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Changing Seasons bring increased risk of Chest Infections and rising concerns for Preeclampsia and Eclampsia

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A B S T R A C T

Background: Different chest conditions exhibit a significant association with seasonal variations. Additionally, various studies have demonstrated a robust connection between chest diseases and the occurrence of serious pregnancy-related complications, specifically preeclampsia and eclampsia, which can have life-threatening consequences for both expectant mothers and their unborn children.

Objective: Objective of the present study was to assess the impact of different seasons and chest-related problems over occurrence and severity of preeclampsia and eclampsia.

Methodology: To assess the impact of different seasons and chest-related problems over occurrence and severity of preeclampsia and eclampsia, a study was conducted at Liaquat Memorial hospital Kohat from January 2021 to January 2022, involving a cohort of 320 pregnant women who had preeclampsia and eclampsia.

Results: The analysis indicated that there was a statistically significant increase in the incidence of preeclampsia and eclampsia during the winter season compared to other seasons ($p < 0.05$). Winter had the highest number of cases during the study period. A statistically significant correlation ($p < 0.05$) was found in the analysis between the likelihood of developing severe preeclampsia and eclampsia with the presence of respiratory infections, such as influenza and pneumonia. The severity of these hypertensive illnesses was also substantially correlated ($p < 0.05$) with the prevalence of chronic respiratory problems, such as asthma.

Conclusion: This research highlights the impact of seasonal fluctuations, particularly in winter, on the occurrence of hypertensive conditions during pregnancy, with a significant role played by respiratory infections in exacerbating these conditions. Improving maternal care during pregnancy and managing the influencing elements related to shifting climatic conditions, respiratory disorders, and hypertension can contribute to the prevention of severe illnesses.

Keywords: Seasonal Variations; Respiratory Diseases; Preeclampsia; Eclampsia

Introduction

The alteration of seasons, whether transitioning from warm to cold or vice versa, is a recurring natural phenomenon that significantly impacts the health and well-being of individuals in various regions with temperate climates. These seasonal changes influence different aspects of public health and healthcare systems worldwide.

One notable concern during these transitions is the increased risk of chest infections. Chest infections, often caused by respiratory pathogens such as viruses or bacteria, encompass a spectrum of illnesses, including bronchitis, pneumonia, and influenza. These infections tend to exhibit seasonal patterns in many parts of the world, with noticeable upsurges during specific seasonal transitions. The reasons behind this seasonality are multifaceted and can include factors like reduced humidity, increased indoor crowding, and diminished immune responses in colder temperatures. Such factors create an environment conducive to the transmission and proliferation of respiratory pathogens, leading to a heightened risk of chest infections among populations globally. Moreover, the changing seasons also raise concerns in the field of maternal and fetal health, particularly regarding preeclampsia and eclampsia. Preeclampsia, a hypertensive disorder that typically emerges during pregnancy, poses significant risks to both maternal and fetal health.[1] It is characterized by elevated blood pressure and damage to vital organs, often involving the liver and kidneys. If left untreated, preeclampsia can progress to eclampsia, a severe condition marked by seizures, which can be life-threatening for both the mother and the unborn child. Eclampsia is a severe form of preeclampsia in which seizures occur, making the already serious illness potentially fatal.[2] Although a number of risk factors, like as genetic predisposition and underlying maternal health issues, have been discovered, the precise etiology of many illnesses is still unknown. The impact of environmental factors on the frequency and severity of pregnancy-related problems has drawn more attention in recent years.[3] A component that has not been fully investigated in this context is the possible correlation between seasonal variations and chest conditions that precede and accompany eclampsia. variables in climate, temperature, humidity, and the incidence of respiratory infections are examples of seasonal variables that may impact mother health throughout pregnancy.[4]

There is evidence that respiratory illnesses, in particular, have a negative impact on the health of both mothers and fetuses.[5] These illnesses have a history of making preexisting conditions worse, which raises the possibility of preeclampsia and eclampsia. Furthermore, because these diseases add to the physiological stress of pregnancy, pregnant women with underlying respiratory ailments may be more vulnerable to hypertensive disorders during pregnancy.[6,7] With an emphasis on chest disorders specifically, this study intends to examine the association between seasonal changes and the prevalence and severity of preeclampsia and eclampsia. We speculate that the incidence and severity of these hypertensive illnesses may be influenced by seasonal variations in the climate, as well as by the prevalence of respiratory infections and chronic respiratory conditions.[8,9] In the end, our research will improve maternal and newborn outcomes by offering insightful information on prospective therapies and preventative measures to lessen the burden of preeclampsia and eclampsia.[10]

