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RESEARCH ARTICLE

EFFECT OF ENVIRONMENTAL TEMPERATURE ON INCIDENCE OF PREECLAMPSIA AND ECLAMPSIA

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Abstract

Background: Preeclampsia and eclampsia continue to be the one of leading causes of maternal and fetal mortality and morbidity worldwide. As global warming has become major concern all over the world ,there is need of studies to know its impact on women's health. Aim of this study is " To observe the effect of environmental temperature on incidence of preeclampsia and eclampsia"**.**

Methods and Material: This is a comparitive study to know the effect of hot and cold months on incidence of preeclampsia and eclampsia , conducted in department of Obstetrics and Gynaecology at a tertiary health centre . All the patients admitted in Labor room emergency were included in the study, making total number of 33,267 admissions in 47 months. All records of the patients admitted were reviewed. All the data were arranged month wise on Microsoft excel 2010·Ink , and calculations were done on this spread sheet. Months were divided into two groups : Hot weather group[N = 11] comprising of months with average maximum temperature >30ºC and Cold weather group[N=9] comprising of months with average maximum temperature ≤ 18ºC. Temperature range for Hot and Cold weather were in accordance with WHO.

Statistical analysis used: Statistic tests used were Chi-square.

Results: Of total admissions incidence of pre-eclampsia and eclampsia cases was 2.8%(927/33267).There was no significant effect of hot weather on incidence of pre-eclampsia and eclampsia cases ($p > 0.05$) while significant effect of cold weather was seen leading to increased incidence of pre-eclapmsia and eclampsia cases ($p < 0.05$).

Conclusions: Trend of global warming warrants the need to study the effect of environmental changes on maternal health on large scale.

Introduction:-

In 1984 World Health Organization defined health as "the extent to which an individual or group is able to realize aspirations and satisfy needs and to change or cope with the environment. Health is a resource for everyday life, not the objective of living; it is a positive concept, emphasizing social and personal resources, as well as physical capacities"[1]. As global warming has become major concern all over the world ,there is need of studies to know its

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impact on health system, especially of women. To achieve the desired goal of reduction in maternal mortality, environmental impact on health could not be ignored.

Preeclampsia and eclampsia are pregnancy-related high blood pressure disorders.Pregnancy-related hypertension disorder symptoms can include high blood pressure, protein in urine, hand/face swelling, headache, vision problems, abdominal pain, seizures, & nausea/vomiting.Women with preeclampsia are at increased risk for organ damage/failure, preterm birth, pregnancy loss, and stroke.Preeclampsia, formerly called "toxemia of pregnancy," may develop into the more severe condition called eclampsia.

Preeclampsia is a multisystem progressive disorder characterized by the new onset of hypertension and proteinuria or the new onset of hypertension and significant end-organ dysfunction with or without proteinuria in the last half of pregnancy or postpartum. It ismainly caused by maternal and placental vascular dysfunction. Eclampsia refers to the occurrence of a grand mal seizure in a woman with preeclampsia in the absence of other neurological conditions that could account for seizure. Preeclampsia and eclampsia continue to be the one of leading causes of maternal and fetal mortality and morbidity worldwide[2].Pathophysiology of preeclampsia and eclampsia is poorly understood. Factors may include poorly developed uterine placental spiral arterioles which decrease uteroplacental blood flow during late pregnancy. Diffuse or multifocal vasospasm can result in maternal ischemia, eventually damaging multiple organs, particularly the brain, kidneys, and liver. Aim of this study was to observe the effect of environmental temperature on incidence preeclampsia and eclampsia.

Material and Methods:-

Study design and participants

This is a observational comparative study to know theeffect of hot and cold months on incidence of preeclampsia and eclampsia conducted in the department of Obstetrics and Gynecology at a tertiary health centre. Study period was from first of May 2016 to 31st of March 2020 .All the patients admitted in Labor room emergency were included in the study, making total number of 33,267 admissions in 47 months.

Data sources and management

All the records of patients admitted were reviewed. All the data were arranged monthwise on Microsoft excel 2010·Ink , and calculations were done on this spreadsheet. Monthly data were divided into two groups : Hot weather group[N = 11] comprising of months with average maximum temperature >30ºC and Cold weather group[N=9] comprising of months with average maximum temperature ≤ 18ºC. Data for maximum average temperature for each month and global annual temperature was collected from weather website[3,4]. Temperature range for Hot and Cold weather were in accordance with World Health Organization[5].

Definitions and Measurements

Preeclampsia + Eclampsia case rate is total number of preeclampsia and eclampsia cases per 100 LRE admissions. Preeclampsia was defined as hypertension (≥140/90 mmHg) and proteinuria after 20 weeks of gestation or hypertension plus the involvement of one organ or system in women with previously normal blood pressure[6]. Eclampsia was diagnosed as the presence of new-onset grand- mal seizures in women with preeclampsia[6].

