Prophetic Utterance of Risk Factors for Pre-Eclampsia in at risk Primigravid Mothers

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Abstract

Introduction: Pre-eclampsia represents a major cause of maternal morbidity and morbidity in many parts of the world. *Objective:* To assess the prevalence of pre-eclampsia among at risk primi gravid mothers. *Methods:* A prospective longitudinal observational research design was used.120 at risk primigravid mothers for pre-eclampsia, who fulfilled the inclusion criteria, were selected by proportionate stratified random sampling. *Results:* It was observed that 31(30%) out of 103 of the at risk primigravid mothers developed preeclampsia. 11(33%) out of 33 mothers in Group A (age < 18 years), 10(28.5%) out of 35 mothers in Group B (age>30 years) and Group C (mothers with pre-pregnancy BMI>27.5 (obese) developed preeclampsia. Mothers of age > 30 years in group B developed severe pre-eclamptic features as early as 24 weeks of gestation. Educational qualification and socio-economic status was found to have statistical significant association with the level of pre-eclampsia at $p<0.05$ level. *Conclusion:* The underlying evidence base of the at risk factors in the study could be targeted at booking, so that a suitable surveillance and prophylactic strategies for pre-eclampsia could be developed.

Keywords: Clinical Parameters; Pre-Eclampsia; PrimiGravid Mothers; Prevalence; Risk factors.

Introduction

Hypertension is the most common medical problem encountered during pregnancy. Pre eclampsiais a multi system disorder, clinically determined by identification of hypertension and proteinuria,in previously normotensive women after 20 weeks of gestation. Pre-eclampsia may be mild or severe, (Dutta 2004) [1] and associated with edema when left untreated, it could progress to eclampsia, thereby resulting in life threatening convulsions or coma.

Pre-eclampsia, which affects 5%–10% of pregnancies, is a common obstetric complication, leading to maternal and prenatal morbidity and mortality in both developed and developing countries. The prevalence of PE in developing countries has been estimated as 1.8%–16.7%, with at least 16% of maternal deaths [2].

World Health Organization estimates the incidence of new cases of pre-eclampsiato be seven times higher in developing countries (2.8% of live births) than in developed countries (0.4%). (KayodeO.et al, 2011), Understanding the mechanism of pre-eclampsia as

well as assessing early risks is stilla major challenge. According to KaajaR (2008) risk factors of pre-eclampsia include nulliparity, history of pre-eclampsia, pre-existing diabetes, increased body mass index (BMI), increased maternal age, adolescent pregnancy and low socioeconomic status.

However, the prevalence is commonly cited to be about 7.0 % in nulliparous women, termed as disease of first pregnancy.(Roberts,2008) Funai et al. (2005) found that pre-eclampsiais found to be 2.5% more in first births compared with all later birth order groups.

Study results have been consistent across continents for these particular risk factors:

i. Age is an important factor for developing pre-eclampsia.According to Hansen, Women over 35 years of age have 2 to 4 fold higher risk than the younger women. (Magpie trial collaborative group, 2002).

ii. Researchers have reported in their studies that, pre-eclampsia is one among the major complications presented in adolescent pregnancy. Adolescent pregnancy increases the complication of pregnancy, whose demand for calcium exceeds that of a pregnancy adult because of continued maternal bone mineralization.(WHO, 2000).

iii. By epidemiologic reviews 2004, large prospective study showed that women with pre pregnancy weight in kg/ height(m^2) greater than 25.8 had 2.7 times higher risk of developing pre-eclampsia than, those with an Index of 18.9 – 25.8. As a result it is proved, that obese women may develop pre-eclampsia. (Gadalla F et al, 2002).

Screening for women at risk of pre-eclampsia is an important part of antenatal care.Once women have been identified as high risk, they can be targeted for more intensive antenatal surveillance and prophylactic interventions can be developed.

Hence, the investigator took the study to assess the prevalence of pre-eclampsia among at risk primi gravid mothers (age < 18 years, age > 30 years & mothers pre pregnancy BMI > 27.5 kgm^2- obese) for developing pre-eclampsia. Keeping in mind, identifying pregnant women at risk for pre-eclampsia, at booking, adding a suitable surveillance routine to the known risk factors & defining specific interventions to prevent the condition is always a definite advantage and a welcoming step rather than looking at sobering statistics of the condition.

