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By Dr. Ankita Metkari, Dr. Ashrulina Pal & Dr. Tushar Tatyana Palve

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Methods: In this retrospective study, antepartum, intrapartum and neonatal parameters were integrated into the clinical records and the relationship of a risk score to the outcome was evaluated for 346 randomly selected pregnant patients over 7 months

Conclusions: The present study shows that we achieve comparative and better results in high-risk pregnancy, improving both maternal and fetal outcome at our institute.

Keywords: *high-risk pregnancies, perinatal and maternal mortality, scoring system.*

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I. Introduction

High-risk pregnancy is defined as one which is complicated by a factor or factors that adversely affect the pregnancy outcome- maternal or perinatal or both. A high-risk pregnancy may be identified by using a scoring system such as the system developed by Hobel et al.1 Risk scoring system may be defined as a formalized method of recognizing, documenting and cumulating antepartum, intrapartum and neonatal risk factors to predict complications for the fetus and newborn. Among the mothers seen in the antenatal period, only 10-30% of mothers have been classified as high-risk. Out of those, 70-80% end up with perinatal mortality or morbidity. One of the most pressing public health issues in developing countries is perinatal mortality. Recent studies have shown that still perinatal mortality and morbidity is high-risk in India. It shows high-risk pregnancy is one of the leading causes of increasing perinatal morbidity and mortality. Early detection of high-risk pregnancy followed by special intensive care will show a significant change in the perinatal outcome. Treating high-risk pregnancies with extra attention and proper care will give a significant decrease in maternal morbidity and mortality.

A high-risk pregnancy is one of significant risk to the mother or her fetus than an uncomplicated pregnancy. Pregnancy places additional physical and emotional stress on a woman's body. Health problems that occur before a woman becomes pregnant or occuring during pregnancy may also increase the likelihood of a high-risk pregnancy. Any pregnancy can turn into a high-risk one anytime during its course. A pregnancy at risk needs to be identified at an earlier stage, often in the prenatal period to have an effective intervention strategy to deal with its complications. High-risk pregnancy requires sophisticated maternal and fetal surveillance to help in its management decisions to ensure optimal outcomes for both mother and her newborn.

II. About this Study

This study has been conducted in a Tertiary care hospital in Mumbai, spanning over 7 months from January to July 2018 with a sample size of 346 cases dealing with high-risk pregnancies. The high-risk pregnancies included in this study are Gestational hypertension (51 cases), Premature rupture of membranes (75 cases), Oligohydramnios (39 cases), Polyhydramnios (7 cases), Previous LSCS (105 cases), Gestational diabetes mellitus (5 cases), Anemia (11 cases), Intrauterine fetal death (14 cases), Breech presentation (22 cases), Antepartum haemorrhage (8 cases), Multiple gestation (9 cases).

Gestational HTN	PROM	Oligo	Prev LSCS	GDM	Poly	Anemia	IUFD	Breech	APH	Multiple gestation
51	75	39	105	5	7	11	14	22	8	9
14.73%	21.67%	11.27%	30.34%	1.44%	2.02%	3.17%	4.04%	6.35%	2.31%	2.60 %

Author: email: ankitametkari@gmail.com

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Types of High-Risk Pregnancies

a) Gestational Hypertension

At our institution:

					Study by Shobha et al[2]
Parity	Primigravida 54.90%	Multigravida 45.09%			Primi: 60.90% Multi: 39.1%
Baby status	Baby with mother 78.43%	Baby in NICU 15.68%	IUFD(1IUFD WITH OH) 5.88%		IUFD: 9.08% NICU : 39.09%
Mode of delivery	FTND 39.21%	LSCS 47.05%	PTVgD 11.76%	VBAC 1.96%	FTND:28.18% LSCS: 64.54% HYSTERECTOMY:2.72%
Period of gestation	Postdated 19.60%	Term 58.82%	Pre-term 21.56%		

As per the observations made, gestational hypertension was found to be more prevalent among primigravidas (54.9%) than multigravida (45.09%) similar to the findings by Shobha et al in which PIH was more common in Primigravida (60.90%) than in Multigravida(39.1%) Majority of the pregnancies extended to term accounting for 58.82%. LSCS was the most common mode of delivery, accounting for 47.05% of the cases, followed by FTND (39.21%), PTVgD (11.76%) and VBAC (1.96%) respectively, similar to the study by Shobha et al. in which FTND percentage was 28.18% and LSCS was 64.54%. In our institution,15.68% of the babies born were admitted in the NICU for indications like Respiratory distress (87.5%) and Anal atresia (12.5%), unlike in the study by Shobha et al. in which 39.09% babies got admitted in NICU. 5.88% of the pregnancies resulted in Intrauterine fetal demise in our hospital and 9.08%, with factors like HELLP syndrome, abruptio placentae, and anemia being additional contributing factors in the IUFDs. While 2.72% pregnancies terminated with hysterectomy in the study by Shobha et al., at our hospital *one patient with an IUFD underwent Obstetric hysterectomy with transfusion of 4-pint Whole blood and 3-pint FFPs and was under CCU care. Another patient who was a grand multipara with preterm gestation with PIH with HELLP syndrome with anemia with abruption placenta underwent Hysterotomy and was under CCU care.*

