

MATERNAL BODY MASS INDEX AS A RISK FACTOR FOR PREECLAMPSIA

Gynaecology

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ABSTRACT

Background: Preeclampsia (PE) is a disease in pregnancy occurring after 20 weeks gestation with multiple genetic, immunologic and environmental causative factors. Obesity is a known risk factor for PE as well as cardiovascular disease

Objective: To study the role of maternal BMI in first trimester as a marker of preeclampsia.

Methods: A prospective study was carried out to evaluate the role of maternal BMI in preeclampsia. A total number of 200 women who met our selection criteria were included in the study.

Results: Among the women in the study, PE was detected in 21 women with incidence of 10.5 %. PE was seen in 4 cases out of the 113 women with BMI of ≤ 25 with incidence of 4%. 11 cases were seen out of 72 women with BMI between 26 and 30 with incidence of 15%. 6 cases were seen out of 15 women with BMI above 30 with incidence of 40 %.

Conclusion: Maternal obesity is an important risk factor for the development of PE and therefore pre-conceptional weight reduction and lifestyle modifications may help in decreasing the burden of the disease.

KEYWORDS

Preeclampsia, Obesity, BMI

Introduction:

Gestational hypertension and its complications are the most important cause of maternal and neonatal morbidity and mortality (1). Preeclampsia (PE) is a pregnancy related disorder occurring after 20 weeks gestation and can present as late as 4-6 weeks post partum. It is characterised by hypertension and proteinuria, with or without pathologic edema. There is a complex etio-pathogenesis involving several genetic, immunologic, and environmental factors. PE is known to have commonality in risk factors with cardiovascular disease including obesity, hyperlipidemia and hypertension (2, 3). In addition, women who had developed PE during pregnancy have an increased risk of developing cardiovascular disease later in life (4, 5).

Obesity has shown an alarming increasing trend in developed as well as developing nations (6). Women who are extremely obese may have fourfold risk of PE in comparison to women with normal weight (7). High body mass index is used as a marker for obesity as it is easy to calculate and widely accepted. The body mass index (BMI) or Quetelet index is calculated from the body weight and height of an individual. It is defined as the body mass divided by the square of the body height. High BMI is an important risk factor for both preeclampsia (8) and cardiovascular disease (9, 10). The risk of preeclampsia has been shown to increase with an increasing BMI, with the lowest prevalence among underweight women (7).

Materials and methods:

A prospective study was carried out to evaluate the role of maternal BMI in the first trimester as a predictor of preeclampsia. Inclusion criteria: All women who came to the antenatal OP in the first trimester and were followed up till the time of delivery. Cases of all age groups were included in the study.

Exclusion criteria: The study excluded women who did not undergo check up in the first trimester and the women who could not be followed up till the time of delivery.

The study was based on patient's clinical history, clinical examination and follow up. Informed consent was obtained. The ethical clearance for the study was obtained from the ethical committee of our institution. A total number of 200 women who met our selection

criteria were included in the study. The weight and height of the pregnant women were measured during the clinical examination and the BMI was calculated.

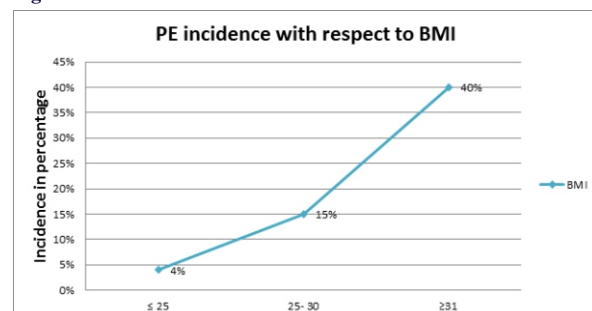
Results:

Among the 200 women who were followed up throughout the course of pregnancy, PE developed in 21 women with an incidence of 10.5 %. PE was seen in 4 cases out of the 113 women with BMI of ≤ 25 with incidence of 4%. 11 cases were seen out of 72 women with BMI between 26 and 30 with incidence of 15%. 6 cases were seen out of 15 women with BMI above 30 with incidence of 40 % (table 1). If the women were to be divided into two groups with BMI ≤ 25 and BMI of 26 and above, the incidence in these two groups was 3.5 % and 19.5%. The odds ratio was 5.6 and relative risk was 4.8 for the group with BMI above 25. An increasing risk of developing PE in women with increasing BMI was demonstrated (figure 1).