Objectives

◆ To assess the prevalence of pre- eclampsia among at risk primigravid mothers.

◆ To associate the prevalence of pre- eclampsia among at risk primigravid mothers with their selected socio demographic variables.

Materials and Methods

Prospective longitudinal observational research design was used to assess the prevalence of pre-eclampsia among at risk primigravid mothers for pre-eclampsia. Study was conducted at Government hospital, Tambaram. 120 at risk primigravid mothers for pre-eclampsia who fulfilled the inclusion criteria were selected by proportionate stratified random sampling. The specified at risk primigravid mothers were grouped together as homogeneous subsets based on their risk factors for developing pre-eclampsia (mothers with age < 18 years, mothers with age > 30 years & mothers pre pregnancy BMI > 27.5 kgm^2-obese), the attribute used for stratification of the selected samples.The sample size calculation was computed by power analysis based on the pilot study. On the basis of the pilot study results, 94 samples were required for the study. Considering the attrition rates of 20%, it was rounded to 120 samples.

Inclusion criteria includes primigravid mothers with singleton pregnancy, selected at 15–16 weeks of gestation by ultrasonography, with absence of pre-eclamptic features (B.P < 140/90 mm of Hg, Aproteinuria), and were in the lower middle, upper lower, lower socioeconomic status according to Kuppuswamy scale (Kumar et al , 2007) at the time of selection of samples. Exclusion criteria included mothers with medical or obstetric complications, family history of pre-eclampsia, who delivered before 37 completed weeks of gestation, who practiced any specific exercises or regular antenatal exercises and with extra calcium supplementation. The study protocol was approved by the institutional review board and the ethical committee. Informed verbal and written consent were obtained from all participants. These participants were requested to voluntarily participate in this study.

Tool Used for the Study

Section-A: Structured questionnaire to assess the socio demographic variables of the at risk primi gravid mothers for pre-eclampsia

The socio-demographic data includes age, education, occupation, religion, type of work, type of family, socio economic status, pre pregnancy Body

Mass Index (BMI). Variables were assessed by interview schedule in the local language and information retrieval through antenatal records by the investigator.Variables like age, occupation, pre pregnancy BMI, socio economic status, and type of family were matched in both the groups.Validity was obtained from experts in the respective fields.

Section B: Tool for surveillance of pre-eclamptic features among at risk primi gravid mothers for pre-eclampsia

The tool for surveillance of pre- eclamptic features consists of 5 items that assesses the clinical parameters for pre-eclampsia (systolic blood pressure, diastolic blood pressure, proteinuria, oedema, weight gain).

As per a published protocol, (Levine J et al, 2012) blood pressure was measured with a standard mercury sphygmomanometer by placing the mother in a seated position after a rest for 3–5 min. Blood pressure readings that coincided with the timing of the first (systolic) and fifth (diastolic) Korotkoff (K) sounds were recorded.These measurements were recorded one minute apart, and the results were average (E.O Brien et al , 2010).Hypertensive BP readings were repeated after 5–10 min. On elevation of subsequent readings, hypertension was confirmed and classified on a scale.

Clean-catch midstream-voided urine specimen were collected to measure protein using a dipstick assay by TC (Techo diagnostics, US) urine reagent Strips (URS) 2P for protein and glucose which produces a color change in presence of protein.Dipstick measurement indicates proteinuria of 1+ (30mg/dl). Protein is considered significant in diluted urine (specific gravity, 1.005–1.015) and 2+(100 mg/dl). Protein is considered significant in a concentrated sample (Specific Gravity>1.015) in absence of urinary infection (Kaplan, 1997).

Assessment of edemawas done by pressing & holding a finger firmly for 5 – 10 seconds against edematous area over a bony area in the ankle. The extent of induration was noted by a standardized tape, by the investigator which was graded on a four point grading scale (Kozier 2008). Measurement of ≥ 2+ in the edema scale is considered significant for pre-eclampsia.

By using a standardized measurement technique of weighing & with regularly calibrated and certified weighing scale, the weight of the at risk primi gravid mothers were monitored. Weight is measured to the nearest 0.5 kg with the mothers standing motionless on the weighing scale, feet about 15 cm apartand weight equally distributed on each leg. Maternal

Weight gain in kilogram was measured while women wearing light garment and without foot wear. The technique of measurement was standardized (Ministry of Health 2009).

