HYPERTENSIVE DISORDERS IN PREGNANCY AND RISK OF CARDIOVASCULAR DISEASES IN INDIAN WOMEN

BACKGROUND:

Pregnancy induced hypertension develops during the second half of pregnancy, usually after the 20th week, and in women over age 40, but it can also develop at the time of delivery. Chronic hypertension is defined as *"systolic BP of 140 mmHg and higher, and a diastolic BP of 90 mmHg and higher"*. When hypertension is first identified during pregnancy, and she is at less than 20 weeks of gestation, blood pressure elevations usually signify chronic hypertension. If symptoms like protein in urine, visual disturbance in daylight blood changes and other problems are experienced then the patient is likely to be diagnosed with preeclampsia and further in severe cases it can be seen to effect the brain activities and cause seizures which is called eclampsia (B. Sibai, Dekker, & Kupferminc, 2005). Evidence shows that discrete pathophysiological changes begin from the moment fertilization takes place, and if delivery does not take place, these changes lead to the involvement of multiple organs and present with dangerous clinical signs in both the mother and fetus (Cunnigham et al., 2010). The fetuses of hypertensive mothers are also at higher risks, such as premature delivery, placental abruption, stillbirth, and neonatal death (De-Cherney et al., 2012). PIH can prevent the placenta from getting enough blood. If the placenta doesn't get enough blood, the baby gets less oxygen and nutrition. This can cause low birth weight, retardation and other problems for the baby. The condition of eclampsia (PIH with seizures), which is very serious for the mother and baby. Fortunately, if PIH is detected early in women who get regular prenatal care, and most problems can be prevented and cause fewer complications to both mother and the baby. PIH affects approximately 1 out of every 14 pregnant women all over the world, and every year it causes 50,000-60,000 pregnancy related death. According to NFHS-3 (2005-06) India, only 1,118 women, (2.17%) reported symptoms suggestive to preeclampsia and 458 women contributing 0.89% reported symptoms suggestive to eclampsia which increased to a percentage of 4.78% (12,420) with symptoms of preeclampsia and 2.76% (7,167) women reporting symptoms of eclampsia in NFHS-4.

It is evident from some studies that hypertensive disorder in pregnancy is an under-recognized risk factor for development of cardiovascular disease (CVD). Compared with women who have had normotensive pregnancies, those who are hypertensive during pregnancy are at greater risk of cardiovascular and cerebrovascular events and have a less favorable overall risk profile for CVD years after the affected pregnancies. Hypertension in pregnancy could induce long-term metabolic and vascular abnormalities that might increase the overall risk of CVD later in life.(Garovic & Hayman, 2007) A history of preeclampsia

should be considered when evaluating the risk of cardiovascular disease in women. This association might reflect a common cause for preeclampsia and cardiovascular disease, or an effect of preeclampsia on disease development, or both. (Bellamy et al., 2007).

DATA AND METHODOLOGY:

Cross-sectional data from the fourth round of the National Family Health Survey (NFHS-4, 2015–2016), India's Demographic & Health Survey (DHS), was used for the analysis. The National Family Health Survey (NFHS) is a large-scale, multi-round survey conducted in a representative sample of households throughout India. All National Family Health Surveys have been conducted under the stewardship of the Ministry of Health and Family Welfare, Government of India, with the International Institute for Population Sciences, Mumbai, serving as the nodal agency. ICF International (formerly Macro International), Maryland, USA, provided technical assistance for all four surveys conducted as on date. The survey is approved by the ethics boards of the implementing agencies in the states of India from where the data has been collected and by the ministry of health and family welfare, the government of India.

NFHS-4 employed an interviewer-administered questionnaire in the native language of the respondent to collect demographic and health information, resulting in a nationally representative probability Sample of 699,686 women of 15 to 49 years of age. All states of India are represented in the data. To assess symptoms of Preeclampsia or Eclampsia, the study was restricted to the sample to those women who had a birth in the five years preceding the survey. Last five years data was considered both to minimize recall bias and in order to draw on iron and folic acid supplementation and antenatal care (ANC) measures, which were only available for only the most recent pregnancy. This resulted in a final sample size of 259,627 participants.

OUTCOME VARIABLE:

To assess the number of women suffering from heart disease, self-reported data were collected asking the women if they currently have any heart disease. The response were collected in '*Yes*', '*No*' and '*Don't know*'.

PREDICTOR VARIABLES:

Predictor variables: Since the etiology of Preeclampsia or Eclampsia is unknown, it is possible that its onset is influenced by maternal, socio demographic and health-related factors. In order to adjust for this, three groups of potential confounders were controlled for.

Maternal Factors: Categorical measures of age (less than 20 years, 20-30 years, and 30 years and above) and birth interval (less than 2 years, 2–3 years, 3 years or more) and a dichotomous indicator of type of pregnancy (single, multiple). Parity (first, second, third, four and above); termination of pregnancy (Yes, No); anemia level (not anemic, mildly anemic, moderately anemic, and severely anemic); were included. In India, nearly 80% of the pregnant women receive iron and folic acid supplement through antenatal care (ANC) and other means of health services. ANC for maternal and child health, thus considered as a controls for self-reported utilization of ANC (a categorical measure of the visit, whether she visited ANC or not) was included.