Table 1: Incidence of PE in relation to BMI

BMI	Incidence of PE
≤ 25	4%
25- 30	15%
≥ 31	40%

Figure 1.



Discussion:

The incidence of preeclampsia during pregnancy shows a varied

distribution worldwide. According to western literature, 2–7% of pregnant women may develop PE (11). According to WHO estimates, preeclampsia is believed to be seven times higher in developing countries when compared to the developed countries (12). The incidence of preeclampsia in developing countries ranges from 1.8% to 16.7% (13). The incidence of preeclampsia in the present study was 10.5 %, which is similar to that reported by other studies done in India in hospital setting by Kamala Dhall (10.6%) and Gandhi MR (11.4%) (14, 15).

The basis of the BMI was devised by Adolphe Quetelet, a Belgian astronomer, mathematician, statistician and sociologist (16). The term "body mass index" (BMI) for the ratio of body weight to squared height was first used in 1972 edition of the Journal of Chronic Diseases (17). The BMI is universally expressed in units of kg/m², resulting from mass in kilograms and height in metres. It helps to categorize a person as underweight, normal weight, overweight, or obese. Commonly accepted BMI ranges are underweight: under 18.5 kg/m², normal weight: 18.5 to 25, overweight: 25 to 30, obese: over 30. In the present study the incidence of PE in the BMI ranges of less than 25, 26- 30 and more than 30 were 4%, 15% and 40% respectively. Ganesh et al also reported higher incidence in women with BMI > 25 with odds ratio of 11 (18). ACOG technical bulletin (1996) lists an odds ratio of 3:1 for development of PE in women with high BMI (19). Wang et al in a meta-analysis showed a dose-dependent relationship between increasing BMI and risk of PE. They concluded that in comparison to women with normal weight, underweight women had the lowest risk for PE while overweight and obese women had a higher risk and severely obese women have the highest risk (20).

Maternal obesity is also associated with several adverse pregnant outcomes (21). There is considerable increased risk of stillbirth, preterm delivery, gestational diabetes mellitus and caesarean delivery (22, 23, 24, 25). Women who develop PE during pregnancy show increased risk of cardiovascular disease during their later years which is more common in women with recurrent preeclampsia, early preeclampsia or if PE develops first time in a multigravida (26). The exact role of obesity in development of PE is not clearly known but they are known to share pathological mechanisms like inflammation, oxidative stress and endothelial dysfunction (27, 28). If this pathophysiology is better understood, there is a prospect for preventing the development of PE in these individuals by pre-conceptional weight reduction and lifestyle modifications

Conclusion:

Preeclampsia is a pregnancy related disorder with significant maternal, fetal and neonatal complications. Maternal obesity is an important risk factor for the development of PE and therefore pre-conceptional weight reduction and lifestyle modifications may help in decreasing the burden of the disease. This also assumes significance in view of women with PE having increased risk of cardiovascular disease later on in life. Further research needs to be carried out to study the role of antenatal dietary, behavioural or lifestyle modifications in gravid women with high BMI to prevent PE.

REFERENCES

- Chesley LC. History and epidemiology of preeclampsia eclampsia. *Clin Obstet Gynecol* 1984; 27: 801–820.
- Sohlberg S, Stephansson O, Cnattingius S and Wikström AK. Maternal Body Mass Index, Height, and Risks of Preeclampsia. *Am J hypertension* 2012; 25 (1): 120–125
- Berends AL, de Groot CJ, Sijbrands EJ, Sie MP, Benneheij SH, Pal R, Heydanus R, Oostra BA, van Duijn CM, Steegers EA. Shared constitutional risks for maternal vascular-related pregnancy complications and future cardiovascular disease. *Hypertension* 2008; 51:1034–1041.
- Magnussen EB, Vatten LJ, Smith GD, Romundstad PR. Hypertensive disorders in pregnancy and subsequently measured cardiovascular risk factors. *Obstet Gynecol* 2009; 114:961–970.
- Smith GC, Pell JP, Walsh D. Pregnancy complications and maternal risk of ischaemic heart disease: a retrospective cohort study of 129,290 births. *Lancet* 2001; 357:2002–2006
- WHO Consultation on Obesity. Obesity: preventing and managing the global epidemic. WHO Technical Report, World Health Organization: Geneva 2000; Series 894:1–253.
- Bodnar LM, Ness RB, Markovic N, Roberts JM. The risk of preeclampsia rises with increasing prepregnancy body mass index. *Ann Epidemiol* 2005; 15: 475–482.
- Ros HS, Cnattingius S, Lipworth L. Comparison of risk factors for preeclampsia and gestational hypertension in a population-based cohort study. *Am J Epidemiol* 1998; 147:1062–1070.
- Klein S, Burke LE, Bray GA, Blair S, Allison DB, Pi-Sunyer X, Hong y, Eckel RH. Clinical implications of obesity with specific focus on cardiovascular disease: a statement for professionals from the American Heart Association Council on nutrition, physical activity, and metabolism: endorsed by the American College of Cardiology Foundation. *Circulation* 2004; 110(18):2952–2967.
- Lamon-Fava S, Wilson PW, Schaefer EJ. Impact of body mass index on coronary heart disease risk factors in men and women. The Framingham Offspring Study. *Arterioscler Thromb Vasc Biol* 1996; 16:1509–1515

