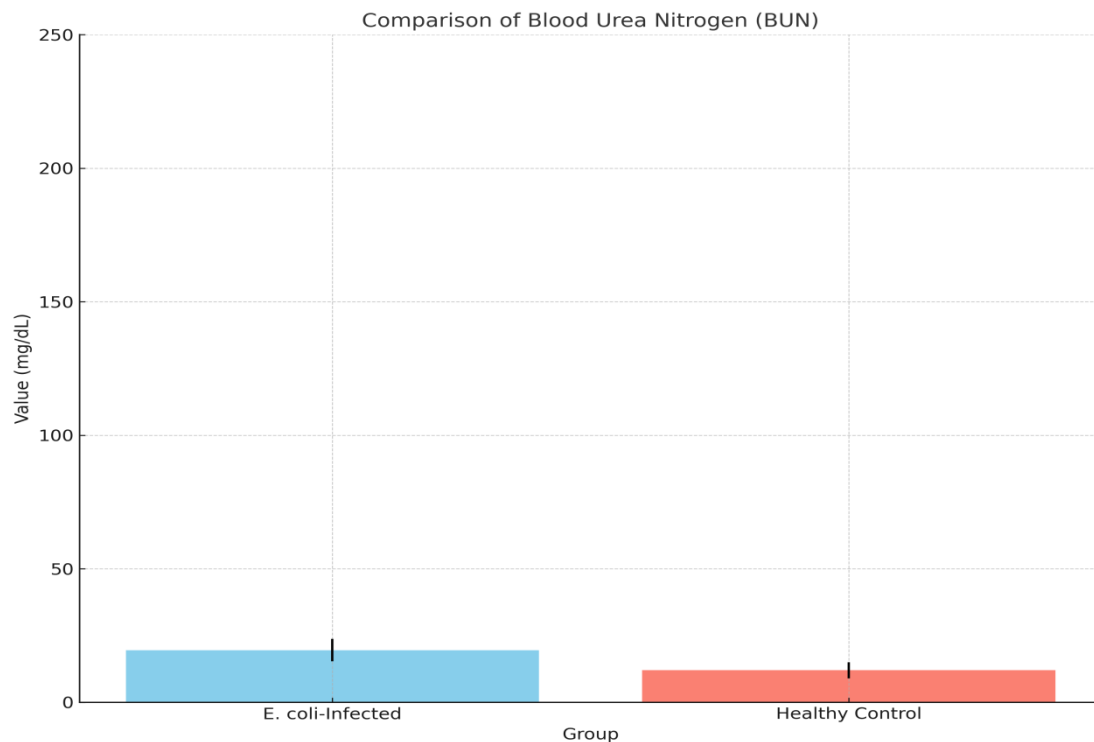
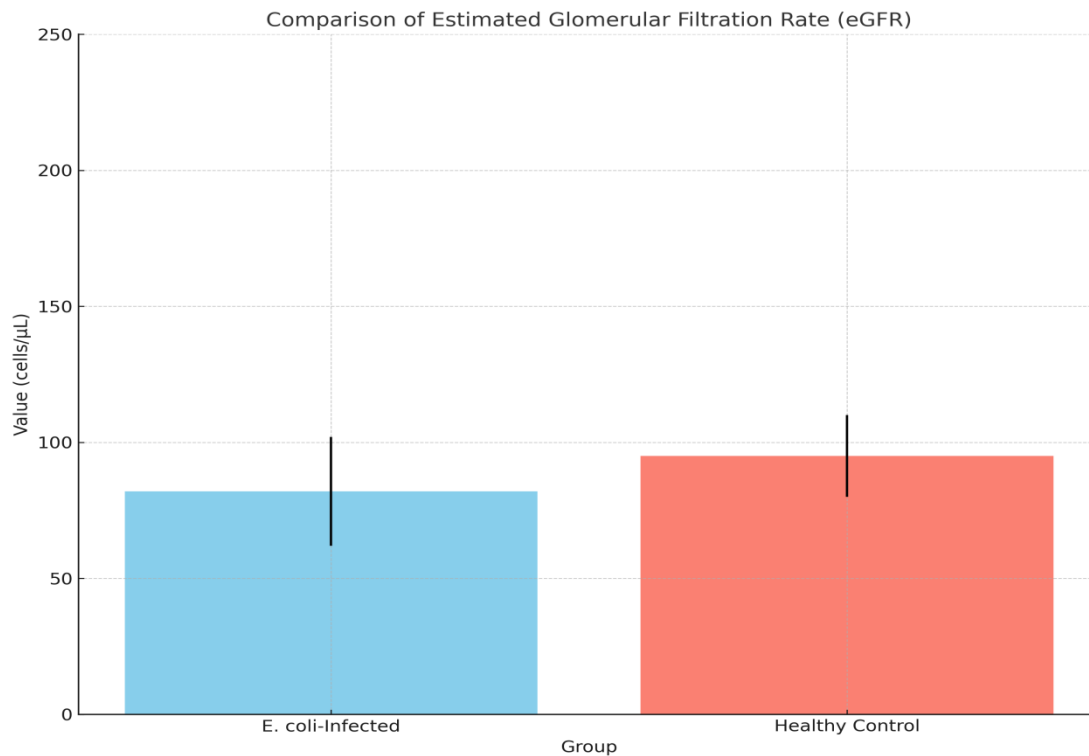


