NTU Journal of Pure Sciences (2025) 4 (1) : 31-38
DOI: https://doi.org/10.56286/ntujps.v4i1

IRAQI Academic Scientific Journals

ISSN: 2789-1089 EISSN: 2789-1097
NTU Journal of Pure Sciences
Available online at: https://journals.ntu.edu.iq/index.php/NTU-JPS/index

COVID-19 Related Thrombocytopenia and Hypertension in Pregnant Patients in Erbil, Kurdistan Region

Aras Othman Rasool
1. Department of Pathological Analytics, Paitaxt Technical Institute, Erbil- Kurdistan region-IRAQ
https://orcid.org/0000-0002-6188-1417, osman.aras.osman@gmail,com

Article Informations

Received: 23-12- 2023,
Accepted: 06-01-2025,
Published online: 31-03-2025

Corresponding author:
Name: Aras Othman Rasool
Affiliation : Department of Pathological Analytics, Paitaxt Technical Institute, Erbil- Kurdistan region-IRAQ
Email:osman.aras.osman@gmail.com

Key Words:
Covid-19,
Thrombocytopenia,
Hypertension,
Pregnancy cases,
Erbil, Kurdistan Region.

A B S T R A C T

The SARS-CoV-2 pandemic has raised impact with pregnant individuals and their fetuses. This study aims to investigate the association between COVID-19 infection, thrombocytopenia, and hypertension in pregnant women patients, as well as thrombocytopenia in pregnant women with COVID-19 infection and/or evaluate the risk of a low platelet count in the context of hypertension.

Prospective data from 150 blood samples, 100 of whom tested positive for COVID-19 through PCR and 50 from the control group, were collected. Based on the statistical analysis, 12.7% of individuals exhibited a low platelet count and 48.7% low blood pressure. Approximately 84.6% showed normal platelet counts with corresponding 44% normal blood pressure levels. Notably, 7.3% of cases were suffering from hypertension and 2.7% from thrombocytosis; compelling evidence emerged suggesting a potential causal link between COVID-19 and an elevated risk of pregnancy-related hypertension disorders. The statistically significant association (p-value less than 0.05).

In conclusion, mothers infected with COVID-19 have reported an increased incidence of hypertension in pregnant women due to thrombocytopenia compared to the control group.

Introduction

The COVID-19 pandemic has brought forth a multitude of challenges and complexities in the realm of healthcare, with particular attention now turning towards its impact on pregnant patients. Among the various enigmatic aspects of the virus, the emergence of COVID-19-Related Thrombocytopenia and Hypertension in Pregnant Patients stands as a significant concern. Clinical manifestations and risk factors for severe disease Pregnant women with COVID-19 are less likely to be symptomatic than non-pregnant counterparts, with almost three-quarters being asymptomatic [1,2,3]. Women with severe SARS-CoV-2 infection should, therefore, be managed in units with access to appropriate neonatal units. Therefore, pregnant women and neonates require special attention regarding the prevention, diagnosis and management of COVID-19 [4,5].

Among these challenges, the intersection of COVID-19 infection, thrombocytopenia (a low platelet count), and hypertension (high blood pressure) within the context of pregnancy has garnered increasing attention. This convergence has given rise to a complex and intriguing medical scenario: COVID-19-Related Thrombocytopenia and Hypertension in Pregnant Patients [6,7]. Pregnancy itself entails physiological changes that can impact a woman's cardiovascular and immune systems, creating an intricate backdrop against which the effects of viral infections like COVID-19 unfold. The virus's potential to exacerbate underlying health conditions and disrupt normal bodily functions has led to a growing body of research focused on its impact on various population subsets, including pregnant individuals [8,9]. Women with pneumonia during pregnancy have a significantly higher risk of adverse pregnancy outcomes, such as preterm delivery, pre-eclampsia, low birth weight and small-for-gestational-age infants. [10,11,12].