- K. Villar, "Eclampsia and pre-eclampsia: a health problem for 2000 years," in Preeclampsia, H. Critchley, A. MacLean, and L. Poston, Eds., pp. 189–207, RCOG Press, London, UK, 2003.
- WHO. Make every mother and child count, in The world health report 2005. Geneva, Switzerland: World Health Organization; 2005.
- Public Health Perspectives of Preeclampsia in Developing Countries: Implication for Health System Strengthening. *J Pregnancy*. 2011; 2011: 481095.
- Kamala Dhall. Epidemiology of Preeclampsia and Eclampsia. *J of Obs & Gyn Research*. 1984; 10(1) : 89-93
- Gandhi MR, Jani PS, Patel UM, Kakani CR, Thakor NC, Gupta N. Perinatal outcome in pregnancy induced hypertension cases at GMERS Medical College, Dharpur-Patan, North Gujarat region, India: a prospective study. *Int J Adv Med*. 2015; 2(2): 152-155
- Eknoyan, Garabed (2007). "Adolphe Quetelet (1796–1874)—the average man and indices of obesity". *Nephrology Dialysis Transplantation*. 23 (1): 47-51
- Blackburn, Henry; Jacobs, David (2014-06-01). "Commentary: Origins and evolution of body mass index (BMI): continuing saga" (PDF). *International Journal of Epidemiology*. 43(3): 665–669.
- Kumar S Ganesh, B Unnikrishnan, I K Nagaraj, 1 and S Jayaram2. Determinants of Preeclampsia: A Case-control Study in a District Hospital in South India. *Indian J Community Med*. 2010 Oct-Dec; 35(4): 502–505.
- American College of Obstetricians and Gynecologists. Hypertension in pregnancy. ACOG Technical Bulletin No. 219. Washington DC: 1996.
- Wang Z, Wang P, Liu H, He X, Zhang J, Yan H, Xu D and Wang B. Maternal adiposity as an independent risk factor for pre-eclampsia: a meta-analysis of prospective cohort studies. *Obesity Reviews*. 2013 Jun; 14(6):508-21.
- Begum KS, Sachchithanantham K, De Somsubhra S. Maternal obesity and pregnancy outcome. *Clin Exp Obstet Gynecol* 2011; 38: 14–20
- Chu SY, Kim SY, Lau J et al. Maternal obesity and risk of stillbirth: a metaanalysis. *Am J Obstet Gynecol* 2007; 197: 223–228.
- McDonald SD, Han Z, Mulla S, Beyene J. Overweight and obesity in mothers and risk of preterm birth and low birth weight infants: systematic review and meta-analyses. *BMJ* 2010; 341: c3428.
- Chu SY, Callaghan WM, Kim SY et al. Maternal obesity and risk of gestational diabetes mellitus. *Diabetes Care* 2007; 30: 2070–2076.
- Chu SY, Kim SY, Schmid CH et al. Maternal obesity and risk of cesarean delivery: a meta-analysis. *Obes Rev* 2007; 8: 385–394.
- Kannam JP, Levy D, Larson M, Wilson PW. Short stature and risk for mortality and cardiovascular disease events. The Framingham Heart Study. *Circulation*. 1994; 90:2241–2247
- Trogstad L, Magnus P, Stoltenberg C. Pre-eclampsia: risk factors and causal models. *Best Pract Res Clin Obstet Gynaecol* 2011; 25: 329–342.
- Catalano PM. Obesity, insulin resistance, and pregnancy outcome. *Reproduction* 2010; 140: 365–371