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OXYGEN SATURATION AT ADMISSION – PREDICTION OF FETO - MATERNAL OUTCOME AMONG PRE-ECLAMPSIA MOTHERS

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ABSTRACT

Introduction: Pre-eclampsia is an pregnancy complication affecting 10% of pregnant mothers. It affects both maternal and fetal outcome adversely. In preeclampsia, hypoxemia may result from a number of mechanisms. Preeclampsia remains a complex and poorly understood disease. Currently, there are no reliable predictor of preeclampsia for early diagnosis to avoid adverse maternal or perinatal outcomes. Objective: To evaluate the incremental value of SPO2 in prediction of maternal and fetal outcome in women with preeclampsia. Methodology: We conducted the cross-sectional study on 50 pre eclamptic women who were hypertensive after 20 weeks of gestation with proteinuria with variable severity, were selected on admission at labor ward of OBG department of Tirunelveli medical college hospital. Results: After statistical analysis, it was seen that the women having SPO2 ≤ 95% was 18 and with normal SPO2 was 32 mothers. The mean age of low and normal group was 30.3 and 26.8 years. The mean gestational age of two groups was 34.6 and 35.8 weeks respectively. The Systolic BP was 161.7 and 145.3 in both groups and Diastolic BP was 103.9 and 95.9 mmHg respectively, the difference was statistically significant in both groups. There was proteinuria in 55.6% in low spo2 group and 43.6% in normal spo2 group. MGSO4 administration was required in 83.3% in low SPO2 group and 12.5 in normal SPO2 group. LSCS was bit higher in low SPO 2 group. Thrombocytopenia, blood transfusion, parenteral antihypertensives and acute renal dysfunction was more in low SPO2 group. Whereas the incidence of cortical blindness, pulmonary edema, hepatic dysfunction, placental abruption and PPH was not statistically significant. The fetal outcome like IUD, Birth asphyxia, neonatal death, MAS and NICU admission between two groups was not statistically significant. **Conclusion:** In mothers SpO2 ≤ 95% had more adverse outcomes in comparison to SpO2 ≥96% along with systemic dysfunction.

KEYWORDS: Pre-eclampsia, oxygen saturation, maternal, fetal outcome.

INTRODUCTION

Preeclampsia is a highly variable multisystem disorder unique to pregnancy. Preeclampsia and other hypertensive disorders of pregnancy complicate up to 10% of pregnancies worldwide, constituting one of the greatest causes of maternal and perinatal morbidity and mortality.[1] Preeclampsia is a multi-organ syndrome that may be characterized by multiple symptoms, signs, and laboratory assessments. It is generally defined as the presence of hypertension and proteinuria but can also involve hyperuricemia, haemolysis, liver perturbations, thrombocytopenia, and eclampsia. Preeclampsia remains the second leading global cause of maternal mortality.[2]

Current classifications of preeclampsia do not reliably predict adverse maternal or perinatal outcomes. The management of "severe" preeclampsia, as currently defined, may lead to inappropriate premature delivery as opposed to expectant management.[3,4] Measurement of oxygen saturation by pulse oximetry is widely used clinically. There have been numerous studies with conflicting findings on the predictive value of SpO2 in adult and paediatric populations.[5-10] While there are limited data related to a normal range in pregnancy against which to measure physiological perturbations, a suggested normal value for SpO2 in pregnancy is ≥ 97%.[11] The ability of maternal SpO2 to predict adverse maternal outcomes has been poorly studied, and in the few studies of the subject the definitions of oxygen desaturation events are inconsistent. Although most would agree that an SpO2. < 90% constitutes an abnormal value (or hypoxemia), some studies of

pregnant women have used much higher values (up to SpO2 < 95%) to classify desaturations.[12]

The challenge to clinicians lies in identifying patients who will suffer subsequent adverse outcomes from preeclampsia in order to intervene appropriately while minimizing unnecessary and potentially harmful interventions in patients who do not require them. The purpose of this study was to evaluate the ability of oxygen saturation as an aid for decision making in triage of women. Hence based on this the objective of this study is to assess the incremental value of SPO2 measured by pulse oximetry in prediction of risk and adverse outcomes among pregnant women with preeclampsia.