Thrombocytopenia and hypertension are both critical health concerns in their own right. Thrombocytopenia can lead to bleeding disorders, increasing the risk of internal bleeding and difficulty in clotting, while hypertension during pregnancy can result in preeclampsia a serious condition characterized by high blood pressure and organ damage. When these conditions intersect with COVID-19 infection, the implications for both maternal health and fetal well-being become even more intricate and urgent [13,14,15]. Thrombocytopenia in pregnancy, occurring in approximately 75% of cases of thrombocytopenia and 12% of all pregnancies. During pregnancy there is a general downward drift in platelet count, particularly during the last trimester. This results at term in a level that is approximately 15% less than the pre-pregnancy level. The mechanisms for this are thought to be a combination of dilutional effects and acceleration of platelet destruction across the placenta [16,17]. Thrombocytopenia in pregnancy deserves special consideration because of the possible consequences on the fetus. A structured approach to the diagnosis of thrombocytopenia involves an integration of clinical findings and appropriate support from the laboratory and other medical disciplines [18,19,20].

This paper seeks to explore the intricate interplay between COVID-19, thrombocytopenia, and hypertension in pregnant patients. By examining the existing literature, understanding the underlying mechanisms, and reviewing potential management strategies, we aim to contribute to the growing body of knowledge surrounding this complex medical challenge. With an eye towards improving both clinical approaches and patient outcomes, a comprehensive understanding of COVID-19-related thrombocytopenia and hypertension in pregnant patients is of paramount importance [21,22,23].

The aim of this study is to investigate the prevalence, clinical manifestations, and potential underlying mechanisms of COVID-19-related thrombocytopenia and hypertension in pregnant patients. By addressing these objectives, the study purposes to determine the extent to which COVID-19 infection contributes to the occurrence of thrombocytopenia and hypertension in pregnant individuals. Additionally, the study seeks to detect the risk of low platelet count in the deliberate of hypertension in pregnant women. The findings of this study could contribute to improved clinical management, risk assessment, and interventions for this specific patient population, ultimately enhancing maternal and fetal health outcomes.

Material and methods

Study design

The current study was conducted in various hospitals and a number of private obstetric clinics. It also involved collaboration with medical laboratory analyzers in order to collect prospective data in Erbil city, Kurdistan region, Iraq. The duration of data collection spanned from January 1, 2022, to June 25, 2022. A total of 100 blood samples were drawn from pregnant women who tested positive for Covid-19 through real-time reverse transcriptase polymerase chain reaction (RT-PCR). Additionally, a control group of 50 samples was collected from individuals who were free from Covid-19 infection, had normal platelet counts, and did not have hypertension.

Furthermore, all necessary safety procedures were carefully followed in order to obtain blood samples in accordance with the National guidelines on laboratory biosafety. After the samples were collected, the required assessments were initiated immediately. Platelet levels were assessed using a CBC device, and hypertension was assessed using a sphygmomanometer, all to gather information for the research questionnaires. Subsequently, participants were asked specific questions according to the questionnaires designed for the study, covering various aspects such as name, address, weight, age, presence of long-term diseases, history of hypertension, diabetes, family history of hypertension, medication usage, and other existing medical conditions.

Objective:

The objective of this study is to investigate the prevalence, clinical characteristics, and potential associations between COVID-19-related thrombocytopenia and hypertension in pregnant patients within the Erbil area of the Kurdistan Region.

Participants:

A target of 150 pregnant participants (100 diagnosed with COVID-19 and 50 controls group was included pregnant individuals free from COVID-19 infection) residing in Erbil was recruited as participants. Clinical Data relevant clinical information, including age, gestational age, medical history, COVID-19 symptoms, and complications was collected through medical records and patient interviews.

Laboratory test:

Each participating pregnant woman had approximately 5 ml of venous whole blood drawn into plasma separator tubes using aseptic techniques. The collected blood was stored in Ethylenediaminetetraacetic acid (EDTA) and kept at room temperature (20 °C) until processing. After the blood components were separated by centrifugation at 1000 rpm for ten minutes, a complete blood count (CBC) was performed to observe the normal platelet count and diagnostic confirmation of COVID-19 infection using PCR testing.

