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INQUISITION ON COALESCE STRATEGIES IN PREVENTION OF PRE-ECLAMPSIA, MATERNAL, FETAL & NEONATAL OUTCOME: A RANDOMISED CLINICAL TRIAL

PROF. K.LATHA*[1] AND DR.PROF.A.JUDIE [2]

[1]Head of the Department, Obstetrics and Gynaecology Nursing, SRM University, TamilNadu, India
[2]Dean, SRM College of Nursing, SRM University, TamilNadu, India

ABSTRACT

Pre-eclampsia (PE) is a unique syndrome in human pregnancy. To assess the effect of coalesce strategies on PE, a randomized clinical trial on 240 at risk primigravid mothers, by proportionate stratified random sampling was conducted. Mothers were stratified as Group A-age < 18 years, Group –B age > 30 years & Group C mothers BMI ≥30kgm^2-obese).Coalecse strategies (Increased dose of calcium lactate supplementation from 300 mg to 1500 and stretching exercises) were given to the study group from 17 weeks of gestation till the end of pregnancy. Subjects were assessed for SBP, DBP, and proteinuria at scheduled visits in both the groups.Maternal, fetal and neonatal outcome were assessed at the end of the delivery**.** Results showed that 17 out of 108 mothers in the study and 31 out of 103 mothers in control group developed PE at the end of pregnancy at $p \leq 0.001$ level (t=4582.50, p=0.003**). Study concludes that coalesce strategies were found effective in the prevention of PE and confers a favorable maternal, fetal, and neonatal outcome.

KEYWORDS:Coalesce strategies, pre-eclampsia, pregnancy, calcium supplementation, stretching exercises

K.LATHA
[1]Head of the Department, Obstetrics and Gynaecology Nursing,
SRM University, TamilNadu, India

***Corresponding author**

INTRODUCTION

Pre-eclampsia (PE), a unique syndrome in human pregnancy, is clinically determined by identification of hypertension and proteinuria, in previously normotensive women after 20 weeks of gestation[1]. Prevalence is commonly cited to be about 7.0 % in nulliparous women.[2] WHO estimates the incidence of new cases of PE to be 7 times higher in developing countries (2.8% of live births) than in developed countries (0.4%).[3] Study results have been consistent across continents for these particular risk factors,extremes of maternal age, i.e. age < 18 years,> 35years, have 2 to 4 fold higher risk ofdevelopingPE[4,5]. By epidemiologic reviews 2004, obese women with pre pregnancy Body Mass Index (BMI)greater than 25.8 kg/height(m^2) had 2.7 times higher risk of developing PE.[6] Screening for early signs of PE followed by appropriate clinical interventions has been the strategy availablefor a long time.Two preventive strategies have been considered.

i) Results from clinical trials[7]and Cochrane reviews[8]suggest that, calcium may play a role in the prevention of PE. Physiological demand of calcium during pregnancy, renal calcium loss, poor intake of dietary calcium in developing countries like Columbia and India, the average calcium intake ranges only between 250- 350 mg/day,[9] divulges the need for calcium supplementation[10]. It is also observed in clinical studies that pre-eclamptic women of South India exhibit significantly lower serum calcium[11]. NIH recommends about 1500-2000 mg of calcium in high risk mothers[12]. It is hypothesized that calcium supplements would reduce the intracellular calcium and relax the vessels and thus prevents PE.

ii)The other preventive strategy which receives an equal weightage in primary prevention of PE is performing regular exercises. The ACOG committee opinion states, “In the absence of either medical or obstetric complications, 30 minutes or more of moderate exercise a day on most, if not all days of the week are recommended for pregnant women”. Overall, the evidence indicates that exercises during pregnancy is safe and even reduces the risk of PE and gestational diabetes.[13]According to a randomized trial by Yeo (2009), stretching exercise may be more effective in mitigating the risk of PE.Regular exercise in pregnancy is linked to a reduction in the oxidative stress and thus the risk of PE.[14] Despites decades of research into PE, identifying the at risk women and preventing them from the illness with speculative strategies is an important significance of the study.Though there are many studies and clinical trials conducted separately on increased calcium supplementation and stretching exercises inprevention of PE, often it had an inadequate control and lack of statistical power, resulting in inconclusive evidence for best interventions of PE in developing countries.Hence the investigator has felt the importance to coalesce the strategies (increased calcium supplements & stretching exercises) for the prevention of pre-eclampsia among at risk mothers, where the illness continues to exact a significant toll with respect to maternal morbidity and mortality

OBJECTIVES

1. To assess the effectiveness of coalesce strategies on the occurrence of PE, clinical parameters , maternal, fetal, and neonatal outcome among at risk primi gravid mothers in study group and control group.