Behavioral Factors: Existing literature have demonstrated that women with preeclampsia have a higher rate of pre-gestational hypertension and overweight or obese body mass index (BMI). Following this, a Asian Population standard BMI (kg/m2) measure, categorized as underweight (less than 18.5 kg/m2), normal (18.5 to 22.9 kg/m2),overweight (23.0 to 24.9 kg/m2), and obese (more than 25.0 kg/m2) was included. While maternal smoking increases the risk of a number of pregnancy complications, smoking has consistently been shown to reduce the risk of Preeclampsia by approximately 30% in western studies. In NFHS-4, participants were asked four yes/no questions to find out the current smoking status of the women whether she smoke bidis, cigarette, cigars and other tobacco. The number of women using chewing or smokeless tobacco was obtained referring to the response of 'yes' to the use of chew, snuff, or other local smokeless tobacco products currently. As some studies have found an association between prenatal alcohol consumption and preeclampsia, a dichotomous indicator of current alcohol use was constructed. Several studies also suggest that diabetic and asthmatics, particularly those who are symptomatic during pregnancy, may be at a greater risk of developing Preeclampsia. Thus a dichotomous indicator of self-reported asthma is included in the analysis.

Socioeconomic Factors. In order to reduce the risk of unobserved homogeneity in the models a variety of socio-demographic controls was included. Religion was categorized into Hindu, Muslim, Christian and other/missing (Sikhs Buddhist, Jain, Jewish, Zoroastrian etc.). Caste was categorized in scheduled caste, scheduled tribe, other backward class (NFHS-4 classification; hereafter referred to as disadvantaged class), general, and others with missing. As education is the key to reduce many risk factors a categorical indicators of maternal education (no education, primary, secondary, and higher) was included. The Household wealth Index is categorized into five quintiles following the standard DHS index of household assets. Place of residence as defined in DHS was either urban or rural. To account for differences geographical factors and dietary preferences, and other factors which may vary regionally, geographic regions was classified into six zones: north, northeast, central, east, west and south.

Dietary diversity used was a proxy of dietary intake. WHO has identified 8 broad categories of food (pulses, legumes and nuts, roots and tubers, egg, fish, flesh foods, milk and curd, vegetables and fruits. The women having at least four types of food from the defined categories were considered to be having accessed to adequately diversified food, women having less than four types of food and all other self-reported frequencies (weekly, occasionally, never) was considered inadequate. The dietary diversity of the women at the time of survey was taken as a proxy measure of diet diversity during pregnancy. The other exposer variable used IFA (iron and folic acid) supplement was obtained from self-reported data from the women.

RESULTS:

The study has found that women with preeclampsia are at greater risk of developing the cardiovascular diseases later in life as compared to the women who don't have any hypertensive complication during pregnancy. 1.62% of women with symptoms of preeclampsia developed cardiovascular diseases which is 0.79% among the women not showing preeclampsia symptoms. (Pearson chi square 235.021, P<0.0001). Among the women not suffering from eclampsia 0.8% reported heart disease and among the eclamptic women 1.81% reported of having heart disease. So women who don't have eclampsia had a lower likelihood of developing cardiovascular diseases. (Pearson chi square 161.489, P<0.0001).

In the unadjusted analysis (model 1), the likelihood of having cardiovascular diseases was significantly higher among women who reported Preeclampsia (OR 2.59, 95% CI 2.28 to 2.94; p<0.0001) as compared to those who did not report these symptoms. The model 2 shows adjusted model for selected control variables. Controlling for diet intake, BMI, tobacco smoking, alcohol intake, parity, birth interval, pregnancy type, wealth index, age, education and geographic region the association remained positive, strong and significant for Preeclampsia. (OR 2.01, 95% CI 1.75 to 2.32, P<0.0001).

The result of multivariate regression model shows that women with Eclampsia symptoms are more likely to develop cardiovascular diseases later in life, (OR 2.67; 95% CI 2.28 to 3.13; p<0.0001). The effect of Eclampsia on cardiovascular diseases remained virtually unchanged after controlling the background variables in model 2. (OR 2.05, 95% CI 1.72 to 2.45, P<0.0001).

CONCLUSIONS:

The study has provided an evidence that Hypertensive Disorder in Pregnancy is associated with development of cardiovascular diseases in later life. A patient with Preeclampsia and Eclampsia during pregnancy should be considered more seriously by the physician for further testing for probable heart diseases. The association was seen to be positive and significant even after controlling the possible background variables. The women diagnosed with Preeclampsia and Eclampsia should be followed and provided proper guidance and counselling for better management of probable cardiovascular diseases in future. Enhancing the awareness about proper lifestyle, healthy diet and medical check ups would provide an opportunity to prevent the probability of development of the cardiovascular diseases among the preeclampctic and eclampctic women.