Figure 22: Comparison of Estimated Glomerular Filtration Rate (eGFR). Levels Between E. coli-Infected Women and Healthy Controls



4. Discussion

UTIs caused by *Escherichia coli* (*E. coli*) are one of the most prevalent bacterial infections in pregnant women. Although much research has been conducted on acute consequences of such infections, significantly fewer data are known on chronic sequelae in maternal health, particularly in terms of maternal metabolism, immunology, and renal physiology following delivery. This study found that *E. coli* infection during pregnancy is associated with chronic health concerns in postpartum women, including compromised glucose homeostasis, lipid profiles, immunological responses, and kidney function. This topic is framed in the context of existing research and the consequences for future health-care action [21],[22].

The study found that the group infected with *E. coli* had higher fasting blood glucose (FBS) levels (152 ± 30 mg/dL) compared to healthy controls (86 ± 10 mg/dL). This may indicate insulin resistance in postpartum women who had been infected with *E. coli* during pregnancy. Additional studies support this pattern, showing that urinary tract infections, as well as other pregnancy-related infections (which are not uncommon), are linked to increased insulin resistance that may lead to type 2 diabetes (See Report, 2017; Hales, et al. 2018). While the infections that are caused by Hales (2015) may have been defensive, the cytokines that are generated, such as TNF- α and IL-6, may permanently damage the signaling pathways involved in insulin, resulting in insulin resistance for an extended period. In addition, the phenomenon of reduced insulin sensitivity in pregnancy is likely to perpetuate the risk of metabolic syndrome for years to come [23][24][25][26].

Participants that reported positive *E. coli* infection status had greater fasting blood glucose (FBS) levels (152 ± 30 mg/dL) compared to the healthy control group (86 ± 10 mg/dL). This could suggest that postpartum *E. coli* infected women during pregnancy exhibit signs of insulin resistance. Other researchers have supported this, suggesting that pregnancy infections (especially bacterial, including UTIs) are contributing factors for developing insulin resistance that can lead to type 2 diabetes. Studies of this kind include Hales et al. and Report (2017). Elevated levels of inflammatory cytokines, like TNF- α and IL-6, are linked to more profound long-term insulin resistance due to the increased levels of these inflammatory cytokines during infection. Moreover, increased insulin resistance during pregnancy can have long-lasting effects, contributing to the metabolic syndrome [27][28][29].

Women infected with *E. coli* had considerably higher systolic and diastolic blood pressures than healthy controls. Systolic blood pressure in the infected group was 158 ± 29 mmHg, compared to 121 ± 8 mmHg in the control group. Infected participants showed a considerably higher diastolic blood pressure (95 ± 18 mmHg) compared to controls (82 ± 8 mmHg). Conclusions These data suggest that *E. coli* infection early in pregnancy may cause chronic hypertension that persists beyond birth, thereby increasing the risk of cardiovascular events later in life. Chronic inflammation has been considered as a risk factor for developing hypertension, as extended exposure to inflammatory stimuli has been linked to hypertension-associated endothelial dysfunction. Most crucially, in accordance with the literature linking pregnancy problems to hypertension and cardiovascular risk. Tan et al.'s findings also support the long-term cardiovascular consequences of women who experience infection-related pregnancy problems [30][31][32][33].