MATERIALS AND METHODS

A randomized clinical trial was conducted at the ante-natal outpatient department at Government hospital, Tambaram. 240 at risk primi gravid mothers for PE,120 in study and 120 in control group, who fulfilled the inclusion criteria, were selected by proportionate stratified random sampling. The specified at risk primi gravid mothers were stratified based on their risk factor as (40 in Group A - mothers with age < 18 years, 40 mothers in Group B - age > 30 years & 40 in Group C - mothers BMI≥30kgm^2 - obese), the attribute used for stratification.The sample size calculation was made on the basis of the pilot study results. 94 samples were required for each group to have a difference of 5% in $P<0.05$ level of significance at 80% power. Considering the 20 % attrition rate, the samples required for each group was 117 samples. Samples were rounded to120 in both the groups. Inclusion

criteria include mothers at 15–16 weeks of gestation with absence of PE features (B.P < 140/90 mm of Hg, aproteinuria), at the time of selection. Exclusion criteria includes, a) mothers with medical or obstetric complications, b) with orthopedic complications contra-indicated for stretching exercise, c) whose value of serum calcium level was more than 10mg/dl at the time of selection and during the course of the study.

Ethical Consideration

The study protocol was approved by the Institutional Review Board, SRM University. Informed written consent was obtained from all participants and were requested to participate voluntarily in this study.Third party consent from the authorized representative of the mothers was also obtained.

TOOL USED FOR THE STUDY

Section-I: Structured questionnaire to assess the socio demographic variables of the at risk primi gravid mothers for PE

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 related information was retrieved through antenatal records by the investigator. Matching for the variables was done.

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

Standardized references were used to interpret the range of the clinical parameters of PE, systolic blood pressure (SBP), diastolic blood pressure (DBP), and proteinuria with pre-determined scores on a scale developed by the investigators (Table I).

SURVEILLANCE OF FEATURES OF PE

As per a published protocol,[15] BP was measured with a standard mercury sphygmomanometer by placing the mother in a seated position after a rest for 3–5 min. BP 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 averaged[16.] Hypertensive BP readings were repeated after 5–10 min. On elevation of subsequent readings, hypertension was confirmed and classified on a scale.

Clean-catch mid stream-voided urine specimen were collected to measure protein using a dipstick assay by TC (Techno diagnostics, US) urine reagent strips (URS) 2P for protein, which produces a color change in presence of protein. 1+(30 mg/dl) protein is considered significant in diluted urine (specific gravity,1.005 –1.015) and 2+(100mg/dl) protein is considered significant in a concentrated sample (Specific Gravity> 1.015) in absence of urinary infection.[17]

BMI was calculated as weight in kg divided by the square of height in meters. Height was measured to the nearest 0.1 cm with a stadiometer (Ann and medical experts, Delhi, India) whereas body weight was measured in kilograms with the calibrated electronic scale (Atma technologies, India) to the nearest 0.5 kg with subjects. The Technique of measurement was standardized. WHO defines “obesity” as BMI ≥ 30kgm^2.[18]

Serum calcium was estimated by monovial accucare kit using arsezeno-111 methods (Lab care diagnostics private limited, India) done in the Government certified laboratory of the hospital. Intolerance to oral calcium lactate supplements was assessed by the investigator at the end of every week using a check list through interview technique.

DESCRIPTION OF THE INTERVENTION

At risk primi gravid mothers in both the groups were subjected to a preliminary test determining absence of PE features at the time of selection (16 weeks of gestation), using standardized methods & instruments.

Study group

Investigator had increased the dose of calcium lactate supplements from 300 mg to 1500 mg per day in 3 divided doses orally after the food (2 tablets in morning and afternoon, 1 in night, each containing 300 grams). Along with the above, at risk primi gravid mothers were taught and asked to perform stretching exercises as follows. i) Full body stretch, ii) Neck stretch, iii) Full body twist, iv) Shoulder, arm, and upper

back stretch, v) Hamstring stretch, vi) Calf stretch for 20 minutes for 5 days for 6 months (from 17 weeks of gestation till the end of the pregnancy).Mothers were asked to mark the practice of the taught stretching exercises in the compliance register provided to them. Supporting the practice, they were given a pamphlet with general information regarding PE and steps to perform the stretching exercises. Compliance <80% of the scheduled stretching exercises per week and its practices were excluded from the study.

Control Group

At risk primi gravid mothers in the control group were given the routine hospital measures. Each mother received orally 1 tablet containing 300 mg of calcium lactate supplements per day after food in the morning, from 17 weeks of gestation till the end of the pregnancy.Compliance of the calcium supplements was assessed by the compliance register and the returned empty foil strips by the mothers at the end of every week for study group and every month for control group.

Compliance of calcium supplements <80% in the both groups was excluded from the study.Participants were permitted to withdraw from the study at any time if they don't wish or develop any signs of intolerance to calcium lactate supplements during the period of the study. Subjects in both the groups were then followed, scored and interpreted for the clinical parameters of PE by the researcher at 16, 20, 24, 28, 32, 36 weeks of gestation and the end of the pregnancy in both groups. Maternal, fetal and neonatal outcome were assessed at the end of the delivery.

Drop outs

Data regarding PE could be obtained only for 108 mothers in study group and 103 mothers in control group and data on the maternal, fetal and neonatal outcome could be obtained for 99 mothers in study group and for 82 mothers in control group due to various reasons like issues in participation, contact lost, poor cooperation, etc.