b) Premature Rupture of Membranes

					Dr. Zirsangliana Chhangte et al (2018)[3]
Parity	Primigravida 50.66%	Multigravida 49.33%			
Baby status	Baby with mother 81.33%	Baby in NICU 18.66%	IUFD -		NICU ADMISSION 6% BWM: 94%
Mode of delivery	FTND 44%	LSCS 48%	PTVgD 6.66%	Forceps 1.33%	FTND: 55% LSCS: 36% FORCEPS: 1%
Period of gestation	Postdated 18.66%	Term 66.66%	Pre-term 14.66%		

As per our study, the Premature rupture of membranes was found to be more prevalent among Primigravida (50.66%) than Multigravida (49.33%). 18.66% of the babies were admitted in the NICU with the indication of prolonged PROM (>18 hrs) being the most common, accounting for 57.14% of all NICU admissions for IV antibiotics administration, followed by Respiratory distress and Congenital anomaly respectively. Whereas in the study done by Dr. Zirsangliana Chhangte et al. in 2018, 6% of babies were admitted in NICU with 2 % babies diagnosed with early-onset sepsis and 2% with Birth asphyxia. No neonatal mortality occurred in either of the studies. In the study done by Dr. Zirsangliana Chhangte et al. termination by FTND was in 55 % of cases, while 36% needed LSCS most common indication being malpresentation. The Majority of patients were delivered by LSCS (48%) followed by FTND (44%), PTVgD (6.66%), and forceps application (1.33%), respectively, in our study, 66.66% of them were term patients.

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c) *Oligohydramnios*

				Veena Vidyasagar et al[4]
Parity	Primigravida 33.33%	Multigravida 66.66%		Primi: 46.34% Multi: 53.66%
Baby status	Baby with mother 89.74%	Baby in NICU 10.25%	IUFD -	NICU: 36.585% BWM: 63.415%
Mode of delivery	FTND 12.82%	LSCS 87.17%	PTVgD -	FTND: 51.22% LSCS: 48.78%
Period of gestation	Postdated 20.51%	Term 61.53%	Pre-term 17.94%	Postdated:8.64 Term: 50.61 Preterm: 40.74

Oligohydramnios was found to be more prevalent among Multigravidas in ours as well as in the study done by Veena Vidyasagar et al. 10.25% of the babies were admitted in the NICU with 50% of them admitted for post-resuscitation care, followed by low birth weight and respiratory distress. In our study 61.53% were term deliveries, 20.51% were postdated, and 17.94% were preterm. 87.17% of them underwent LSCS for safe confinement; the rest were full-term vaginal deliveries.

Whereas in the study by Veena Vidyasagar et al. 50.61 were term patients, 40.74% preterm, 8.64% postdated, termination by LSCS was done in 48.78% cases while the rest delivered vaginally eventually 36.585% babies were admitted in NICU, with 9.76% perinatal mortality rate.

d) *Polyhydramnios*

				Aditi Rajgire et al[5]
Parity	Primigravida 14.28%	Multigravida 85.71%		
Baby status	Baby with mother 85.71%	Baby in NICU -	IUFD 14.28%	IUFD 5%
Mode of delivery	FTND 14.28%	LSCS 57.14%	PTVgD 28.57%	
Period of gestation	Postdated 14.28%	Term 42.85%	Pre-term 42.85%	

Polyhydramnios was found to be more prevalent among multigravidas. An equal proportion of patients had delivered at term and at preterm. 87.71% of the babies had an uneventful delivery with no baby admitted in the NICU as per this study. 14.28% of the pregnancies resulted in IUFDs. 57.14% underwent LSCS, 28.57 % had PTVgDs and 14.28% underwent vaginal delivery.

e) *Previous LSCS*

				Nigamnanda et al[6]
Order of previous LSCS	Previous 1 LSCS 83.80%	Previous 2 LSCS 16.19%		
Baby status	Baby with mother 92.38%	Baby in NICU 6.66%	IUFD 0.95%	
Mode of delivery	VBAC 9.52%	LSCS 90.47%		LSCS: 84% VBAC: 16%
Period of gestation	Postdated 11.42%	Term 72.38%	Pre-term 16.19%	

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In this study, of all the patients who were a case of previous LSCS, 83.80% of them were previous 1 LSCS, and the rest were previous 2 LSCS. The majority of them were subjected to LSCS in their present conception, and only 9.52% delivered by VBAC (vaginal birth following caesarean section).In a study done by Nagamnand et al. although a trial of labour was given, VBAC was successful only in 16%, and 84% women underwent LSCS.