METHODS

The present study was a prospective hospital based observational study carried out in Department of Obstetrics & Gynecology, Tirunelveli Medical College, Tirunelveli, Tamilnadu, India. We conducted this study on 50 pre-eclampsia women who were hypertensive after 20 weeks of gestation with proteinuria with variable severity The data was collected for six months and analysed.

All patients who fulfilled the inclusion criteria and gave consent were enrolled in the study. A detailed history and meticulous clinical examination including general,

systemic and obstetric examination was done. The investigation like complete blood count, liver function test, renal function test was performed. Oxygen saturation measured by pulse oximetry. Mothers with admission SPO2 > 95% were considered in low SPO2 group and with more than 95% considered normal SPO2 group.

Systolic BP> 140mmHg or Diastolic BP > 90 mmHg on at least 2 occasions between 24 hours apart and proteinuria measured by dipstick. Patient with HELLP syndrome were also included in the study. Statistical analysis was done using SPSS Version 22.0 Numeric variable were described in averages and categorical variables were analyzed using Chi square test. P value less than 0.05 considered significant. The study was done after approval from the institutional ethical committee.

RESULTS

The pre eclamptic mothers were described according to their demographic and obstetric variables. During the study period, a total of 150 patients were admitted with preeclampsia. Out of these 50 women fulfilled the study criteria and were included in the study.

Most of the patients (69.6%) were in the age group 20-29 years and 27 (54%) were primigravida's. Most women were from rural areas and belonged to low socioeconomic class.

Table 1: Demographic profile of the patients.

MATERNAL VARIABLES	LOW SPO2% (90-95) N=18		NORMAL SPO2% (90-95) N=32		SIG
	MEAN	SD	MEAN	SD	
AGE (YEARS)	30.3	6.1	26.8	5.2	P=0.037
GEST. AGE (WEEKS)	34.6	2.4	35.5	1.5	P=0.034
SBP	161.7	11.0	145.3	9.5	P<0.00 I
DBP	103.9	6.1	95.9	7.1	P<0.001

The Table 1 depicts obstetric variables like age, gestational age in weeks. Systolic BP and diastolic BP. The mean age of Low SPO2 mothers were   30.3 ± 6.1 years while in normal mothers it was 26.8±5.2 years, the difference between them was statistically significant. The mean gestational age of Low SPo2 group was 34.6 V 2.4 weeks and normal was 35.8 ± 1.5 weeks. The difference between them was also statistically significant.

The mean systolic BP in low spo2 group was 161.7 ± 11 mmHg and in normal spo2 group was 145.3 ± 9.5 mmHg, similarly the mean Diastolic BP was 103.9 ± 6.1 mmHg in low SPO2 group and 95.9 ± 7.1 mmHg in normal SPO2 group. Both the difference was statistically significant.

Table 2: Obstetric characteristics – comparison.

CHARACTERISTICS	COMPONENTS	LOW SPO2 N=18		NORMAL SPO2 N=32		SIGNIFICANCE
		NO	%	NO	%	P VALUE
OBSTETRICS CODE	PRIMI	7	38.9	20	62.5	P=0.273
	G2A 1	3	16.7	6	18.8	
	G2P1 L1	2	11.1	3	9.4	
	G3A2	3	16.7	1	3.1	
	G3 P2L2	3	16.7	2	6.2	
PROTEINURIA	1+	2	11.1	18	56.2	P<0.001

	2+	10	<u>55.6</u>	14	43.8	
	3+	6	33.3	0	0	
ANTI HT	ADMINISTERED	18	100	32	100	NIL
STEROID	ADMINISTERED	18	100	32	100	NIL
ADMINISTRATION OF MGSO4	YES	15	83.3	4	12.5	P<0.001
	NO	3	16.7	28	87.5	P < 0.001
MODE OF DELIVERY	LABOR NATURALIS	8	44.4	27	84.4	P=0.003
	LSCS	10	55.6	5	15.6	
INCIDENCE OF PRES	YES	6	33.3	0	0	P<0.001
	NO	12	66.7	32	100	
CORTICAL BLINDNESS	YES	2	11.1	0	0	P=0.241
	NO	16	89.9	32	100	
PULMONARY EDEMA	YES	2	11.1	0	0	P=0.241
	NO	16	89.9	32	100	
ADMINISTRATION OF PARENTERAL ANTIHYPERTENSIVES	YES	11	61.1	4	12.5	P<0.001
	NO	7	38.9	28	87.5	

Table 2 Shows the obstetric characteristics of low SPO2 and Normal SPO2 group mothers. The Obstetric code comparison between groups was not significant. The proteinuria was 2+ 55.6% in low SPO2 mothers and 43.8% in Normal SPO2 mothers. This difference was statistically significant.