STATISTICAL DATA PROCESSING

Statistical Package for social sciences (SPSS) version 16, IBM,Chicago, USA and Instat were used for data analysis. Frequency and percentage distribution was used to distribute the variables. Relative risk and odds ratio was used to compare the cumulative incidence of PE. Mann Whitney U test was used to compare the post interventional level of pre-eclampsia and its clinical parameters between the groups. Chi square analysis was used to associate the demographic variables with level and clinical parameters of PE.

RESULTS

Distribution of stratified atrisk factors, shows that 35 (32.4%) of mothers belonged to Group A (age<18 years), 35(32.4%) mothers belonged to Group B (age >30 years), and 38(35.2%) mothers belonged to Group C (mothers with BMI ≥ 30Kgm^2 (Obese) in study group, whereas 33 (32.0%) mothers belonged to Group A, 35 (34.0%) mothers belonged to Group B and 35 (34.0%) mothers belonged to Group C in control group.There was no statistical significant difference observed between the socio- demographic variables among the primi gravid mothers between the study and control group for PE (overall) at p≤ 0.05% level. At the end of pregnancy, mothers in Group A, 6(17.1 %)(CI ±12.44,4.56-29.44%) in study group and 11(33%)(CI ±16.04, 16.96 – 49.45%) mothers in control group developed PE, whereas in Group B,5 (14.29%)(CI ±11.5, 2.5 - 25.5%) in study group and 10(28.57%)(CI ±15.03, 13.97 – 44.03%) in control group developedPE,in Group C, 6(15.79%) (CI ±11.66, 4.34-27.66%) in study group and 10 (28.57%) (CI ±15.03, 13.97 – 44.03%) in control group developed PE(Table II). At the end of pregnancy, SBP of the mothers in over all,showed that, 17(15.7%) in study group and 6(5.8%) in control group developed mild systolic hypertension and none in study group and 25(24.3%) mothers in control group developed severe systolic hypertension (RR 1.912., 95% CI - 1.130 – 3.237).(Table III)

(Table IV) At the end of pregnancy, DBP of the mothers in overall showed that 17(15.7%) in study group and 8(7.8%) in control group developed mild diastolic hypertension and none in study group and 23(22.3%) mother in control group developed severe diastolic hypertension (RR 1.912,95% CI - 1.130 – 3.237). (Table V)

Proteinuria of the mothers at the end of pregnancy in overall shows that 17(15.7%) out of 108 mothers in study group and 15(14.6%) out of 103 mothers in control group developed mild proteinuria and none in study group and 16(15.5 %)mothers in control group developed severe proteinuria (RR 1.912,95% CI - 1.130 – 3.237).

At the end of pregnancy, 17 out of 108 atrisk primi gravid mothers in study group, whereas 31 out of 103 mothers in control group developed PE.

It is evident that mothers in control group have 1.912 times risk in developing PE compared to study group. (RR1.912 (95% CI 1.130 - 3.237),(OR 2.305(CI 1.182 – 4.492).
(Table VI)

Comparison of mean rank of the post interventional level of PE shows a statistical significant difference at 24thweek (t = 5022, *p* = 0.001***), 28th week (t=4838, *p*=0.006**), 32ndweek (t=4660, *p*=0.002**), 36th week (t=4633, *p*=0.003**) and at the end of the pregnancy (t=4582.50, *p*=0.003**) between the at risk primi gravid mothers (overall) in the study group and control group.(Table VII, Graph I)

Overall, none of the socio demographic and anthropometric variables were found to have significant association with the post interventional level of PE at the end of pregnancy in study group at $p<0.05$ level, whereas the socio economic status was found to have statistical significant association in control group at $p \leq 0.05$ ($\chi 2=14.52$, p=0.024). It is evident from the table, that there was a statistical significance difference observed with all the variables of maternal, fetal and neonatal outcome level at $p \leq 0.05$. The statistical difference between the study and control group confers a high risk maternal, fetal and neonatal outcome in control group compared to the study group.

Table I

Tool of surveillance and grading of the Pre-eclamptic features

S.No.	Ranges of Clinical Parameters	Classification	Scoring
1.	**Blood Pressure** i) Systolic Pressure a) ≤ 139 mm of Hg b) 140 - 159 mm of Hg c) ≥ 160 mm of Hg	 Normal Blood Pressure Mild Hypertension Severe Hypertension	 0 1 2
2.	**Blood Pressure** ii) Diastolic pressure a) ≤ 89 mm of Hg b) 90 - 99 mm of Hg c) ≥ 100 mm of Hg *(According to International society for the study of hypertension 2010)*	 Normal Blood Pressure Mild Hypertension Severe Hypertension	 0 1 2
3.	**Proteinuria** **Diluted urine(Sp . gravity 1.005 -1.015)** a) <1+ - <30mg/dl b) 1+ - 30mg/dl c) ≥ 2+ - (100mg /dl) **Concentrated urine(Sp . gravity >1.015)** a) ≤ 1+ - ≤ (30mg/dl) b) 2+- (100mg /dl) c) ≥ 3+ - (300mg/ dl) *(Society of Obstetrics and Gynaecology committee clinical practice guidelines 2008)*	 Absence of Proteinuria Mild Proteinuria Severe Proteinuria Absence of Proteinuria Mild Proteinuria Severe Proteinuria	 0 1 2 0 1 2

The grading of pre-eclampsia features is as follows.