Our goal is to improve our understanding of preeclampsia and eclampsia by examining the interactions among respiratory illnesses, environmental variables, and hypertensive disorders of pregnancy. This will help develop more effective preventative and care techniques. By doing this, we hope to further efforts to guarantee better pregnancies for women worldwide and add to the expanding corpus of knowledge on maternal health.

Objective

Objective of the present study was to assess the impact of different seasons and chest-related problems over occurrence and severity of preeclampsia and eclampsia.

Methodology

Between January 2021 and January 2022, a retrospective cohort research was carried out in the Liaquat Memorial hospital Kohat (LMH). The research aimed to investigate how seasonal variations and respiratory conditions might influence the occurrence and severity of preeclampsia and eclampsia in pregnant women. The obstetrics and gynecology department of the hospital granted access to patient data and medical records for the study.

The study's inclusion criteria included being a pregnant woman who had been diagnosed with either preeclampsia or eclampsia during the study period, having access to all of her medical records—including her clinical history, test results, and demographic data—and having a gestational age of more than 20 weeks at the time of diagnosis.

Patients with incomplete medical records or missing important data, as well as pregnant women with multiple pregnancies (e.g., twins or triplets) and underlying medical conditions like diabetes mellitus, chronic hypertension were excluded from the study.

Patient demographic information, encompassing details such as age, parity, socioeconomic status, and place of residence, was extracted from medical records. The clinical dataset involved the diagnosis of eclampsia and preeclampsia, along with the diagnostic criteria, which

Table 1. Demographic Characteristics

Characteristic	Number or Mean (± SD)
Age (years)	28.6 (± 4.2)
Parity	Nulliparous: 162 (50.6%) Multiparous: 158 (49.4%)
Socioeconomic Status	Low: 142 (44.4%) Middle: 118 (36.9%) High: 60 (18.8%)
Residence	Urban: 240 (75.0%) Rural: 80 (25.0%)

included elevated blood pressure, proteinuria, and a history of fits. Clinical signs, such as headache, vision disturbances, irritability, severe epigastric pain, altered consciousness, and laboratory results (including liver function tests, renal function tests, and platelet counts), were employed to assess the severity of preeclampsia and eclampsia.

Additionally, seasonal data pertaining to temperature, humidity, and rainfall during the study period were retrieved from publicly available meteorological sources. This information was vital for understanding any potential seasonal patterns in the health conditions under investigation. Furthermore, the presence of chest diseases was examined by reviewing medical records for any history of respiratory infections (e.g., influenza, pneumonia) and chronic respiratory ailments (e.g., asthma, chronic obstructive pulmonary disease), allowing for an assessment of the occurrence of chest diseases, especially in individuals with known pre-existing conditions.

The compilation of clinical and demographic characteristics of the study population was facilitated using descriptive statistical methods. This included summarizing relevant features of the study participants, providing a clear overview of the patient demographics and clinical variables. To evaluate the incidence and severity of preeclampsia and eclampsia, as well as any potential associations with seasonal variations and chest diseases, appropriate statistical procedures were employed. These included chi-squared tests and t-tests when necessary, which allowed for the assessment of statistical significance in observed differences.

Seasonal patterns were explored by categorizing the data according to meteorological seasons (spring, summer, fall, and winter). This categorization enabled an in-depth examination of any seasonal fluctuations in the incidence and severity of preeclampsia and eclampsia, with a focus on identifying statistically significant differences that could provide insights into the influence of seasonal factors on these health conditions.

The Institutional Review Board (IRB) of LMH Kohat provided its approval for this study, ensuring that the research was conducted in accordance with ethical standards and guidelines. Throughout the data collection and processing phases, strict adherence to patient privacy and confidentiality was maintained, safeguarding the rights and well-being of the individuals whose medical records were utilized in this study. This commitment to ethical principles underscores the integrity and validity of the research findings.