According to the study done in our hospital 6.66% of the babies were admitted in the NICU with fetal respiratory distress is the most common cause for the same accounting for 42.85% of the total, followed by PROM > 18 hrs (28.57%), ELBW + extreme preterm (14.28%) and for HGT monitoring (14.28%). 0.95% was the IUFD rate in the case of previous LSCS.

f) Gestational Diabetes Mellitus

				K Manga Reddy et al[7]
Parity	Primigravida	Multigravida 100%		Primi 40.8% Multi 59.1%
Baby status	Baby with mother 60%	Baby in NICU 40%	IUFD -	Baby in NICU 76%
Mode of delivery	FTND -	LSCS 100%	PTVgD -	VD 38% LSCS 62%
Period of gestation	Postdated 20%	Term 60%	Pre-term 20%	

In this study, all the patients with GDM were found to be multigravidas, and all of them underwent LSCS. 40% of the babies born to GDM mothers were admitted to NICU for HGT monitoring. 60% of them went to term, and 20% of them were postdated and preterm each.

g) Anemia

				Shraddha S Maka et al[8]
Parity	Primigravida 45.45%	Multigravida 54.54%		Primigravida 37% Multigravida 63%
Baby status	Baby with mother 72.72%	Baby in NICU 27.27%	IUFD -	Baby in NICU 25% IUFD 3%
Mode of delivery	FTND 72.72%	LSCS 18.18%	PTVgD 9.09%	
Period of gestation	Postdated 27.27%	Term 63.63%	Pre-term 9.09%	

Anemia is more prevalent among multigravidas. 27.27% of the babies were admitted in NICU, of which respiratory distress accounted for 66.66% of the NICU admissions and LBW with severe birth asphyxia accounting for the rest of the cases. Most of the patients underwent Full term vaginal delivery (72.72%), 18.18% of patients underwnt LSCS and the remaining were preterm vaginal deliveries. Maximum patients delivered at term, and *36.36% of the patients were given a blood transfusion.*

h) Intrauterine Fetal Death

				Anand Karale et al[9]
Parity	Primigravida 35.71%	Multigravida 64.28%		Primi: 43% Multi: 57%
Type of IUFD	MSB 57.14%	FSB 28.57%	Spontaneous Abortion 14.28%	Maceration present: 49.4% No signs of maceration: 50.6%
Mode of delivery	FTVgD 7.14%	LSCS 14.28%	PTVgD 78.57%	LSCS:5.1% Vaginal: 94.9%
Period of gestation	Postdated -	Term 7.14%	Pre-term 92.85%	Term: 12.7 % Preterm: 87.3%

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Intra-uterine fetal deaths were more prevalent among multigravidas (64.28%). Maximum patients delivered before term (92.85%) with only 7.14% of term deliveries. 78.57% were PTVgDs, 14.28% underwent LSCS and 7.14% underwent FTVgD. The most common type of IUFD was MSB (macerated still-birth), with 28.57% of FSB (fresh still-birth) and 14.28% of spontaneous abortions. *28.57% of the still-births were found to be associated with PIH.*

i) Breech Presentation

				Bushra Rauf et al (2000)[10]
Parity	Primigravida 59.09%	Multigravida 40.90%		Primigravida 24.9% Multigravida 75%
Baby status	Baby with mother 86.36%	Baby in NICU 13.63%	IUFD -	IUFD: 4.9%
Mode of delivery	FTND 13.63%	LSCS 86.36%	PTVgD -	VD 55.8% LSCS 44.4%
Period of gestation	Postdated 9.09%	Term 72.72%	Pre-term 18.18%	Term: 4.7% 29-32 weeks: 14%

The breech presentation was found to be prevalent among Primigravidas in our study, but contrary to it in the study done by Bushra et al. breech was more common in multigravida(75%) . The outcome of maximum pregnancies was uneventful, with only 13.63% of babies admitted in NICU of which LBW with preterm being the most common cause followed by the need for post-resuscitation care. 72.72% of the pregnancies went up to term, followed by preterm and postdated deliveries respectively, but in the study by Bushra et al. only 4.7 % breech were full-term , 14% between 29-32 wks and maximum were pre-term. LSCS was the most common mode of delivery (86.36%) in our institution, although in the comparative study vaginal delivery was more common, probably in view of, preterm breech presented in their study. The major cause of LSCS in their study was fetal distress followed by failure to progress.