Grades of pre-eclampsia	Scores
Absence of pre-eclamptic features	0
Mild pre-eclamptic features	1 - 2
Moderate pre- eclamptic features	3 - 4
Severe pre-eclamptic features	5-6
Total score	**6**

Table: II

Frequency and percentage distribution of post interventional level of pre-eclampsia in study and control group

Weeks of gestation	Level of Pre-eclamptic Features	Mothers age <18 years				Mothers age > 30 years				Mothers obese-BMI >27.5				Overall			
		Study group		Control group		Study group		Control group		Study group		Control group		Study group		Control group	
		n (35)	%	n (33)	%	n (35)	%	n (35)	%	n (38)	%	n (35)	%	n (108)	%	n (103)	%
24th week	Absence	35	100.0	31	93.9	35	100.0	31	88.6	38	100.0	31	88.6	108	100.0	93	90.3
	Mild	0	0.0	2	6.1	0	0.0	1	2.9	0	0.0	1	2.9	0	0.0	4	3.9
	Moderate	0	0.0	0	0.0	0	0.0	3	8.6	0	0.0	3	8.6	0	0.0	6	5.8
	Severe	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
32nd week	Absence	31	88.6	25	75.8	31	88.6	26	74.3	34	89.5	26	74.3	96	88.9	77	74.8
	Mild	4	11.	2	6.1	4	11.4	2	5.7	3	7.9	1	2.9	11	10.2	5	4.9
	Moderate	0	0.0	6	18.2	0	0.0	5	14.3	1	2.6	4	11.4	1	0.9	15	14.6
	Severe	0	0.0	0	0.0	0	0.0	2	5.7	0	0.0	4	11.4	0	0.0	6	5.8
At end of pregna-ncy	Absence	29	82.9	22	66.7	30	85.7	25	71.4	32	84.2	25	71.4	91	84.3	72	69.9
	Mild	6	17.1	3	9.1	3	8.6	1	2.9	4	10.5	1	2.9	13	12.0	5	4.9
	Moderate	0	0.0	6	18.2	2	5.7	5	14.3	2	5.3	4	11.4	4	3.7	15	14.
	Severe	0	0.0	2	6.1	0	0.0	4	11.4	0	0.0	5	14.3	0	0.0	11	10.7
Proportion with 95%CI		±12.44 (4.56%, 29.44%)		±16.04 (16.96%, 49.04%)		±11.5 (2.5%, 25.5%)		±15.03 (13.97%, 44.03%)		±11.66 (4.34%, 27.66%)		±15.03 (13.97%, 44.03%)		±6.91 (9.09%, 22.91%)		±8.85 (21.15%, 38.85%)	

Table III Frequency and percentage distribution of (SBP) in study and control group

Weeks of gestation	Level of SBP (systolic hyper-tension)	Group -A Mothers age < 18 years		Group -B Mothers age > 30 years		Group - C Obese Mothers BMI> 30kgm^2		Over all at risk primigravid mothers		RR with 95% CI
		Study Group	Control group	Study Group	Control group	Study Group	Control group	Study Group	Control group	
		n (35) %	n (33) %	n (35) %	n (35) %	n (38) %	n (35) %	n (108) %	n (103) %	
24th week	Normal	35 (100)	31(93.9)	35(100)	31(88.6)	38(100)	31(88.6)	108(100)	93(90.3)	NA
	Mild	0(0.0)	2(6.1)	0(0.0)	2(5.7)	0(0.0)	4(11.4)	0(0.0)	8(7.8)	
	Severe	0(0.0)	0(0.0)	0(0.0)	2(5.7)	0(0.0)	0(0.0)	0(0.0)	2(1.9)	
32nd week	Normal	31(88.6)	25(75.8)	31(88.6)	26(74.3)	34(89.5)	26(74.3)	96(88.9)	77(74.8)	RR – 2.272 CI- (1.212 - 4.259)
	Mild	4(11.4)	7(21.2)	4(11.4)	2(5.7)	4(10.5)	4(11.4)	12(11.1)	13(12.6)	
	Severe	0(0.0)	1(3.0)	0(0.0)	7(20.0)	0(0.0)	5(14.3)	0(0.0)	13(12.6)	
At the end of pregnancy	Normal	29(82.9)	22(66.7)	30(85.7)	25(71.4)	32(84.2)	25(71.4)	91(84.3)	72(69.9)	RR – 1.912 CI- (1.130- 3.237)
	Mild	6(17.1)	3(9.1)	5(14.3)	1(2.9)	6(15.8)	4(11.4)	17(15.7)	8(7.8)	
	Severe	0(0.0)	8(24.2)	0(0.0)	9(25.7)	0(0.0)	6(17.1)	0(0.0)	23(22.3)	

RR- Relative risk

CI – Confidence Interval

Table IV

Frequency and percentage distribution of (DBP) among the at risk primi gravid mothers in study and control group