Based on the mother's prepregnancy BMI, the following is classifiedas abnormal weight gain in pregnancy among the at risk primi gravid mothers, which is considered significant for pre-eclampsiaas follows.(Wuhl, 2002).

- ☞ Under weight (BMI<18.5) - > 0.6 kg / week,
- ☞ Normal weight (BMI 18.5-22.9) -> 0.5 kg / week,
- ☞ Over weight (BMI 23 - 27.5) - >0.3 Kg / week,
- ☞ Obese (BMI >27.5) - >0.3 Kg / week.

Standardized references were used to interpret the range of the clinical parameters of pre-eclampsia with pre-determined scores on a scale developed by the investigator.

Validity was obtained from the experts of the field. The reliability of the tool was assessed by inter rater observers technique and the spearman's rank correlation co-efficient ρ value was 0.8. It was statistically significant and hence the tool was considered reliable.

At risk primigravid mothers were followed for the clinical parameters (systolic blood pressure, diastolic blood pressure, proteinuria, abnormal weight gain) at 16, 20, 24, 28, 32, 36 weeks of gestation and at the end of pregnancy. All visits were accomplished during day time and at normal working hours. Data regarding the prevalence of pre-eclampsia could be obtained only for 103 mothers due to various reasons like personal issues in participation, contact lost, poor co-operation etc. Data were fed to SPSS Statistics for Windows, Version 19.0 (IBM, Armonk, NY). Univariate analysis-Frequency and percentage distribution and Multi variate analysis - Multiple regression analysis was used for analysis. It was considered $p<0.05$ as significant.

Results

Frequency and percentage distribution of stratified at risk primigravid mothers shows that:

- ☞ 33(32%) of the mothers belongs to (Group A) Mothers < 18 years,
- ☞ 35(34%) belongs to (Group – B) Mothers >30 years, and
- ☞ 35(34%) belong to (Group – C) Mothers with pre pregnancy BMI > 27.5 – (Obese).

Demographic Variables of the at Risk Primi Gravid Mothers for Pre-Eclampsia (Overall)

Majority (33.9%) mothers were in the age group ≥ 30 years. Regarding educational qualification, majority 39(37.9%) mothers were educated up to middle school, considering occupation, majority 93(90.3%) mothers were unemployed, majority 53(51.5%) mothers were Hindus. Regarding type of work, majority 42(40.8%) mothers were sedentary workers. With respect to type of family, 60(58.3%) mothers were in nuclear family. With respect to socio-economic status, majority, 66(64.1%) mothers were in lower class. Considering the pre pregnancy BMI, majority, 40(38.8%) were in the BMI category 18 – 22. [9].

(Table 1) Distribution of level of pre-eclampsia among the stratified at risk primi gravid mothers shows that majority 6(18.2%) of the at risk primi gravid mothers developed moderate pre-eclamptic features in Group A (age < 18 years). Majority 5 (14.3%) of mothers developed moderate pre-eclamptic features in Group B (age > 30 years). Majority, 5(14.3%) of mothers developed severe pre-eclamptic features in Group-C (pre-pregnancy BMI >27.5). Majority 15 (14.5%) developed moderate pre-eclamptic features in overall.

(Table 2) Distribution of level of clinical parameters of pre-eclampsia among the at risk primi gravid mothers at the end of pregnancy shows that, Majority 25(24.3%) mothers developed severe systolic pressure and (5.8%) mothers developed mild systolic blood pressure. 8(7.8%) mothers developed mild diastolic blood pressure and 23(22.3%) developed severe diastolic blood pressure. Majority 16(15.5%) mothers developed severe proteinuria and 15(14.6%) developed mild proteinuria. Majority 11(10.7%) mothers developed mild proteinuria and 6(5.8%) mothers developed severe edema. 15(14.6%) mothers developed abnormal weight gain.

(Table 3) Incidence of Pre-eclampsia among the stratified at risk primi gravid mothers and over all shows that the incidence of pre-eclampsia was more in group A (Mothers age < 18 years), when compare to the other stratified groups

(Table 4) Weekly incidence of pre-eclampsia among the at risk primigravid mothers reveals that the incidence was intense at 24 weeks of gestation in mother in Group B (mothers age > 30 years and Group C (mothers with pre pregnancy BMI > 27.5 (obese). Multiple regression analysis reveals that the variables educational qualification and the level socio-economic status of the mothers had an statistical significant association with the level of pre-eclampsia at p=0.03 and p=0.02 level respectively.