Blood Pressure Measurements:

Blood pressure measurements was recorded for each participant by using stethoscope with sphygmomanometer.

Statistical Data Analysis

The SPSS program serves as the tool to assess the significance rate by evaluating each element including P value (0.05), mean, and standard deviation.

Results

General descriptive

The current study was carried out in collaboration with private obstetric clinics and their medical laboratory analysts within a hospital setting, aiming to collect prospective data in Erbil city/ Kurdistan region of Iraq. A total of 100 samples were gathered from pregnant women who tested positive for Covid-19 through PCR testing. Moreover, a control group of 50 samples was collected, comprising individuals free from Covid-19 infection, with normal platelet counts and no hypertension. Notably, the results reveal a significant distribution of ages among participants, with 28% being teenagers and 72% being adults. This distribution highlights that the study primarily involves adult individuals, emphasizing the potential role of age-related factors in the research findings.

The data provides an intriguing insight into the distribution of body weight categories among participants. The majority, accounting for 69.3%, exhibited a normal body weight, while 30.7% fell into the obesity category. Interestingly, there is no mention of individuals with low body weight in the provided result. This distribution holds implications for understanding the potential hereditary aspect of hypertension within the study population. Remarkably, 78% of individuals lack a family history of hypertension, while 22% have such a family history. Furthermore, a striking observation arises from the data: a significant 95.3% of individuals lack diabetes, with a smaller subset of 4.7% identified as having diabetes. This distribution underscores the prevailing absence of diabetes among the majority, indicating the potential health status of the studied population. The presented data offers a notable insight into the prevalence of hypertension prior to pregnancy among participants. Impressively, a vast majority, totaling 96.7%, did not exhibit hypertension before pregnancy, while a relatively small subset, comprising 3.3%, reported having hypertension before pregnancy.

The data also provides a compelling view of the distribution of thrombocyte (platelet) levels among subjects. Notably, 84.6% of individuals possess platelet counts within the normal range, while a smaller but significant proportion of 12.7% exhibit low platelet counts. A minority of 2.7% is characterized by high platelet

counts, The platelet counts range from a minimum of 127 to a maximum of 786 K/uL. Moreover, the provided data presents a convincing perspective on hypertension prevalence during pregnancy. Intriguingly, 48.7% of participants experienced hypertension, indicating a substantial proportion with elevated blood pressure levels. A noteworthy 44% maintained normal blood pressure during this state, signifying a majority within the normal range. Furthermore, 7.3% were categorized as having hypertension. The Systolic blood pressure values span from a minimum of 90 to a maximum of 140 mmHg and diastolic blood pressure values range from a minimum of 50 to a maximum of 90 mmHg. The demographic traits as well as the gynecologic, obstetrical, and medical histories of the cases are presented in Table 1.

Table 1. The General descriptive of participant.

Characteristics	No.	Percent%
Age		
Teen Age	42	28 %
Adult	108	72 %
Obesity		
Low body weight	0	0 %
Normal body weight	104	69.3 %
Obesity	46	30.7 %
Family hypertension		
No Family hypertension	117	78 %
Family hypertension	33	22 %
Diabetes		
No diabetes	143	95.3 %
Diabetes	7	4.7 %
Hypertension before pregnancy		
No hypertension before pregnancy	145	96.7 %
Hypertension before pregnancy	5	3.3 %
Platelet		
Low platelet	19	12.7 %
Normal Platelet	127	84.6 %
High platelet	4	2.7 %
Hypertension		
Hypotension	73	48.7 %
Normal hypertension	66	44.0 %
Hypertension	11	7.3 %

Table 2. Statistical Analysis of Covid-19 relation to thrombocyte (platelet) and Blood pressure.