Weeks of gestation	Level of DBP	Mothers age <18 years				Mothers age > 30 years				Mothers obese-BMI >27.5				Overall				Relative risk with 95% CI
		Study group		Control group		Study group		Control group		Study group		Control group		Study group		Control group		
		n (35)	%	n (33)	%	n (35)	%	n (35)	%	n (38)	%	n (35)	%	n (108)	%	n (103)	%	
24th week	Normal	35	100.0	31	93.9	35	100.0	31	88.6	38	100.0	31	88.6	108	100.0	93	90.3	NA
	Mild	0	0.0	2	6.1	0	0.0	2	5.7	0	0.0	4	11.4	0	0.0	8	7.8	
	Severe	0	0.0	0	0.0	0	0.0	2	5.7	0	0.0	0	0.0	0	0.0	2	1.9	
32nd week	Normal	31	88.6	25	75.8	31	88.6	26	74.3	34	89.5	26	74.3	96	88.9	77	74.8	RR – 2.272 CI- (1.212 -4.259)
	Mild	4	11.4	7	21.2	4	11.4	2	5.7	4	10.5	4	11.4	12	11.1	13	12.6	
	Severe	0	0.0	1	3.0	0	0.0	7	20.0	0	0.0	5	14.3	0	0.0	13	12.6	
At the end of pregnancy	Normal	29	82.9	22	66.7	30	85.7	25	71.4	32	84.2	25	71.4	91	84.3	72	69.9	RR – 1.912 CI- (1.130-3.237)
	Mild	6	17.1	3	9.1	5	14.3	1	2.9	6	15.8	4	11.4	17	15.7	8	7.8	
	Severe	0	0.0	8	24.2	0	0.0	9	25.7	0	0.0	6	17.1	0	0.0	23	22.3	

Table V

Frequency and percentage distribution of (Proteinuria) in at risk primi gravid mothers in study and control group

Weeks of gestation	Level of Proteinuria	Mothers age <18 years				Mothers age > 30 years				Mothers obese-BMI >27.5				Overall				Relative risk with 95% CI
		Study group		Control group		Study group		Control group		Study group		Control group		Study group		Control group		
		n (35)	%	n (33)	%	n (35)	%	n (35)	%	n (38)	%	n (35)	%	n (108)	%	n (103)	%	
24th week	Absence	35	100.0	31	93.9	35	100.0	31	88.6	38	100.0	31	88.6	108	100.0	93	90.3	NA
	Mild	0	0.0	2	6.1	0	0.0	3	8.6	0	0.0	4	11.4	0	0.0	9	8.7	
	Severe	0	0.0	0	0.0	0	0.0	1	2.9	0	0.0	0	0.0	0	0.0	1	1.0	
32nd week	Absence	31	88.6	25	75.8	31	88.6	26	74.3	34	89.5	26	74.3	96	88.9	77	74.8	RR – 2.272 CI- (1.212 - 4.259)
	Mild	4	11.4	8	24.2	4	11.4	3	8.6	4	10.5	6	17.1	12	11.1	17	16.5	
	Severe	0	0.0	0	0.0	0	0.0	6	17.1	0	0.0	3	8.6	0	0.0	9	8.7	
At the end of pregnancy	Absence	29	82.9	22	66.7	30	85.7	25	71.4	32	84.2	25	71.4	91	84.3	72	69.9	RR – 1.912 CI- (1.130-3.237)
	Mild	6	17.1	8	24.2	5	14.3	1	2.9	6	15.8	6	17.1	17	15.7	15	14.6	
	Severe	0	0.0	3	9.1	0	0.0	9	25.7	0	0.0	4	11.4	0	0.0	16	15.5	

Table VI

Risk valuation of the incidence of pre-eclampsia (overall) in study and control group

Weeks of gestation	Groups	Incidence of pre-eclampsia		Risk valuation		95% Confidence Interval	
		Present	Absent			Lower	Upper
24th week	Study group (n=108)	0	108	Odds Ratio	NA	NA	NA
	Control group (n=103)	10	93	Relative Risk	NA	NA	NA
28th week	Study group (n=108)	8	100	Odds Ratio	3.012	1.262	7.190
	Control group (n=103)	20	83	Relative Risk	2.621	1.209	5.685
32nd week	Study group (n=108)	12	96	Odds Ratio	2.701	1.280	5.701
	Control group (n=103)	26	77	Relative Risk	2.272	1.212	4.259
36thweek	Study group (n=108)	14	94	Odds Ratio	2.507	1.233	5.097
	Control group (n=103)	28	75	Relative Risk	2.097	1.172	3.753
At the end of pregnancy	Study group (n=108)	17	91	Odds Ratio	2.305	1.182	4.492
	Control group (n=103)	31	72	Relative Risk	1.912	1.130	3.237

Table VII

Comparison of the post interventional level of of pre- eclampsia, between the study group and control group N=211