Table 1: Distribution of level of pre-eclampsia among the stratified at risk primi gravid mothers

Weeks of gestation	Level of Pre - eclamptic Features	Groups							
		Mothers Age < 18 years)		Mothers Age > 30 years)		Mothers with pre pregnancy BMI > 27.5 - obese		Over all	
		n (33)	%	n (35)	%	n (35)	%	n (103)	%
16th week	Absence	33	100.0	35	100.0	35	100.0	103	100.0
	Mild	0	0.0	0	0.0	0	0.0	0	0.0
	Moderate	0	0.0	0	0.0	0	0.0	0	0.0
	Severe	0	0.0	0	0.0	0	0.0	0	0.0
20th week	Absence	33	100.0	35	100.0	35	100.0	103	100.0
	Mild	0	0.0	0	0.0	0	0.0	0	0.0
	Moderate	0	0.0	0	0.0	0	0.0	0	0.0
	Severe	0	0.0	0	0.0	0	0.0	0	0.0
24th week	Absence	31	93.9	31	88.6	31	88.6	93	90.3
	Mild	2	6.1	1	2.9	1	2.9	4	3.9
	Moderate	0	0.0	3	8.6	3	8.6	6	5.8
	Severe	0	0.0	0	0.0	0	0.0	0	0.0
28th week	Absence	26	78.8	29	82.9	28	80.0	83	80.6
	Mild	3	9.1	1	2.9	2	5.7	6	5.8
	Moderate	4	12.1	5	14.3	5	14.3	14	13.6
	Severe	0	0.0	0	0.0	0	0.0	0	0.0
32nd week	Absence	25	75.8	26	74.3	26	74.3	77	74.8
	Mild	2	6.1	2	5.7	1	2.9	5	4.9
	Moderate	6	18.2	5	14.3	4	11.4	15	14.6
	Severe	0	0.0	2	5.7	4	11.4	6	5.8
36th week	Absence	24	72.7	25	71.4	26	74.3	75	72.8
	Mild	3	9.1	3	8.6	1	2.9	7	6.8
	Moderate	4	12.1	4	11.4	3	8.6	11	10.7

	Severe	2	6.1	3	8.6	5	14.3	10	9.7
At the end of	Absence	22	66.7	25	71.4	25	71.4	72	69.9
the	Mild	3	9.1	1	2.9	1	2.9	5	4.9
pregnancy	Moderate	6	18.2	5	14.3	4	11.4	15	14.
	Severe	2	6.1	4	11.4	5	14.3	11	10.7

n- Frequency, %- Percentage

Table 2: Distribution of level of clinical parameters of pre-eclampsia among the at risk primi gravid mothers at the end of pregnancy

Clinical Parameters	Grading of clinical parameters	At risk primi gravid mothers for pre-Eclampsia							
		Mothers Age < 18 years)		Mothers Age > 30 years)		Mothers with pre pregnancy BMI > 27.5 -obese		Over all	
		n (33)	%	n (35)	%	n (35)	%	n (103)	%
Systolic Blood	Normal	22	66.7	25	71.4	25	71.4	72	69.9
Pressure	Mild	3	9.1	1	2.9	2	5.7	6	5.8
	Severe	8	24.2	9	25.7	8	22.9	25	24.3
Diastolic Blood	Normal	22	66.7	25	71.4	25	71.4	72	69.9
Pressure	Mild	3	9.1	1	2.9	4	11.4	8	7.8
	Severe	8	24.2	9	25.7	6	17.1	23	22.3
Proteinuria	Absence	22	66.7	25	71.4	25	71.4	72	69.9
	Mild	8	24.2	1	2.9	6	17.1	15	14.6
	Severe	3	9.1	9	25.7	4	11.4	16	15.5
Oedema	Absence	29	87.9	31	88.6	26	74.3	86	83.5
	Mild	2	6.1	0	0.0	9	25.7	11	10.7
	Severe	2	6.1	4	11.4	0	0.0	6	5.8
Weight Gain	Normal	28	84.8	31	88.6	29	82.9	88	85.4
	Abnormal	5	15.2	4	11.4	6	17.1	15	14.6

n- Frequency, %- Percentage

Table 3: Incidence of Pre-eclampsia among the stratified at risk primigravid mothers and over all

