

"The Familial Factor in Toxemia of Pregnancy" (1968), by Leon C. Chesley, et al. [1]

By: Patel, Sarah Keywords: [Preeclampsia](#) [2] [Hypertension](#) [3] [Pregnancy](#) [4]

In the 1950s and 1960s, researchers Leon Chesley, John Annitto, and Robert Cosgrove investigated the possible familial factor for the conditions of preeclampsia and eclampsia in pregnant women. Preeclampsia and eclampsia, which are related to high blood pressure, have unknown causes and affect at least five percent of all pregnancies. The researchers, who worked at Margaret Hague Maternity Hospital in Jersey City, New Jersey, used hospital patient records to find and reexamine women who had eclampsia at the hospital, as well as their daughters, sisters, daughters-in-law, and granddaughters. Chesley and colleagues found that the daughters and granddaughters of eclamptic women were more likely than the female offspring of non-eclamptic women to have preeclampsia and eclampsia in their own pregnancies, and especially in their first pregnancies. The study provided evidence that the disorders are inherited, enabling physicians to better monitor pregnancies in women who have a known family history for preeclampsia and eclampsia.

Up to the mid-1900s, preeclampsia and other conditions related to blood pressure were often classed as toxemia of [pregnancy](#) [5], and physicians diagnosed pregnant women with toxemia largely based on the existence of high blood pressure. However, in 1956 Chesley noted that preeclampsia also required combined symptoms of swelling and high levels of protein in the urine.

The complications of preeclampsia can cause damage to a number of organs in the mother and [fetus](#) [6], and can prevent sufficient blood flow to the [fetus](#) [6]. Unmanaged cases of preeclampsia can progress to eclampsia, which is associated with convulsions and seizures that can result in preterm delivery, coma, or death. Doctors usually induce labor or suggest cesarean sections, in which they surgically remove the [fetus](#) [6], if symptoms from preeclampsia or eclampsia become severe enough to cause long-term damage.

Prior to Chesley and his colleagues' study, in 1960 researcher John O'Neal Humphries had investigated the familial factor for preeclampsia and eclampsia at The Johns Hopkins University School of Medicine in Baltimore, Maryland. He analyzed the cases of one hundred women with preeclampsia, two hundred women with normal pregnancies, and the daughters of women in both groups. Humphries found that the daughters of women who had symptoms of preeclampsia had higher incidences of preeclampsia in their own pregnancies. But according to Chesley and his team, Humphries diagnosed cases of maternal preeclampsia that could have been normal cases of high blood pressure, or hypertension. Chesley and his team attempted to rectify that problem in their own preeclampsia studies by using a stricter definition of the disorder: the combination of high blood pressure, swelling, and protein in the urine.

Chesley, Annitto, and Cosgrove continued Humphries' investigation of familial incidences of preeclampsia by studying the daughters, daughters-in-law, and granddaughters of eclamptic women. The research team used the same patient records as their previous 1962 publication, during which they studied only the daughters and sisters of eclamptic women. In the 1962 study, Chesley, Annitto, and Cosgrove found that preeclampsia had occurred in thirty-seven percent of sisters and twenty-seven percent of daughters from the group of eclamptic women. The percentages show higher incidences of preeclampsia in familial relations than in the rest of the population.

Chesley, Annitto, and Cosgrove used that evidence from 1962 and evidence from twenty-six previous studies by other researchers to improve the methods of their 1968 study. They studied more women and new relations, granddaughters and daughters-in-law. They used daughters-in-law as a control because the daughters-in-law were not related to the daughters of the eclamptic women, but likely shared similar environments, ages, and social status. The researchers aimed to see if the experimental group, daughters and granddaughters, had higher rates of preeclampsia than the control group, the daughters-in-law.

Another difference between the 1962 and 1968 studies was that the research team in 1968 focused on first successful pregnancies of the women compared to later pregnancies. The team specifically analyzed first pregnancies because of new evidence in 1964 by researcher Charles McCartney in Chicago, Illinois. McCartney's research suggested that in first pregnancies, combined symptoms of hypertension, swelling, and high levels of protein in urine were likely to be preeclampsia, whereas those symptoms in later gestations were less likely to be preeclampsia.

After finalizing their methodology, Chesley, Annitto, and Cosgrove used state records and hospital records to find the offspring of 268 eclamptic women who were treated and successfully delivered at Margaret Hague Maternity Hospital between 1931 and 1951. The research team traced those women until 1966, finding medical records for their daughters, daughters-in-law, and granddaughters. In addition, the researchers used patient records of seventy-eight women who died from eclampsia during the 1931 to 1951 period and found their surviving children. They used the hospital charts of the offspring to find the incidence of

preeclampsia and eclampsia by relying on physicians' diagnoses and recordings of blood pressures, urine analyses, and possible swelling.

Following the data collection, Chesley, Annitto, and Cosgrove found that between 1931 and 1951, the original group of eclamptic women had 363 daughters total. The researchers analyzed 426 pregnancies of the daughters and found the incidence of eclampsia in the daughters' first pregnancies to be one in 62 and the incidence of eclampsia in all of their pregnancies to be one in 107. According to the researchers, the rate of eclampsia in the general population at that time, using statistics from another hospital, was one in 840 pregnancies.

The results showed that the daughters of eclamptic women had an eightfold increase in the incidence of eclampsia compared to the rest of population, and the incidence of eclampsia was even higher for the first pregnancies of daughters. When comparing the first pregnancies of daughters to the first pregnancies of daughters-in-law, eight percent of the daughters-in-law had preeclampsia versus twenty-six percent of the daughters' group. The granddaughters of the eclamptic women also had higher rates of preeclampsia and eclampsia. However, the researchers only obtained sixteen hospital records regarding the granddaughters' pregnancies, a much smaller sample size compared to the daughters' pregnancies.

The research team made two other major conclusions from their study. Firstly, they found that when an eclamptic woman had two daughters, who each had their own pregnancies, the likelihood increased of at least one or both experiencing eclampsia. Secondly, the researchers noted the distinction between high blood pressure in preeclampsia and chronic hypertension in [pregnancy](#)^[5]. Whereas previous research had indicated that a familial history of hypertension increased the likelihood of a person developing preeclampsia and eclampsia, Chesley and his team disconfirmed that theory. Instead, the daughters of hypertensive women, or women who had high blood pressure before they were pregnant, had similar rates of eclampsia as the daughters of normotensive women, or women who did not have high blood pressure before their [pregnancy](#)^[5]. Moreover, according to Chesley and his colleagues, cases of chronic hypertension in pregnant woman were usually diagnosed before the twentieth week of [gestation](#)^[7], unlike preeclampsia, and did not include swelling or protein in the urine, also unlike preeclampsia.

In 1968, the team published their results as "The Familial Factor in Toxemia of Pregnancy." The study differed from former research on familial factors of preeclampsia and eclampsia, which relied on anecdotal or observational evidence in the late 1800s and early 1900s. In the article, Chesley, Annitto, and Cosgrove concluded that preeclampsia and eclampsia persist in families, though the reasons were unknown. In 1986, Chesley used the same patient data from Margaret Hague Maternity Hospital to investigate the existence of a genetic factor in the development of preeclampsia and eclampsia.

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