Scoring grade	Grouping	n	Mean Rank	Sum of Ranks	Mann-Whitney U	Asymp. Sig. (2-tailed)
16th week	Study	108	106.000	11448.0	5562.00	1.000
	Control	103	106.000	10918.0		
20th week	Study	108	106.000	11448.0	5562.00	1.000
	Control	103	106.000	10918.0		
24th week	Study	108	101.000	10908.0	**5022.00**	**0.001*****
	Control	103	111.243	11458.0		
28th week	Study	108	99.296	10724.0	**4838.00**	**0.006****
	Control	103	113.029	11642.0		
32nd week	Study	108	97.648	10546.0	**4660.00**	**0.002****
	Control	103	114.757	11820.0		
36th week	Study	108	97.398	10519.0	**4633.00**	**0.003****
	Control	103	115.019	11847.0		
At the end of pregnancy	Study	108	96.931	10468.5	**4582.50**	**0.003****
	Control	103	115.510	11897.5		

** significant at p≤0.05 ** highly significant at p≤0.01 *** very high significance at p≤0.001*

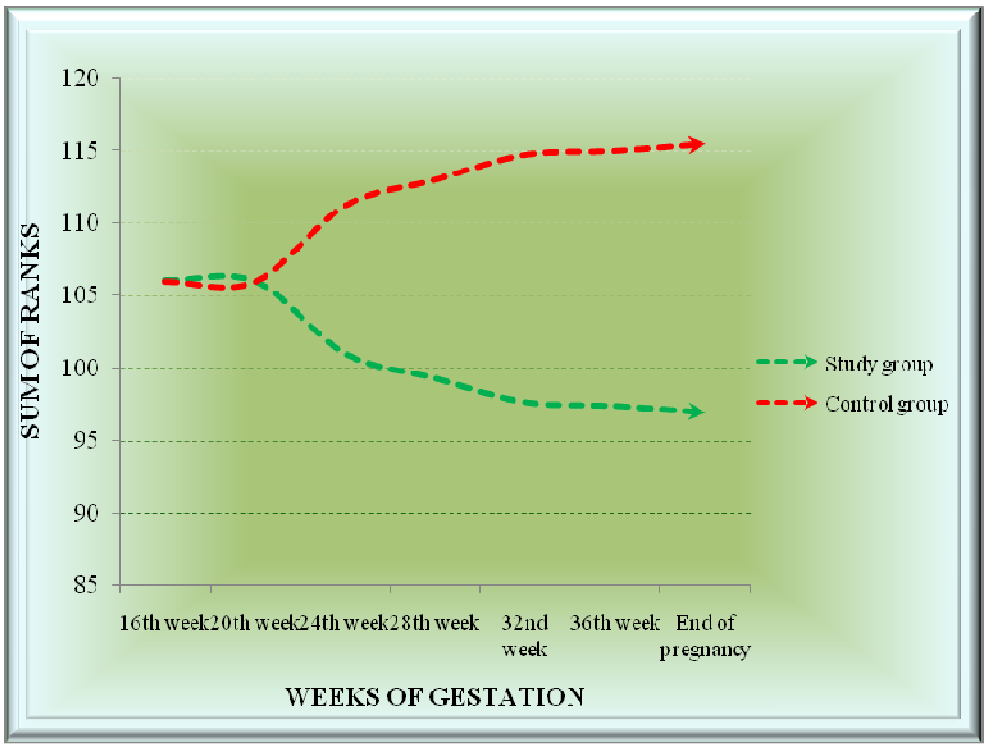
Table VIII

Frequency, percentage distribution and chi square analysis of maternal, fetal and neonatal outcome of at risk primi gravid mothers for pre-eclampsia in study and in control group

Maternal, fetal and neonatal outcome variables		Study group		Control group		Chi square test P value *df*
		n (99)	%	n (82)	%	
Complications at pregnancy	No complications	95	96	76	92.6	**χ^2=4.88 *p*=0.01** *df*=3**
	HELLP syndrome	0	0	2	2.4	
	Eclampsia	0	0	2	2.4	
	Hypertensive emergency	2	2	2	2.4	
Gestational age at delivery	<37 weeks	0	0	0	0	**χ^2=30.51 *p*=0.0001*** *df*=2**
	37 weeks	0	0	18	22	
	38 weeks	12	12.1	18	22	
	≥ 39 weeks	87	87.9	46	56	
Mode of delivery	Normal vaginal delivery	45	45.5	19	23.2	**χ^2=10.59 *p*=0.005** *df*=2**
	Caesarean section	48	48.5	59	72	
	Forceps delivery	6	6.1	4	4.9	
Complications during labor	No complications	89	89.9	63	76.8	**χ^2=10.21 *p*=0.059* *df*=5**
	HELLP syndrome	0	0	2	2.4	
	Eclampsia	0	0	2	2.4	
	PROM	6	6.1	13	15.9	
	Hemorrhage	4	4	2	2.4	
	Hypertensive emergency	0	0	2	2.4	
Complications during puerperium	No complications	95	96	74	90.2	**χ^2=7.50 *p*=0.011** *df*=4**
	HELLP syndrome	0	0	1	1.2	
	Eclampsia	0	0	1	1.2	
	PPH	1	1	4	4.9	
	Hypertensive emergency	0	0	2	2.4	
Fetal wellbeing at the end of pregnancy	Normal	97	98	71	87	**χ^2=8.73 *p*=0.003** *df*=3**
	Abnormal	0	0	11	13.4	
Birth weight of the baby	<1500 Grams	2	2.0	3	3.7	**χ^2=10.53 *p*=0.01** *df*=3**
	1500-2499 Grams	9	9.1	21	25.6	
	2500-3500 Grams	67	67.7	48	58.5	
	>3500 Grams	21	21.2	10	12.1	
APGAR Score at 1st minute	<7	2	2.0	12	14.6	**χ^2=7.36 p=0.006** *df*=1**
	>7	97	98	70	85.4	
APGAR Score at 5th minute	<7	0	0	4	4.9	**χ^2=4.84 p=0.02* *df*=1**
	>7	99	100	78	95.1	
Neonatal complications	No complications	86	86.9	44	53.7	**χ^2=29.64 p=0.000*** *df*=6**
	Hypoglycemia	0	0	4	4.9	
	RDS	0	0	3	3.7	
	TTN	0	0	1	1.2	
	Growth retardation	7	7.1	16	19.5	
	Hyperbilirubinaemia	6	6.1	13	15.9	
	Perinatal asphyxia	0	0	3	3.7	