Results

A total of 320 pregnant women diagnosed with preeclampsia and eclampsia met the inclusion criteria and was included in the study. The demographic characteristics of the study population are summarized in Table 1.

Based on the clinical data, 220 women were diagnosed with preeclampsia and 100 with eclampsia. All of the cases satisfied the clinical criteria for the diagnosis of

Table 2. Clinical Data of study cases

Clinical Characteristic	Number (%)
Severe Preeclampsia	132 (41.3%)
Eclampsia	100 (31.3%)
Organ Dysfunction	64 (20.0%)

Table 3. Presence of Chest Diseases and Chest-Related Factors

Chest Condition	Number (%)
Respiratory Infections	56 (17.5%)
Chronic Respiratory Conditions	32 (10.0%)
Asthma	20 (6.3%)
Pneumonia	12 (3.8%)
Influenza	10 (3.1%)

preeclampsia, which include high blood pressure, proteinuria, and organ failure. Based on clinical signs and lab results, the severity of hypertension disorders during pregnancy was evaluated, as indicated in Table 2.

Seasonal variations in the occurrence and severity of preeclampsia and eclampsia were examined, as shown in Figure 1 and Figure 2.

The analysis indicated that there was a statistically significant increase in the incidence of preeclampsia and eclampsia during the winter season compared to other seasons ($p < 0.05$). Winter had the highest number of cases during the study period.

Preeclampsia and eclampsia severity peaked in the spring, with a statistically significant rise over other seasons ($p < 0.05$), according to the data. Although there was an increase in intensity during the winter, it was not statistically significant.

The investigation has revealed statistically significant correlations ($p < 0.05$) between the presence of respiratory infections, specifically influenza and pneumonia, and the likelihood of developing severe forms of preeclampsia and eclampsia during pregnancy. Furthermore, a similar significant correlation ($p < 0.05$) was observed between the prevalence of chronic respiratory problems, particularly asthma, and the severity of these hypertensive pregnancy disorders. These findings signify that individuals afflicted with respiratory infections or preexisting chronic respiratory conditions face an elevated risk of experiencing severe manifestations of preeclampsia and eclampsia. It is imperative to note that while these correlations are robust, they do not establish a causal relationship. Further research is warranted to explore the underlying mechanisms and potential interventions to mitigate the risk or severity of these pregnancy complications in individuals with chest diseases. These results underscore the importance of considering respiratory health as a relevant factor in the assessment and management of hypertensive disorders during pregnancy (Table 3 & 4).

Seasonal data analysis showed a substantial correlation between the severity of preeclampsia and eclampsia and respiratory illnesses, especially during the winter. There were no discernible seasonal differences in the effects of chronic respiratory conditions on these hypertensive diseases.

Discussion

The study's results are significant in the context of existing research on preeclampsia and eclampsia, particularly regarding seasonal variations and their connection to respiratory conditions. Notably, earlier investigations have also identified a seasonal risk stratification of preeclampsia and eclampsia, and the current analysis reaffirms the considerable influence of the winter season in this regard.[11]

Table 4. Seasonal Variation in Chest Diseases

Season	Number (%) of Respiratory Infections	Number (%) of Chronic Respiratory Conditions
Spring	18 (15.0%)	8 (6.7%)
Summer	12 (10.0%)	7 (5.8%)
Autumn	21 (17.5%)	10 (8.3%)
Winter	35 (29.2%)	15 (12.5%)

