

## Histopathological study of placental changes associated with pre-eclampsia and eclampsia in a tertiary care centre of Puducherry

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### Abstract

**Introduction:** Foetal development mainly depends on normal placental development. Mother, Placenta and Foetus are related to each other during the course of the pregnancy. Pregnancy induced hypertension shows considerable changes in the histopathology of placenta. Therefore the main aim of the present study is to evaluate the morphological changes of placenta in case of Pregnancy Induced Hypertension (PIH) and to correlate the findings with severity of toxemia of pregnancy.

**Materials and Methods:** The present study includes 61 cases of placenta out of which 51 are in the study group and 10 cases are in the control group. Our study was descriptive study conducted in the Department of Pathology, Mahatma Gandhi Medical College and Research Institute, Sri Balaji Vidhyapeeth University, Puducherry during the period of July 2015-June 2018. The study group were further divided into four categories. All the placenta are grossed according to the institute protocol and the slides were examined for various morphological changes and correlated with the severity of pre-eclampsia and eclampsia. Descriptive statistics were used to evaluate the results.

**Results:** The most prominent lesion seen in the toxemia of pregnancy were villous cytotrophoblastic proliferation and villous fibrinoid necrosis which accounts to 78% and 75% respectively. Villous stromal fibrosis constitutes 71% of the study group cases. Increased villous vascularity was seen in 39% of the placenta of toxemia of pregnancy. 69% of the cases shows villous basement membrane thickening in the study group placenta.

**Conclusion:** Our study helps in evaluating the various morphological changes in placenta in the hypertensive disorder of pregnancy. This study helps in anticipating the occurrence of changes in the subsequent pregnancy induced hypertension cases.

**Keywords:** Pregnancy, Eclampsia, Cytotrophoblastic cell proliferation, Fibrinoid necrosis.

### Introduction

Pre-eclampsia and eclampsia are most important obstetrics disorders in concerned to fetal outcomes in pregnancy. Pregnancy Induced hypertension, a multisystem disorder related to pregnancy is characterised by gestational hypertension, proteinuria and activation of coagulation cascade with associated abnormalities in renal and hepatic function. The Foetus, placenta and mother are interrelated to each other in the course of pregnancy.<sup>1</sup> Placental health is essential for sustaining and promoting normal fetal development. Pregnancy induced hypertension affect the placenta in a significant way both grossly and microscopically.<sup>2,3</sup> The placenta is the most accurate record of the infant prenatal experiences. So it is essential to study the histopathological changes of placenta in hypertensive disorder of pregnancy and to correlate with the severity of pre-eclampsia and eclampsia.

### Aims and Objectives

1. To evaluate the morphological changes of placenta in Pregnancy Induced Hypertension (PIH).
2. To correlate the histopathological changes of placenta with the severity of toxemia of pregnancy.

### Materials and Methods

This study has undertaken to evaluate the histopathological changes of placenta in a hypertensive disorder of pregnancy. All the cases of placenta with hypertensive disorder of pregnancy received in the Pathology Department of Mahatma Gandhi Medical College

and Research Institute, Sri Balaji Vidhyapeeth University, Puducherry during the period of July 2015-June 2018.

The study material consists of placenta collected after the Normal or induced delivery of women clinical diagnosed as Grade I (16 cases), Grade II (12 cases), Grade III (18 cases), Grade IV (5 cases) and Normal pregnancy (10 cases) as a control. The control group consisted of ten placenta collected from women having no bad obstetrics history, no history of bleeding during pregnancy, duration of amenorrhoea corresponded to height of uterus and had normal foetal presentation. All of these were normotensive and their haematocrit values were within normal limits.

After the delivery placenta was collected in a clean tray, placental disc, membrane and umbilical cords are subjected to both gross and histopathological study.

Placenta obtained were oriented, fixed in 10% neutral buffered formalin and routinely processed for paraffin tissue embedding. Sections were taken at 4 micron thickness and stained with Hematoxylin and eosin.