Parameters			COVID-19 Positive	Control Negative	Total	Mean ± St.D	P. Value
Platelet	Low platelet	No (%)	19(19.0%)	0 (0.0%)	19 (12.7%)	1.900±0.379	0.012
	Normal	No (%)	77 (77.0%)	50 (100.0%)	127 (84.7%)		
	High platelet	No (%)	4 (4.0%)	0 (0.0%)	4 (2.7%)		
	Total	No (%)	100 (100.0%)	50 (100.0%)	150 (100.0%)		
Blood Pressure	Hypotension	No (%)	73 (73.0%)	0 (0.0%)	73 (48.7%)	1.03 ± 0.180	0.0001
	Normal	No (%)	16 (16.0%)	50 (100.0%)	66 (44.0%)		
	Hypertension	No (%)	11 (11.0%)	0 (0.0%)	11 (7.3%)		
	Total	No (%)	100 (100.0%)	50 (100.0%)	150 (100.0%)		

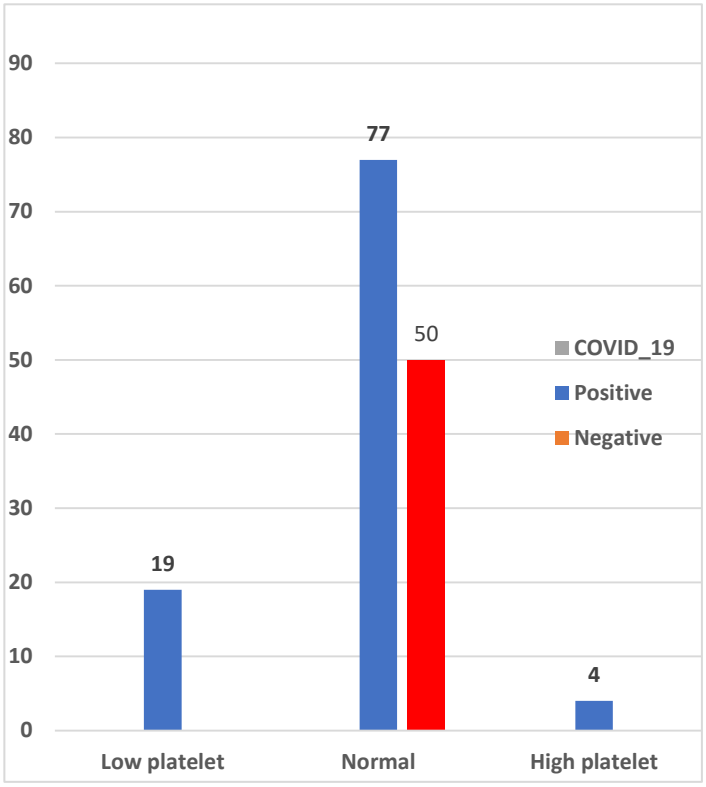
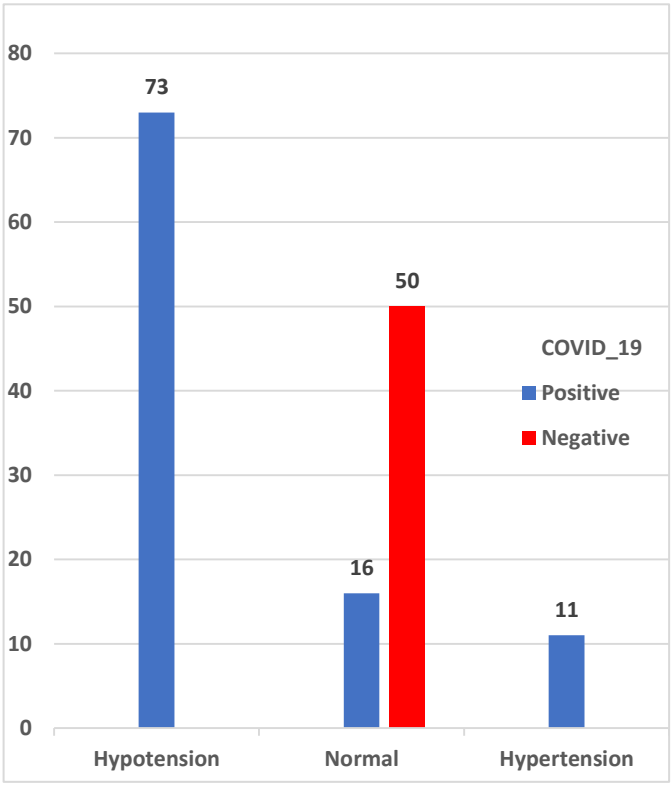