Data analysis

Statistic tests used were Chi-square.

Results:-

Overall number of total admissions in the whole sample was 33,267 with incidence of pre-eclampsia and eclampsia cases 2.8%(927/33267). Number of admissions per month (mean) as compared to whole sample (707.8) was lower in Hot weather(676) and Cold weather(685) groups.

Year wise incidence of preeclampsia and eclampsia was 2.72%(163/5980) for 2016, 2.68%(232/8632) for 2017, 2.3% (199/8551) for 2018 , 3.29% (273/8393) for 2019 and 3.31% (60/1811) for the year 2020.

Applying Chi-square showed there was no significant effect of hot weather on incidence of pre-eclampsia and eclampsia cases ($p > 0.05$) while significant effect of cold weather was seen leading to increased incidence of pre-eclampsia and eclampsia cases ($p < 0.05$).

Chi sqare for eclampsia incidence diff in hot and cold weather is 7.1786, p value is 0.007378. Chi sqare for admission per month diff in hot and cold is 12.4055 and p-value is 0.000428

Table 1:-

Case Group 1: Months With Hot Weather (Maximum Avg. Temperature > 30°c) (N = 11)

Months	Admissions	Preeclampsia + Eclampsia cases	Preeclampsia + Eclampsia case rate
May-16	660	11	1
Jun-16	660	16	2
Aug-16	881	27	3
Apr-17	588	14	2
May-17	666	24	3
Jun-17	637	16	2
May-18	662	8	1
Jun-18	611	9	1
Jul-18	776	22	2
May-19	666	16	2
Jun-19	626	26	4

Table 2:-

Case Group 2 : Months With Cold Weather(Maximum Avg. Temperature ≤ 18°C) (N = 9)

Months	Admissions	Preeclampsia + Eclampsia	Preeclampsia + Eclampsia rate
Dec-16	646	24	3
Jan-17	685	18	2
Dec-17	729	25	3
Jan-18	687	19	2
Dec-18	722	27	3
Jan-19	737	21	2
Dec-19	699	25	3
Jan-20	640	30	4
Feb-20	621	17	2

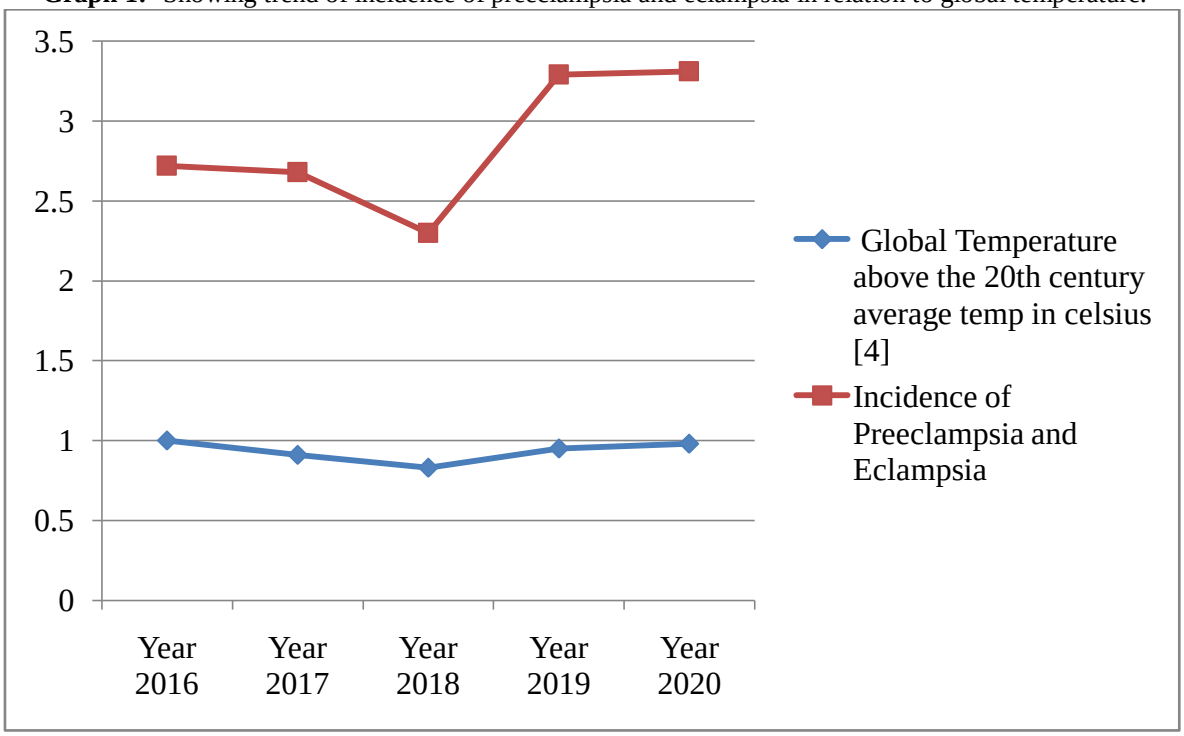
Table 3 :-Chi-square(X^2) & p-value calculation and Mean(μ) & Standard deviation(σ) comparison of groups with whole sample.