The sections were examined for various histopathological changes in placenta and correlated with the severity of pre-eclampsia and eclampsia. Descriptive statistics were used to evaluate the results.

### Results

Out of 61 placenta which were undertaken for histopathological study in the present analysis 51 cases were in the study group and 10 cases were in the control group. The distribution of cases in each group has been shown in Table 1. The percentage of histopathological changes of

placenta in different grades of toxemia has been shown in table 2 and table 3.

**Table1: Distribution of cases.**

| Study group | Toxemia of pregnancy                              | Number of cases | Percentage of Toxemic cases |
|-------------|---------------------------------------------------|-----------------|-----------------------------|
| Group I     | Mild Pre-eclampsia                                | 16              | 31%                         |
| Group II    | Severe Pre-eclampsia                              | 12              | 24%                         |
| Group III   | Eclampsia                                         | 18              | 35%                         |
| Group IV    | Eclampsia super imposed on essential hypertension | 5               | 10%                         |
|             | Total                                             | 51              | 100%                        |
|             | Control group                                     | 10              | 100%                        |

**Table 2: Distribution of histological findings of placenta.**

| S. No | Histological findings                | Percentage of cases (%) in our study | Study conducted by Das SR et al <sup>(9)</sup> |
|-------|--------------------------------------|--------------------------------------|------------------------------------------------|
| 1.    | Cytotrophoblastic proliferation      | 78%                                  | 80%                                            |
| 2.    | Villous basement membrane thickening | 69%                                  | 70%                                            |
| 3.    | Villous fibrinoid necrosis           | 75%                                  | 77.5%                                          |
| 4.    | Increased Villous vascularity        | 39%                                  | 32.5%                                          |
| 5.    | Villous stromal fibrosis             | 71%                                  | 72.5%                                          |

**Table 3:**

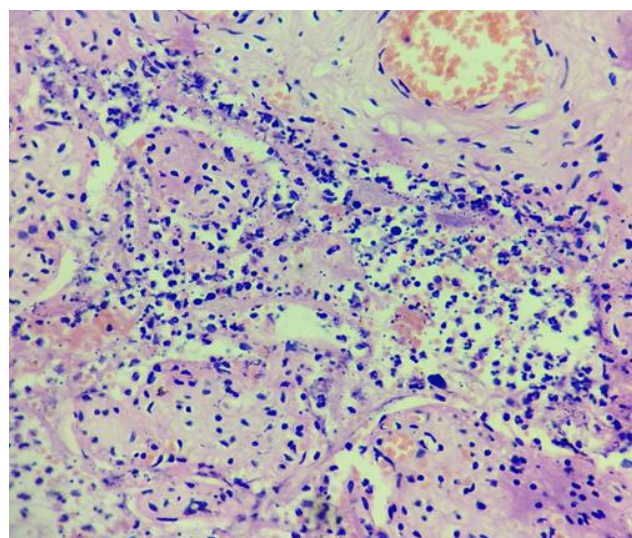
| Groups              | Cytotrophoblastic proliferation |      | Villous BM thickening |     | Fibrinoid necrosis |     | Villous Vascularity |      |       | Stromal Fibrosis |     |
|---------------------|---------------------------------|------|-----------------------|-----|--------------------|-----|---------------------|------|-------|------------------|-----|
|                     | ≤20%                            | >20% | ≤3%                   | >3% | ≤3%                | >3% | Normal              | Hypo | Hyper | ≤3%              | >3% |
| <b>I (16)</b>       | 8                               | 8    | 9                     | 7   | 8                  | 8   | 10                  | 1    | 5     | 10               | 6   |
| <b>II (12)</b>      | 3                               | 9    | 3                     | 9   | 3                  | 9   | 7                   | 1    | 4     | 3                | 9   |
| <b>III</b>          | -                               | 18   | 4                     | 14  | 2                  | 16  | 11                  | -    | 6     | 2                | 16  |
| <b>IV</b>           | -                               | 5    | -                     | 5   | -                  | 5   | 2                   | -    | 3     | -                | 5   |
| <b>Total (51)</b>   | 11                              | 40   | 16                    | 35  | 13                 | 38  | 31                  | 2    | 18    | 15               | 36  |
|                     | 22%                             | 78%  | 21%                   | 69% | 25%                | 75% | 61%                 | 4%   | 35%   | 29%              | 71% |
| <b>Control (10)</b> | 10                              | -    | 2                     | -   | 8                  | 2   | 8                   | -    | 2     | 8                | 2   |
|                     | 100%                            | -    | 20%                   | -   | 80%                | 20% | 80%                 | -    | 20%   | 80%              | 20% |