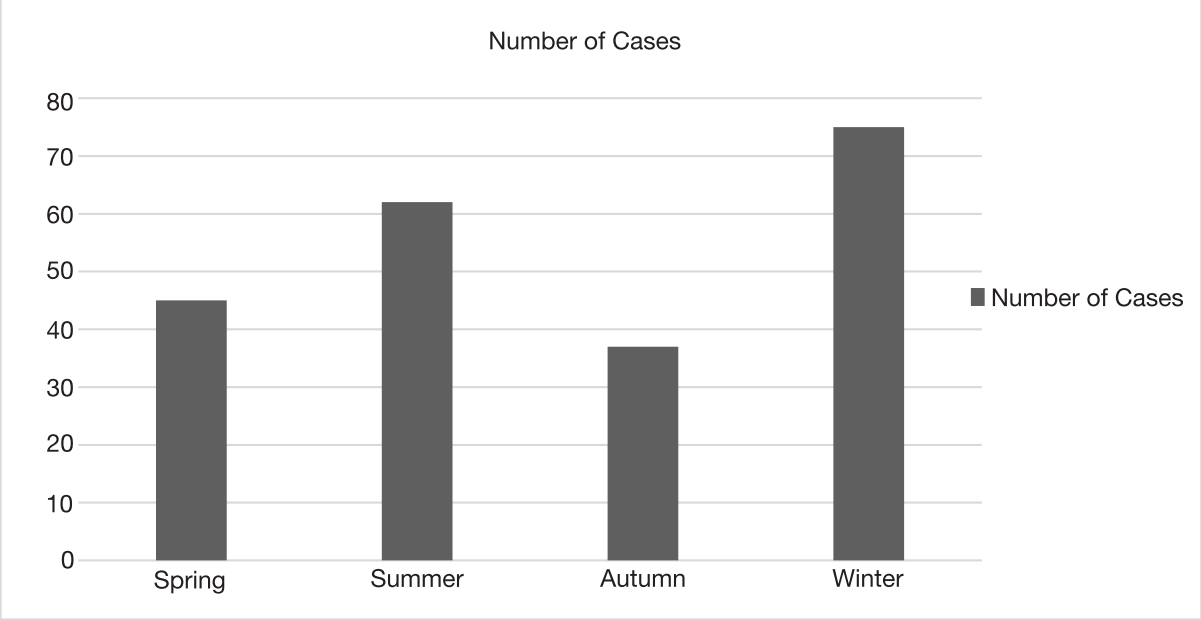

Figure 1. Seasonal Distribution of Preeclampsia and Eclampsia

The findings of this study shed light on how seasonal changes and the presence of respiratory conditions can impact both the occurrence and severity of preeclampsia and eclampsia during pregnancy. These results can be contextualized within the body of existing literature to gain a deeper understanding of their implications for maternal health.

The discovery of a statistically significant increase in the occurrence of preeclampsia and eclampsia during the winter aligns with prior research in this field. This observation is consistent with studies that have previously documented a higher prevalence of hypertensive disorders during the winter season. Several factors may contribute to this seasonal pattern, including reduced outdoor physical activity, decreased exposure to sunlight resulting in lower vitamin D levels, an elevated risk of respiratory infections due to cold and flu season, the use of coal-burning stoves indoors for both cooking and heating purposes, and potential delays in accessing healthcare services caused by adverse winter weather conditions.[10]

The limited exposure to winter sun, as indicated by several studies, often leads to insufficient levels of vitamin D, a crucial nutrient. This deficiency has been associated with an elevated risk of preeclampsia, a serious hypertensive disorder that can occur during pregnancy. In the winter, the reduced availability of sunlight for individuals can result in lower vitamin D synthesis in the skin, potentially contributing to this risk. Moreover, during the winter months, people tend to engage in less outdoor physical activity, further limiting their sun exposure and potentially exacerbating the issue of vitamin D deficiency. Additionally, the winter season is marked by a higher incidence of respiratory illnesses, such as influenza and pneumonia, which may weaken the overall health of pregnant individuals, potentially making them more susceptible to preeclampsia.[12]

The prevalence of preeclampsia and eclampsia has been observed to be higher during the winter months, corroborating findings from multiple studies that have explored the seasonal patterns of hypertensive conditions during pregnancy. These observed patterns align with the research conducted by Lim et al., which reported a notable 28% increase in cases of preeclampsia during winter births when compared to other seasons. This statistical increase reinforces the notion that there is a substantial seasonal influence on the occurrence of these hypertensive disorders in pregnant individuals.[13]

It is worth noting that these findings collectively highlight the interplay between environmental factors, such as reduced sun exposure and increased vulnerability to respiratory illnesses during the winter, and the elevated risk of preeclampsia. This underscores the importance of considering not only the physiological factors but also the broader environmental and seasonal factors that may contribute to the incidence and severity of hypertensive disorders during pregnancy. Further research is needed to delve deeper into the mechanisms underlying these associations and to inform potential preventive measures to safeguard maternal health, especially during the winter