Figure 1. Number of participates according to number of platelets



Figuer 2. Number of participates according to blood pressure.

The provided data analysis was represented the significance differences in platelet levels and blood pressure among pregnant women who tested "Positive" for COVID-19 by PCR as compared with control cases who tested "Negative". Additionally, these data indicated a statistically significant difference in platelet levels between the two tested groups. Positive group for COVID-19 had a significantly lower mean platelet count (1.900 ± 0.379) compared to control group, moreover, the p-value associated with this comparison is 0.012, which is less than the commonly used significance level of 0.05.

The pregnant women who tested "Positive" for COVID-19 had a significantly lower mean blood pressure (1.03 ± 0.180) the p-value 0.0001, when compared to control groups.

The data suggests that there are statistically significant differences in platelet levels and blood pressure between individuals who tested "Positive" for COVID-19 and those who tested "Negative." The calculated means, standard deviations, and p-values all contribute to the understanding that these differences are not likely due to random chance and may have potential clinical implications.

Discussion

The COVID-19 pandemic, caused by SARS-CoV-2, is rapidly evolving as a major threat to global health. The worse outcomes have been reported in pregnant women because physiological alterations in the immune and respiratory systems might render pregnant women more vulnerable to contracting COVID-19 infection [24]. Similar to patterns observed in other viral infections, this phenomenon could be attributed to a combination of diminished platelet production and escalated platelet degradation and utilization, potentially contributing to thrombocytopenia [25]. Also, a discernibly elevated prevalence of hypertension in individuals afflicted with COVID-19 [26]. The analysis of the provided data yields important insights into the potential impact of COVID-19 on platelet levels and blood pressure. The significance of these findings lies in their potential implications for understanding the relationship between COVID-19 infection and these health parameters.

Platelet Levels:

The data indicates a notable difference in mean platelet counts and blood pressure between individuals who tested "Positive" for COVID-19 and those who tested "Negative." The lower mean platelet count observed in the "Positive" group suggests that COVID-19 infection might have an influence on platelet levels. This finding aligns with existing literature that highlights the virus's impact on the cardiovascular system. The significant p-value further underscores the statistical validity of this difference. The distribution of platelet counts among the

groups, including low, normal, and high platelet counts, further supports the notion that COVID-19 might affect platelet homeostasis.

In pregnant patients found that platelet counts typically decrease during uncomplicated pregnancies. While the distribution of platelet counts shifts, most patients still remain within normal laboratory ranges. Pregnancy-related thrombocytopenia can stem from various causes, ranging from benign issues like gestational thrombocytopenia to severe conditions such as HELLP (hemolysis, elevated liver function tests, low platelets syndrome) syndrome. These conditions often share overlapping onset times and clinical symptoms, posing challenges for precise diagnosis [27].

Hematological factors examinations of severe COVID-19 patients unveiled shifts in distinct coagulation indicators, such as heightened D-dimer levels, prolonged prothrombin time, and reduced platelet counts. [28,29].

The changes observed suggest an increased inclination for blood coagulation in severe COVID-19 patients, potentially prompting the creation of small lung blood clots. This mechanism might also retain platelets and foster clot formation at injury sites, potentially depleting platelets and their precursor cells, ultimately reducing platelet production and increasing their utilization [30,31]. Certainly, similar to individuals with COVID-19, various retrospective examinations of patients affected by SARS demonstrated the presence of thrombocytopenia, with approximately 40-50% of those infected having the lowest platelet counts [32,33,34].