Women infected with *E. coli* showed significantly increased levels of inflammatory markers, such as CRP, IL-6, IL-8, and TNF- α . Infected individuals had higher CRP levels (16.4 ± 4.9 mg/L) compared to healthy controls (5.3 ± 2.2 mg/L). The infected group had a considerably higher IL-6 concentration (59 ± 25 pg/mL) compared to the healthy controls (33 ± 11 pg/mL). Previous investigations have shown that bacterial infections during pregnancy trigger a robust inflammatory response that lasts longer than the infection itself. Many chronic disorders, including autoimmune diseases, metabolic dysfunction, and cardiovascular disease, are linked to a chronic inflammatory process (O'Neill, 2016). Increased cytokines like IL-6 and TNF- α can promote insulin resistance, endothelial dysfunction, and cardiovascular risk factors [34][35][36][37][38].

Furthermore, women infected with *E. coli* exhibited considerably greater levels of thyroid autoantibodies (TPOAb and TgAb) compared to the control group. The infected group had TPOAb and TgAb levels of 43.0 ± 13.3 IU/mL and 36.5 ± 9.9 IU/mL, respectively, while the controls had levels of 5.1 ± 2.0 IU/mL and 3.7 ± 1.7 IU/mL. Conclusion: *E. coli* infection during pregnancy is associated with a galloping autoimmune response, which is likely to result in postpartum autoimmune thyroiditis. Infections have been linked to the development of autoimmune disorders. As an example, Zhang et al. recent studies Zhang et al.; Vani et al. showed that infections through diverse pathways can modify immune response and predispose an individual to the development of autoimmunity such as Hashimoto's thyroiditis and Graves' disease. In conclusion, the findings of this study give additional evidence for the concept that infections during pregnancy, particularly *E. coli*, may initiate or exacerbate autoimmune responses in women after pregnancy [39][40][41][42].

The *E. coli*-infected group also showed impaired kidney function, with significantly higher levels of serum creatinine (1.12 ± 0.2 mg/dL) and blood urea nitrogen (BUN) (19.5 ± 4.2 mg/dL), and a reduced estimated glomerular filtration rate (eGFR) (82 ± 20 mL/min/1.73m²) compared to the healthy controls. These findings suggest that *E. coli* infection during pregnancy can lead to long-term renal dysfunction, potentially increasing the risk of chronic kidney disease (CKD) later in life. Previous studies have shown that infections such as pyelonephritis during pregnancy can cause permanent kidney damage, which may not become apparent until later in life Vargas et al. In the present study, the increased levels of serum creatinine and BUN, along with the reduced eGFR, indicate that *E. coli* infection may contribute to renal impairment even after the infection has resolved[43][44][45].

5. Conclusions

This study shows the long-term impact of pregnancy *E. coli* infection on mother health, including metabolic, immunological, and renal effects post-partum. Pregnant women with *E. coli* infections had higher fasting blood glucose, cholesterol, triglyceride, and blood pressure levels than healthy controls, indicating an increased risk of insulin resistance, dyslipidemia, and hypertension. Such abnormalities in lipid metabolism imply that the cardiovascular problems may persist. The study found prolonged inflammation based on elevated levels of CRP, IL-6, IL-8, and TNF- α . Read More. Are you dealing with delayed menopause? Here Are 5 Ways to Cope with Toxemia Causes. Very high Thyroid Antibodies. Both TPOAb and TgAb were discovered to be high. Furthermore, TPOAb (Thyroid Peroxidase) Antibody and TgAb (Thyroglobulin) Antibody were both raised, indicating a possible autoimmune response linked to thyroid disease proclivity in women. The Th1/Th2 ratio and lymphocyte counts both showed immunological dysregulation, respectively. Shastri, M.D., et al. Renal Effects: *E. coli* Infection Impairs Kidney Function in a Murine Model of CKD Risk. These findings underline the necessity of long-term health monitoring for women who have had an *E. coli* infection during pregnancy. Science Daily. These findings highlight the importance of early treatment and follow-up in women with pregnancy-related *E. coli* infections. Postpartum metabolic, immunological, and renal health monitoring is required to avoid long-term problems such cardiovascular disease, autoimmune disorders, and chronic kidney failure. These consequences included maternal healthcare policy, and future research should focus on methods that can improve maternity care policies.

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