Graph I

Comparison of the post interventional level of pre- eclampsia, (overall) between the study and control group



Mean sum rank of the post intervention level of pre-eclampsia between the study and control group.

DISCUSSION

None of the at risk primigravid mothers in both groups developed PE at 16th and 20 weeks of gestation. Incidence of PE was delayed in all the stratified groups in the study group, which occurred at 28 weeks of gestation, whereas the incidence was as early as 24 weeks of gestation in the control group. Moreover, at the end of pregnancy, intensity of PE was only mild in the study group through the course of pregnancy, whereas mothers developed moderate pre-eclamptic features as early as 28th week and severe pre-eclamptic features at 32nd week of gestation in control group. From 24th,28th, 32nd,36th weeks of gestation and at the end of pregnancy, there was a statistical significant difference observed between the atrisk primigravid mothers in study and control group for group A at $p \leq 0.01$level , for Group B at $p \leq 0.05$ level, and in Group C at $p \leq 0.001$ level . In over all, the incidence was almost double in control group compared to the study group at 24th, 28th, 32^{nd,} 36th weeks of gestation and at the end of pregnancy, where a statistical significant difference was observed at $p \leq 0.001$ level. Overall intensity of clinical parameters of PEin the atrisk primigravid others were mild in study group, whereas illness was both mild and severe with all the clinical parameters (SBP,DBP, Proteinuria) in control group (RR 1.912, 95% CI - 1.130- 3.237). The relative risk of the at risk primigravid mothers in control group shows that they are 1.9 times of risk in developing high SBP, DBP, and abnormal proteinuria and compared to the study group. Comparison of the mean rank of the post interventional level of PE showed a statistical significant difference between study and control group (overall) at the end of pregnancy at P≤0.001 level(t=4582.50, p=0.003**).The above study infers that increased dose of calcium lactate supplements from 300 mg to1500 mg and stretching exercises) was found to be effective in prevention of PE among the atrisk primigravid mothers.The study findings were consistent with the study conducted by Villar et al, [19]on the effect of 1.5 g daily calcium

supplementation on reduction of PEin women's at high risk concluded thatcalcium supplementation is beneficial for preventing PE among Iranian women at high risk of developing PE.[20] The effects of stretching exercises on prevention of PE is found to be consistent with the study conducted by Davidge S et al [21], which concluded that, stretching exercises weremore effective in mitigating the risk of PE.[22] Socio economic status was found to have statistical significant association with the post interventional level of PE in control group at p ≤0.05 (χ2=14.52, *p*=0.024). Over all the maternal, fetal, and neonatal outcome variables confers a high risk maternal, fetal and neonatal outcome in control group compared to study group.The mean serum calcium level in control group was 8.1±0.12 mg/dl,which was lower than the study group was 9.0 ±0.16 mg/dl shows a low intake of calcium in the control group. The above discussions clearly represent that, there has been a statistical impact of increased calcium supplements and stretching exercises in the prevention of PE. This study draws an inference, that coalesce strategies can be used an effective strategy, in prevention and management of PE.

LIMITATIONS

Present study did not have any information on maternal dietary habits, life style changes before and during the pregnancy. And as a part of ethical concern, the investigator could not benefit the control group as the study was completed after the delivery.

CONCLUSION

The study finding showed that there was a 50 % reduction in the incidence of PE in the study group compared to the control group, where the atrisk primigravid mothers in control group were having 1.9 times more risk of developing PE compared to the study group, which proves the efficiency of the coalesce strategies in the prevention of PE. Hence the study concludes that coalesce strategies (Increasing the dose of calcium lactate supplements from 300 mg to 1500 mg and stretching exercises) are hard evidenced, proven to be very effective in the prevention of PE and a favorable maternal, fetal, neonatal outcome. Early recognition of women at risk of PE will enable the identification of highrisk women who may benefit from enhanced surveillance and prophylaxis from the coalesce strategies.