Groups	Admissions	Preeclampsia + eclampsia rate
Overall **N= 47** **(whole sample)**	n= 33267 μ = 707.8 σ = 99.57	2.8% (927/33267) μ= 2.3 σ = 1.02
Hot weather **N = 11**	n = 7433 μ = 675.73 σ = 83.02 x^2 = 804.68 p < 0.00001	2.5% (189/7433) μ = 2.09 σ = 0.94 X^2= 1.2841 P =0.25714
Cold weather **N = 9**	n = 6166 μ = 685.1 σ = 41.61 x^2 = 1083.68 p<0.00001	3.3% (206/6166) μ = 2.7 σ = 0.71 X^2= 5.3884 P = 0.020271

μ= mean for N numbers of values in each group(n/N).
σ = standard deviation.
X^2= Chi square value.
N= number of months in each group.
n = total number of patients in various category of each group.

Chi square value has been computed by 2×2 contingency table of each group with that of whole sample.
All values may vary due to rounding of figures used for calculation.

Graph 1:- Showing trend of incidence of preeclampsia and eclampsia in relation to global temperature.



Discussion:-

The incidence of preeclampsia and eclampsia was similar to other study done in low middle income countries[7].There was also significant increase in cases of preeclampsia and eclampsia(nearing delivery , at delivery or post- delivery) during Cold weather, findings were similar to other studies[8,9,10]. This warrants special care and blood pressure monitoring for maternal patients conceived in warm climate as they will spend their maximum part of gestation period during hot and moderate months while their expected date of delivery will be in December and January(cold months).Pre-eclampsia has a complex pathophysiology, the primary cause being abnormal placentation. Defective invasion of the spiral arteries by cytotrophoblast cells is observed during pre-eclampsia. These events leading to preeclampsia start in early pregnancy during which change in environmental temperature may play a role, as evident in this study.

Conclusion:-

Trend of global warming warrants the need to study the effect of environmental changes on maternal health on large scale.

References:-

1. World Health Organization. Regional Office for Europe (1984). Health promotion : a discussion document on the concept and principles : summary report of the Working Group on Concept and Principles of Health Promotion, Copenhagen, 9–13 July 1984 (ICP/HSR 602(m01)5 p). Copenhagen: WHO Regional Office for Europe.
2. Duley L. The global impact of pre-eclampsia and eclampsia. SeminPerinatol. 2009;33:130–137. [PubMed] [Google Scholar]
3. https://www.timeanddate.com/weather/india/patna/historic Accessed 18 October 2020
4. https://www.ncdc.noaa.gov/sotc/global/202013
5. World Health Organization 2018. WHO housing and health guidelines. [Google Scholar]

6. American College of Obstetricians and Gynecologists. Hypertension in pregnancy. Report of the American College of Obstetricians and Gynecologists' task force on hypertension in pregnancy. Obstetrics and gynecology. 2013 Nov;122(5):1122. [Google Scholar]
7. Magee LA, Sharma S, Nathan HL, Adetoro OO, Bellad MB, Goudar S, Macuacua SE, Mallapur A, Qureshi R, Sevene E, Sotunsa J. The incidence of pregnancy hypertension in India, Pakistan, Mozambique, and Nigeria: A prospective population-level analysis. PLoS medicine. 2019 Apr 12;16(4):e1002783. [Google Scholar]
8. Shashar S, Kloog I, Erez O, Shtein A, Yitshak-Sade M, Sarov B, Novack L. Temperature and preeclampsia: Epidemiological evidence that perturbation in maternal heat homeostasis affects pregnancy outcome. Plos one. 2020 May 18;15(5):e0232877. [Google Scholar]
9. Xiong T, Chen P, Mu Y, Li X, Di B, Li J, Qu Y, Tang J, Liang J, Mu D. Association between ambient temperature and hypertensive disorders in pregnancy in China. Nature Communications. 2020 Jun 10;11(1):1-1. [Google Scholar]
10. Tam WH, Sahota DS, Lau TK, Li CY, Fung TY. Seasonal variation in pre-eclamptic rate and its association with the ambient temperature and humidity in early pregnancy. Gynecologic and obstetric investigation. 2008;66(1):22-6. [Google Scholar].