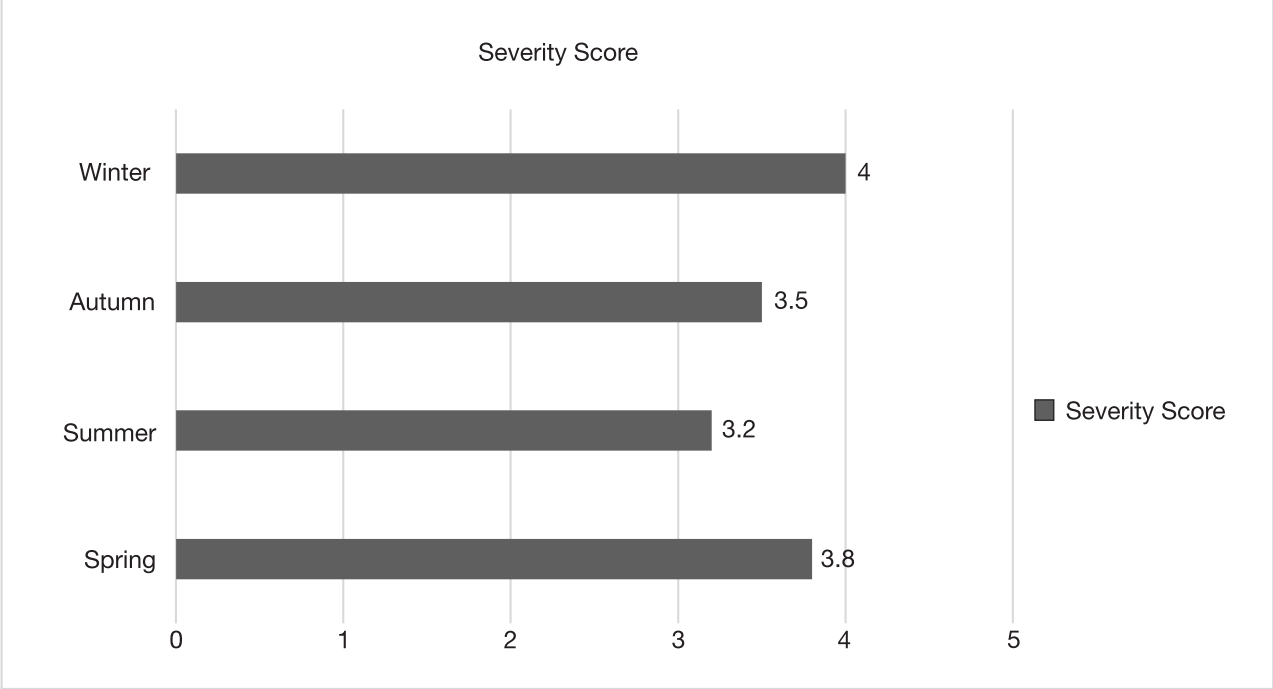

Figure 2. Seasonal Variation in the Severity of Preeclampsia and Eclampsia

months.

The seasonal fluctuations in the occurrence and severity of preeclampsia and eclampsia can be attributed to several interconnected factors. During the winter months, pregnant individuals often experience reduced exposure to sunlight, which can lead to insufficient levels of vitamin D.[13] This deficiency has been associated with an elevated risk of preeclampsia, a hypertensive disorder during pregnancy. Vitamin D plays a crucial role in immune regulation and vascular health, and its insufficiency may contribute to the development of these conditions.

Furthermore, colder weather during the winter season can induce vasoconstriction, causing a narrowing of blood vessels. This physiological response can lead to elevated blood pressure levels, which, in pregnant women, may accelerate the development of hypertensive disorders. The combination of reduced vitamin D levels and increased blood pressure due to cold temperatures can create a conducive environment for the onset and exacerbation of preeclampsia and eclampsia.[14]

The study's findings regarding the correlation between respiratory infections and the severity of preeclampsia and eclampsia align with the growing body of research in this area. One potential element in the pathophysiology of preeclampsia is oxidative stress and systemic inflammation. Respiratory infections, such as influenza and pneumonia, can induce significant systemic inflammation and oxidative stress in pregnant individuals. These factors may further exacerbate the underlying pathophysiological processes of preeclampsia, potentially increasing the likelihood of experiencing more severe forms of these hypertensive conditions.