All cases of control group fell within the normal range of villi containing cytotrophoblastic proliferation, whereas 78 percentage of cases in the study group has high cytotrophoblastic cell proliferation as shown in Fig. 2.

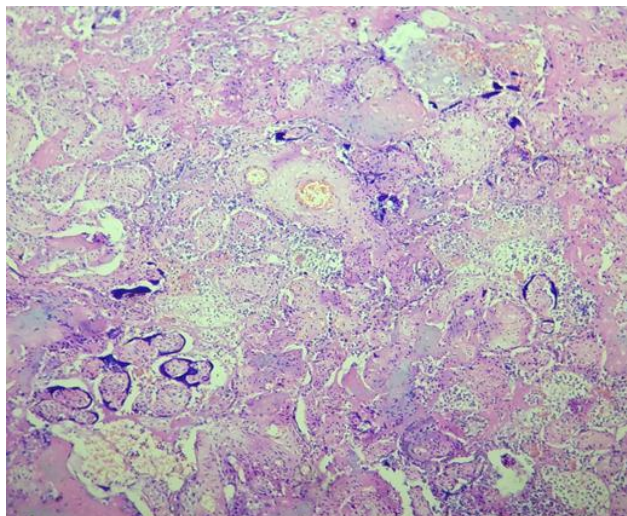
In our study 69 percentage of the study group placenta showed significant villous basement membrane thickening (in excess of 3 percent villi), while none of the placenta from the control group reveals significant basement membrane thickening. Significant villous fibrinoid necrosis was noted in 75 percent of toxemia cases of pregnancy and 25 percent cases of uncomplicated pregnancy as shown in Fig. 1.

Out of 51caes of study group, majority of placenta with severe pre-eclampsia and eclampsia superimposed on essential hypertension shows hypervascular changes in the villi. However both the control group (80%) and study group (61%) placenta shows normal vascularity. At the same time both hypo and hyper vascularity changes are appreciated in toxemia of pregnancy cases and control cases.

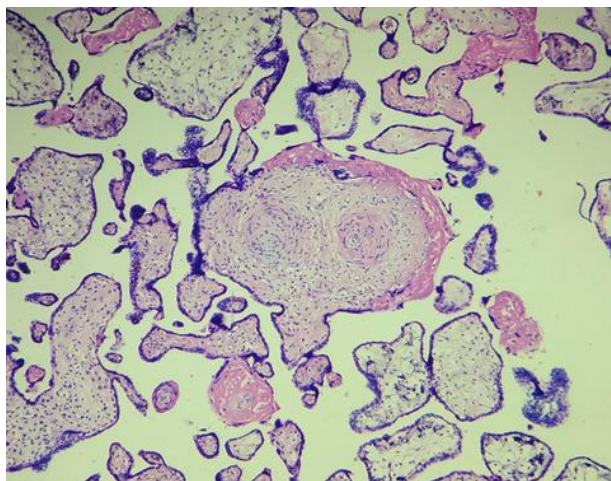
In relation to villous stromal fibrosis, 71 percentage of study group and 20 percentage of control group shows significant villous stromal fibrosis as shown in Fig. 3 & Fig. 4.