Weeks of gesta tion	Incidence of pre-eclampsia	At risk primi gravid mothers			
		Group - A Age < 18 years n(33)	Group B Age > 30 years n (35)	Group C Pre preg BMI >27.5 (obese) n (35)	Over all at risk primi n(103)
16th week	Present	0	0	0	0
	Absent	33	35	35	103
20th week	Present	0	0	0	0
	Absent	33	35	35	103
24th week	Present	2	4	4	10
	Absent	31	31	31	93
28th week	Present	7	6	7	20
	Absent	26	29	28	83
32nd week	Present	8	9	9	26
	Absent	25	26	26	77
36th week	Present	9	10	9	28
	Absent	24	25	26	75
At the e nd of pregnancy	Present	11	10	10	31
	Absent	29	25	25	72

n- Frequency

Table 4: Weekly incidence of pre-eclampsia among the at risk primigravid mothers   N=103

Stratified at risk factorstors	Incidence		Proportion with 95% Confidence Interval
	n	%	
Group A Mothers age < 18yrs	11/33	33.3	**±16.04 (16.96%,49.04%)**
Group B Mothers age >30 yrs	10/35	28.5	±15.03 (13.97%, 44.03%)
Group C Mothers Prepregnancy BMI >27.5 (Obese)	10/35	28.5	±15.03 (13.97%, 44.03%)
Overall	31/103	30.1	±8.85 (21.15%, 38.85%)

n- Frequency, %- Percentage

Discussion

The present study projects the results of baseline characteristics and prevalence of Pre-eclampsia observed in the stratified at risk primi gravid mothers for pre-eclampsia. Demographic variables shows that majority of the at risk primi-gravid were educated up to middle school, unemployed and were sedentary workers in the lower socioeconomic status.

It was observed that 30% of the at risk primi gravid mothers developed pre-eclampsia with severe systolic blood pressure, diastolic blood pressure and proteinuria compared to the other clinical parameters of pre-eclampsia. Mothers age > 30 years developed severe features of clinical parameters of pre-eclampsia as early as 24 weeks of gestation.

Collectively, lower socioeconomic class is reported to have a higher incidence of pre-eclampsia and incidence of severe pre-eclampsia in very young girls may reflect the greater tendency to social neglect among this group. Lower education level attainment reduces access to medical care for screening and is often associated with greater exposure to poor nutrition, physical inactivity, being overweight and other risk factors (Howard J 1992).

Studies were found to be consistent with the finding of J.Wandabwa et al, 2010) where in his case control study of 143 women with severe PE and eclampsia, family history of hypertension, low educational status, low socio-economic status, and nulliparity are considered as risk factors for pre-eclampsia and recommends that those at risk factors should be identified and treated with counseling and expertise facilities. Similar linear trends were reported by Fang et al, 2009), who concluded that advanced maternal age, obesity were identified as risk factor for pre-eclampsia, and was also supported by Y.Islam, (1998) who concluded that nulli parours women, young women with low socioeconomic status, and low literacy rate are considered more vulnerable to develop pre-eclampsia.

Early detection and strengthening special antenatal care among the targeted pregnant risk groups of the study, becomes an important aspect in the prevention of complications of pre-eclampsia, which tolls the significant maternal morbidity and mortality.

Strengths & Limitations

Strength of the study was that the population of the study was relatively homogenous leaving less room for confounding variables. Limitations of the study are that the investigator relied on the self-reported pre-pregnancy BMI at the first antenatal visit. The reported weight by the mothers was correlated for the actual weight at the time of registration, and that difference would be very minimal influencing the study outcomes.

Conclusion

The at risk factors identified in the present study and its underlying evidence base can be used to assess risk factors at booking, so that a suitable surveillance routine to detect pre-eclampsia could be planned for the rest of the pregnancy. Pre-eclamptic risk factors can be manipulated, so primary and secondary preventive strategies could be developed. Further, early detection demands careful ante-natal care at appropriate intervals, especially in women predisposed to pre-eclampsia. A program of bio-psycho-social risk assessment of pre-eclampsia could be developed and added to the standard ante-natal care.

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