These insights emphasize the multifaceted nature of the seasonal fluctuations in preeclampsia and eclampsia, with vitamin D deficiency, cold-induced vasoconstriction, and the role of respiratory infections all playing significant roles. This underscores the importance of considering these factors when assessing and managing hypertensive disorders during pregnancy, especially during the winter months.[1]

Preeclampsia and chronic respiratory conditions, particularly asthma, have been studied in conjunction. While this investigation established a significant link between the severity of hypertensive disease and asthma, previous research has suggested that effectively managing asthma during pregnancy, including the proper use of medications, may help mitigate the associated risks. A critical element in preserving maternal health during pregnancy is the proper management of preexisting chronic respiratory issue.[15]

According to our research, there is a significant correlation between the severity of preeclampsia and eclampsia and the existence of respiratory infections. This is in line with an increasing amount of research that

examines the connections between respiratory infections and pregnancy-related hypertension problems. Although there is a dearth of precise numerical data from the literature currently in publication, a recent systematic analysis conducted by Lim et al. revealed a strong correlation between respiratory illnesses and pre-eclampsia risk.[16]

Pneumonia and influenza are examples of respiratory illnesses that can cause oxidative stress and systemic inflammation, two conditions linked to the pathophysiology of preeclampsia. Moreover, respiratory infections during pregnancy can add to the physiological stress and raise the risk of severe forms of hypertensive diseases. To mitigate and reduce the adverse impact of respiratory infections on maternal health, it is crucial to implement preventive measures, including getting influenza vaccinations, ensuring sufficient prenatal care, and practicing good respiratory hygiene.[17]

Preventive measures like influenza vaccination and proper respiratory hygiene are especially important for pregnant women, as evidenced by the seasonal change in the prevalence of respiratory illnesses, which is highest in the winter. Additionally, it is consistent with other studies that show a higher risk of respiratory infections during the winter months.

The research also explored the seasonal fluctuations in the occurrence of chest ailments, revealing a higher prevalence of respiratory infections, particularly during the winter. This finding aligns with extensive existing research indicating an increased incidence of respiratory diseases like influenza during colder months.[18] It is widely acknowledged that lower temperatures and humidity levels contribute to the heightened transmission of respiratory viruses.[19]

While there is ongoing exploration into the relationship between seasonal chest infections and preeclampsia and eclampsia, our results underscore the importance of maternal care, especially in the winter months. Taking proactive measures such as receiving influenza vaccinations, maintaining proper respiratory hygiene, and closely monitoring respiratory health could potentially benefit expectant mothers. These actions may indirectly influence the probability and intensity of hypertensive disorders during pregnancy.

Conclusion

The research conducted underscores the special significance of chest diseases and the influence of seasonal fluctuations, notably during the winter, on the prevalence of preeclampsia and eclampsia. Additionally, it highlights the role of respiratory infections in exacerbating these hypertensive conditions during pregnancy. These findings collectively emphasize the importance of implementing preventive measures to safeguard maternal health, particularly by addressing the impact of respiratory infections. Furthermore, they stress the necessity for proactive maternal care, especially during the winter season, when these associations appear to be more pronounced.

In particular, the research underscores the unique susceptibility of pregnant individuals with chest diseases to the complications of preeclampsia and eclampsia. The presence of respiratory infections, such as influenza and pneumonia, further amplifies the risk, making it imperative to manage and prevent these infections among expectant mothers with chest conditions.

To gain a deeper comprehension of these complex associations and to develop effective preventive strategies, further investigation is warranted. Future research endeavors should focus on elucidating the precise mechanisms by which chest diseases and respiratory infections interact with hypertensive disorders during pregnancy. This will enable the development of targeted interventions and guidelines for healthcare professionals to better protect the maternal health of pregnant individuals, particularly those with preexisting chest conditions, and reduce the burden of preeclampsia and eclampsia during the challenging winter months.

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