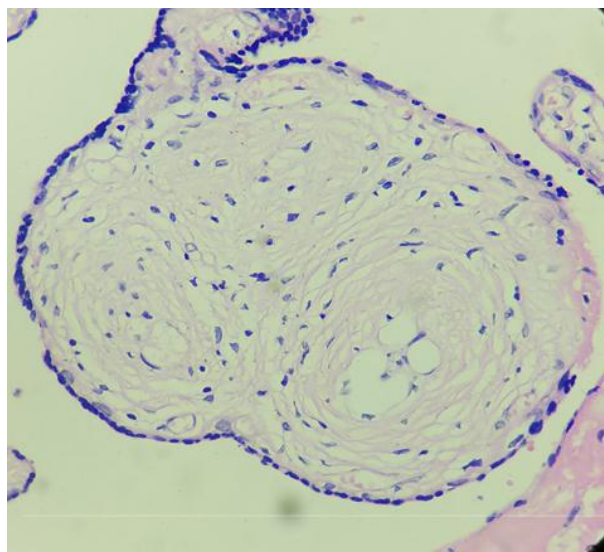
**Fig. 1: Section showing Fibrinoid necrosis. (H&E; 40 x).**



**Fig. 2:** Section showing Fibrinoid necrosis with focal cytotrophoblastic proliferation. (H&E; 10x).



**Fig. 3:** Section showing chorionic villous stromal fibrosis. (H&E; 10x).



**Fig. 4:** Section showing chorionic villous stromal fibrosis. (H&E; 40x).

## Discussion

The present study reveals the incidence of various microscopic features of placenta in toxemic pregnancy like Cytotrophoblastic proliferation, Villous basement membrane deficiency, Villous fibrinoid necrosis, Villous vascularity and Villous stromal fibrosis. Comparing the histopathological features of various grades of toxemia gives the duration and severity of the disease.

This study was undertaken to critically analyse the placental changes in various grades of toxemia of pregnancy. Villous abnormalities can be studied by histopathological methods which indirectly gives the information about the duration and severity of the disease.

In the present study out of 51 cases of placenta 78 percentage of the cases shows cytotrophoblastic proliferation (>20%), which is in concordance with the study conducted by Majumdar S et al.<sup>4</sup> Mostly the cytotrophoblastic proliferation were noticed around the infarct area which concomitantly useful to assess the severity of the disease.

In regards to vasculosyncytial membrane deficiency (<5% of villi), 69% of the study group shows membrane deficiency. Similar findings were observed in the study conducted by Pasricha N et al.<sup>5</sup>

In the aspect of fibrinoid necrosis 75% of the study group and 20% of the control group shows fibrinoid necrosis (>3%). This finding correlates with the study conducted by Narasimha A et al.<sup>6</sup> The cause for fibrinoid necrosis is mainly due to the immunological reaction within the villous cytotrophoblastic tissue. It also claimed that pregnant women with toxemia shows increased level of antitrophoblastic antibodies in the serum.

Other villous lesion like villous vascularity is increased in 35 percentage of the study group and 20 percentage of the control group, which is in concordance with study conducted by Manjunath HK et al.<sup>7</sup>

In our study there is increase in the incidence of stromal fibrosis which accounts upto 71%. Similar observation were also documented by Kher et al.<sup>8</sup> and Das S R et al.<sup>9</sup> Stromal fibrosis occurs as a result of inflammation or ischemia which indirectly attributed to decreased fetal perfusion.

## Conclusion

From the our study it confirms that the pre-eclampsia and eclampsia adversely affects the histology of placenta and helps in understanding the important causes that leads to adverse outcomes of the deliveries. The placental examination will help in understanding of the specific aetiologies and helps in preventing the recurrence in subsequent pregnancies specifically in pre-eclampsia and eclampsia cases. If this etiological mechanism is fully elucidated, more precise intervention strategies can be devised and can contribute to more effective therapies in the future.

**Conflicts of Interest:** None.

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**How to cite this article:** K Shanmugasam, Vaithy A, Samal R, R UDK., Sowmya, Histopathological study of placental changes associated with pre-eclampsia and eclampsia in a tertiary care centre of Puducherry. *Arch Cytol Histopathol Res* 2019;4(1):57-60