The MgSO4 administration was more in low SPO2 group, it was 83.3% and in normal SPO2 group it was 12.5%. This was also statistically significant, the normal labour was seen bit less in low SPO2 group (44.4%) where as it was high in normal SPO2 Group (84.4%). The difference was statistically significant.

The cortical blindness was seen more in low SPO2 group, similarly Pulmonary edema was also seen only in Low SPO2 group. Both were statistically significant. The administration of parenteral antihypertensives has also been high in low SPO2 group.

Table 3: Obstetric outcomes – Comparison.

CHARACTERISTICS		LOW SPO2 N=18		NORMAL SPO2 N=32		SIGNIFICANCE
		NO	%	NO	%	P VALUE
BLOOD PRODUCTS TRANSFUSION	YES	7	38.9	1	3.1	P<0.001
	NO	11	61.1	31	96.9	
THROMBOCYTOPENIA	YES	7	38.9	1	3.1	P<0.001
	NO	11	61.1	31	96.9	
HEPATIC DYSFUNCTION	YES	4	22.2	1	3.1	P-0.095
	NO	14	77.8	31	96.9	
ACUTE RENAL DYSFUNCTION	YES	4	22.2	0	0	P<0.001
	NO	14	77.8	32	100	
PLACENTAL ABRUPTION	YES	2	11.1	0	0	P - 0.241
	NO	16	88.9	32	100	
PPH	YES	1	5.6	1	3.1	P<0.001
	NO	17	94.4	31	96.9	

In low SPO2 group blood transfusion was more when compared to normal SPO2 group. Other complication like thrombocytopenia, hepatic dysfunction, renal dysfunction was also seen more in low SPO2 group. Placental Abruption and PPH was not much significantly related between groups.

Table 4: Fetal outcome.

OUTCOME	COMPONENTS	LOW SPO2		NORMAL SPO2		SIGNIFICANCE
		NO	%	NO	%	
IUD	YES	3	16.7	0	0	P=0.078
	NO	15	86.6	32	100	
NEONATAL DEATH	YES	4	22.2	1	3.1	P=0.095
	NO	14	77.8	31	96.9	
BIRTH ASPHYXIA	YES	3	16.7	L	3.1	P=0.250

	NO	15	83.3	31	96.9	
MAS	YES	2	11.1	1	3.1	P=0.603
	NO	16	88.9	31	96.9	
NICU ADMISSION	YES	6	33.3	4	12.5	P—0.162
	NO	12	66.7	28	87.5	

In our study group, there was not much difference in incidence of IUD with 3 in low SPO2 group had IUD, similarly Neonatal deaths was 22.2% in low SPO2 group in comparison to 3.1% in normal SPO2 group. Birth asphyxia, MAS, NICU admission, all three were more in low SPO2 group but none was statistically significant.

DISCUSSION

The present study was undertaken to evaluate the ability of oxygen saturation levels in predicting adverse maternal and fetal outcome in patients of preeclampsia. Most of the patients (69.6%) were in the age group 20-29 years and 27 (54%) were primigravida's. Most women were from rural areas and belonged to low socioeconomic class.

Alexandra L. Millman et. Al,[13] classified pre-eclamptic women into various groups on the basis of oxygen saturation. Baseline (98% to 100%), low risk (96% to 97%), medium risk (94% to 95%), and high risk (90% to 93%). They successfully predicted SpO2 as an adverse maternal outcome and found SpO2 value of ≤93% conferred particular risk. The study also revealed that SpO2 of 90% to 93% was independently associated with 2 an 18-fold increase in the odds of an adverse outcome within 48 hours compared with a normal SpO2 (98% to 100%)