Thrombocytopenia occurs in approximately one-third of patients infected with COVID-19 and can increase the bleeding risk of performing invasive procedures. While the risk of epidural hematoma with neuraxial anesthesia increases with worsening thrombocytopenia, obstetric anesthesiologists must carefully consider all factors including the respiratory status and severity of thrombocytopenia of pregnant patients infected with COVID-19 [35]. The possible mechanisms of thrombocytopenia in COVID-19 patients are reduced platelet production, increased platelet destruction, or increased platelet consumption [36]. Many findings corroborated the link between preeclampsia (PE) and chronic hypertension or obesity in the context of COVID-19 among women. Both obesity and chronic hypertension are established long-term health conditions that are connected to the presence and seriousness of COVID-19 [37,38,39].

Blood Pressure:

The lower mean blood pressure in the "Positive" group might be a result of the virus's impact on cardiovascular function. The considerably low p-value signifies the strong statistical significance of this finding, suggesting that the observed difference is unlikely due to random chance. The distribution of blood pressure categories, including hypotension, normal blood pressure, and hypertension, highlights the potential impact of COVID-19 on blood pressure regulation.

The connection between COVID-19 and hypertension disorders in pregnancy due to thrombocytopenia lacks clear evidence. While recent research has comprehensively outlined the origins, clinical traits, and complications of COVID-19 patients in the acute phase, uncertainties remain regarding the long-term impacts of this severe ailment, including its potential link to pregnancy or hypertension. The question of whether COVID-19 heightens the risk of hypertension disorders during pregnancy remains unanswered. Yet, the outcomes could provide insights into subsequent societal challenges and inform government strategies concerning public health. In contrast to traditional observational epidemiological studies, an analysis has the potential to yield the strongest proof for assessing the causal connection between COVID-19 and hypertension disorders in pregnancy [40]. Various conditions have previously demonstrated the ability to mimic Pre-Eclampsia (PE), as they share certain clinical and laboratory features observed in PE patients. These disorders, such as gestational hypertension and thrombotic thrombocytopenic purpura, approximately 11% of pregnant women with COVID-19 infection experienced Pre-Eclampsia (PE); this percentage increased for those with a preexisting chronic hypertension background [15,41].

The current study has several limitations. The data may not be generalizable to other population groups, as they are collected from one Kurdish resident general hospital. The comparison period may not be entirely perfect for this season. However, the clinical consequences of this low acceptance rate remain uncertain and require long-term studies. Being an observational study, a phenomenon has been described and no evidence for cause can be derived from the results.

Conclusion

Many authors emphasize the importance of understanding the complex interplay between COVID-19 infection, thrombocytopenia, and hypertension in pregnant patients. In a broader context, these findings contribute to the growing body of knowledge about the multi-systemic effects of COVID-19. The virus's impact on cardiovascular parameters, as demonstrated through platelet levels and blood pressure, underscores the complexity of the disease and its potential to affect various aspects of human health. However, it's important to note that further research is needed to establish a causal relationship between COVID-19 and these health parameters. Exploring viral intrusion, platelet parameters, and blood pressure variables, it offers valuable insights into risk markers and clinical considerations for pregnant individuals with COVID-19. Significantly, this study can improve clinical strategies, strengthen risk assessment, and tailor interventions for pregnant

patients with COVID-19. Understanding the interplay between COVID-19 infection, thrombocytopenia, and hypertension aids healthcare recognition and management of potential complications. Ultimately, ongoing scholarly exploration in this field ensures the well-being of expectant mothers and their offspring amid the relentless COVID-19. Therefore, checking blood pressure, monitoring CBC, managing chronic hypertension and gestational hypertension are performed during pregnancy.

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