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CONFLICT OF INTEREST

There is no conflict of interest to declare.

REFERENCES

1. Dutta.D.Text book of Obstetrics: Including Perinatology and Contraception, 4thEdn, Vol 7, Central Book Agency publishers:NewDelhi, India, 215-217, (2004)
2. Roberts M., Creasy RK., Resnick., Pregnancy related hypertension. In: Maternal Fetal Medicine, 4th Edition, WB Saunders Company:Philadelphia, 555-567, (1998).
3. Kayode.O, Oscengbade,Olusimbo.K."Public health perspectives of pre-eclampsia in developing countries. Implications for health system are strengthening". Journal of pregnancy, Accessed on 25.february 2014 http;//www.hidawi.com/journals/pdf
4. Magpie trial collaborative group, Do women with pre-eclampsia and their babies, benefit from magnesium sulphate: the Magpie trial with randomized placebo control trial, BJOG, 114(3): 300–309, (1890).
5. World Health organization, "Globalprogramme to conquer pre-

eclampsia/ eclampsia";367,pp.1066-1074,(2000)
6. Gadalla F., Abd El-Salam A., Wassif SM., Khalifa SM., Foda MA., Ali AS and Abd El-Hamid ESH. "Differential magnitude of high risk pregnancy in rural and urban communities in Sharkia governorate". Egypt J Comm Med,2(2): 157-65, (2002).
7. Hamet P., The evaluation of the scientific evidence for a relationship between calcium and hypertension. J Nutr, 125:311, (2004)
8. RepkeJT., VillarJ., Pregnancy Induced hypertension and low birth weight: the role of calcium. American journal of clinical nutrition, 54;2375-41,(1991)
9. National Institutes of Health. Optimal calcium intake.NIH Consensus Statement, Vol12,1-31,(1994)
10. Belizan JM., Villar J., Bergel E., Gonzalez L., Campodonico L. Calcium supplementation to prevent hypertensive Disorders of pregnancy. N Engl J Med, 325: 1399-405,(1991)
11. Magna Manjareeka., Sitikantha Nandha. "Serum electrolyte level in pre-eclampticwomen: A comparative study"International journal of pharma and biosciences, Accessed on 23 august 2014.http://www.ijpbs.net/vol.3_issue2/biosciences/65.pdf.
12. AtallahA.N, HofmeyeG.J, Duley L. "Calcium supplementation during Pregnancy for preventing hypertensive disorder and related problem".The Cochrane database and systemic review. Accessed on 24.8.2013 http://www.ncbi.nlm.nih.gov/pubmed/16855957.
13. Beth Lewis, et al. The effect of exercises during pregnancy on maternal outcomes. Practical Implications for practice. American Journal of lifestyle Medicine, 2 (5):441-455,(2008).
14. American college of Obstetrics and gynecology.(ACOG),"Exercises during pregnancy and Post natal period ACOG Home exercise program". Accessed on 10 August 2012.http:// www.acog.org
15. Levine RJ, Esterlitz JR, Raymond EG, etal, "Trial of Calcium for Pre-eclampsia Prevention (CPEP): rationale, design, and methods". Control ClinTrials, Accessed on 12 0ctober 2013. http://www.ncbi.nlm.nih.gov.
16. E.O Brien.T, et al, "Working group on blood pressure monitoring of the European society of the Hypertension International Protocol for validation of blood pressure measuring devices in adult- Blood pressure monitoring", Accessed on July 6 2012. http://www.dableeducational.org/pdfs/esh-ip%202010%.
17. Kaplan RE, Springate JE, Feld LG, "Screening dipstick urinalysis: a time to change. Pediatrics" Accessed on 27 July 2012. http://.inovapeds.org/library/readings/.../The%20Abnormal% 20Urinanaylsis.pdf.
18. WHO Technical Series Obesity: Preventing and managing the global epidemic. "Report of a WHO consultation. World Health Organization Technical Report Series" Accessed on 24.June 2013,http://www.who.org
19. Villar J, Abdel-aleem, Merialdi M .World Health Organization randomized trial of calcium supplementation among low calcium intake in pregnant women. American journal of Obstetrics and Gynaecology, Accessed on "25 June 2014. www.ncbi.nlm.nih.gov
20. S.Niroramesh. Supplementary calcium in prevention of pre-eclampsia, International journal of Obstetrics & Gynaecology; Accessed on 27June 2013. www.biomedcentral.com/1471-2458/11/S3/S18
21. Yeo S, Davidge S, Ronis DC, AntonakesoCL, "A comparison of Walking versus stretching exercises to reduce the incidence of pre-eclampsia: randomised clinical trial". Hypertension in pregnancy, Accessed on 12.7.13. www.ncbi.nlm.nih.gov/pubmed/18504873
22. Seon Ae Yeo. "Adherence of walking or stretching exercises in the risk of pre-eclampsia in sedentary pregnant women". Reg Nurses health,Accessed on 16 October 2014. http://www.ncbi.nlm.nih.gov/pubmed/19415672.