The Table 1 depicts obstetric variables like age, gestational age in weeks. Systolic BP and diastolic BP. The mean age of Low SPO2 mothers were 30.3 ± 6.1 years while in normal mothers it was 26.8±5.2 years, the difference between them was statistically significant. Contrary to this there was no difference in median maternal age in a study done by Millman et.al.[13] in which median maternal age was 31yrs in parents developing adverse outcome and median maternal age was 32 yrs in parents having normal outcome where the p value was 0.523 which was statistically insignificant. The mean gestational age of Low SPo2 group was 34.6 V 2.4 weeks and normal was 35.8 ± 1.5 weeks. The difference between them was also statistically significant. According to Peter von Dadelszen et. Al[4] gestational age at the time of admission to hospital for pre-eclampsia was found significantly lower and independently predictive, in 8 women destined to develop complications

The mean systolic BP in low spo2 group was 161.7 ± 11 mmHg and in normal spo2 group was 145.3 ± 9.5 mmHg, similarly the mean Diastolic BP was 103.9 ± 6.1 mmHg in low SPO2 group and 95.9 ± 7.1 mmHg in normal SPO2 group. Both the difference was statistically

significant. This was similar to study done by Rani S et al[14] where the mean and median of systolic blood pressure was 177.51 ± 4.22 mm of Hg and 170 mm of Hg in group L while 155.76 ± 0.84 and 156 in group H respectively which was statistically significant (p<0.05). The mean and median of diastolic blood pressure was 114.75±3.27 and 120 mm of Hg in group L while 100.16 ± 0.63 and 98 mm of Hg in group H respectively which was statistically significant (p<0.05).

Table 2 Shows the obstetric characteristics of low SPO2 and Normal SPO2 group mothers. The Obstetric code comparison between groups was not significant. The proteinuria was 2+ in 55.6% in low SPO2 mothers and 43.8% in Normal SPO2 mothers. This difference was statistically significant. .Peter von Dadelszen[4] also revealed dipstick proteinuria to be higher in women who developed 8 adverse outcomes.

The MgSO4 administration was more in low SPO2 group, it was 83.3% and in normal SPO2 group it was 12.5%. This was also statistically significant; the normal labor was seen bit less in low SPO2 group (44.4%) where as it was high in normal SPO2 Group (84.4%). The difference was statistically significant.

The cortical blindness was seen more in low SPO2 group, similarly Pulmonary edema was also seen only in Low SPO2 group. Both were statistically significant. The administration of parenteral antihypertensives has also been high in low SPO2 group.

In low SPO2 group blood transfusion was more when compared to normal SPO2 group. Other complication like thrombocytopenia, hepatic dysfunction, renal dysfunction was also seen more in low SPO2 group. Placental Abruption and PPH was not much significantly related between groups. In a study on full PIERS by Agrawal and Mitra, serum creatinine was found to be an independent predictor of adverse maternal outcome.[15] Thangaratinam et al found that the presence of increased liver enzymes was associated with an increased probability of maternal and fetal complications, but normal liver enzyme levels did not rule out disease, as specificity was often higher than sensitivity.[16] Platelet count of <1.5 lakh/cumm was significantly associated with adverse maternal outcome. Similar results were seen in the study by Agrawal and Mitra.[15]

According to the PIERS developed through international Delphi consensus in year 2011,[17] Women with adverse outcomes were sicker overall; they were more hypertensive, more proteinuria, had higher liver enzyme levels, lower platelet counts, and lower SpO2 levels, and

have experienced 2 more cardio respiratory symptoms. women with adverse outcomes required more therapeutic interventions, including corticosteroids, anti-hypertensives, and magnesium sulphate.

In our study group, there was not much difference in incidence of IUD with 3 in low SPO2 group had IUD, similarly Neonatal deaths was 22.2% in low SPO2 group in comparison to 3.1% in normal SPO2 group. Birth asphyxia, MAS, NICU admission, all three were more in low SPO2 group but none was statistically significant.

CONCLUSION

The SPO2 played a vital role in prediction of maternal outcome among severe pre-eclamptic mothers. whenever the SPO2 levels are low, the ante- natal mothers encounter following adverse outcome namely LSCS mode of delivery, increased incidence of PRES, thrombocytopenia and acute renal dysfunction in addition in these mothers with low spo2 there is increased need for administration of parenteral anti-hypertensives , MgSO4 and blood products .The measurement of SPO2 on admission forms an excellent predictive tool helping the treating obstetrician to predict and decide the intervention at the earliest.

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