j) Antepartum Hemorrhage

				Siddhartha Majumder et al (2015)[11]
Parity	Primigravida 50%	Multigravida 50%		Primi: 18% Multi: 82%
Baby status	Baby with mother 100%	Baby in NICU -	IUFD -	Perinatal mortality PP: 12.1% Abruptio placentae: 44.1%
Mode of delivery	FTND 12.50%	LSCS 75%	PTVgD 12.50%	LSCS: 85% (LSCS: IN PP: 100% Abruptio placentae:55.8%)
Period of gestation	Term 75%	Pre-term 25%		Term: 17% Preterm: 83%

Antepartum hemorrhage was found to be equally prevalent among primigravidas and multigravidas in our institution, but in the study by Siddhartha Mujemdar it was high-risk-risker in multigravidas in incidence (82%) Our study showed that there were no NICU admission and no IUFDs.

Where in, the study by Mujemdar et al. showed Perinatal mortality of 12.1% in placenta previa and 44.1% in Abruptio placentae. At our institute LSCS was the most prevalent mode of delivery (75%) followed by FTND and PTVgD similar to the study done by Mujemdar et al. in which the LSCS rate was 85% although all of placenta previa cases were delivered by LSCS and 44.2%v of abruption placentae delivered vaginally. Contrary to our study in which Three-fourth of the pregnancies went up-to term and one-fourth had to be terminated at preterm, the other study showed the incidence of APH to be high-risk-risker in preterm (83%).

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k) Multiple Gestation

				Amiben Gajera et al (2015)[12]
Parity	Primigravida 44.44%	Multigravida 55.55%		Primi: 34% Multi: 66%
Baby status	Baby with mother 66.66%	Baby in NICU 33.33%	IUFD -	NICU: 26.5 % Both IUD: 6% Single IUD:4.5%
Mode of delivery	FTND 33.33%	LSCS 33.33%	PTVgD 33.33%	VD: 56% LSCS: 39%
Period of gestation	Term 66.66%	Pre-term 33.33%		Term: 26% Preterm: 64% < 28 weeks: 10%

This study showed that multiple gestations were more prevalent among multigravidas, with 66.66% reaching term and the rest being terminated pre-term. Similarly, in the study done by Amiben Gajera et al. in 2015, Twin gestation was more in multigravidas,but contrary to our study only 26% reached full term while 64% delivered prematurely and a stand out of 10% were of <28 weeks of gestation. Regarding the perinatal outcome, 33.33% babies admitted in NICU, with respiratory distress being the most common cause followed by LBW for NICU admission. Mode of delivery was equally distributed among FTND, LSCS and, PTVgD in our study.

III. Summary

PIH: PIH was more prevalent in Primigravida, more common mode of delivery was LSCS and significant rate of PTVgD (11.76%) In our institution 15.68% of the babies born were admitted in the NICU for indications like Respiratory distress (87.5%) 5.88% of the pregnancies resulted in Intrauterine fetal demise in contrast to 9% IUFD and 2.72% obstetric hysterectomy in the study compared, *1 patient with a vaginally delivered IUFD underwent Obstetric hysterectomy i/v/o liver capsular hematoma.*

PROM: Premature rupture of membranes was found to be more prevalent among Primigravida (50.66%) and, 18.66% of the babies were admitted in the NICU with the indication of prolonged PROM (>18 hrs) being the most common, while FTND was found to be the common mode of delivery overall, and no neonatal mortality was associated with PROM.

Oligohydramnios: More prevalent among Multigravidas, 0.51% were postdated and, 17.94% were preterm. 87.17% of them underwent LSCS, whereas in the study compared termination by LSCS was done in 48.78% cases, Eventually 36.585% babies were admitted in NICU, with 9.76% perinatal mortality rate which wasn't the case in our institute with 10.25% NICU admissions and no neonatal mortality associated.

Polyhydramnios: It can be said that Polyhydramnios have been studied at a lower rate as high-risk compared to others. In our institute, it was seen more commonly in multigravidas, with equal incidence of term and preterm delivery (42% each). Polyhydramnios associated with IUFD was seen in 14% cases in our institute in contrast to 5% IUFD in the study compared.

GDM: At our institute, all mothers with GDM were Multigravida and, the choice of mode of delivery was LSCS in all of them with 40 % NICU admissions for HGT monitoring as compared to 76 5 NICU admissions in the study compared.

Anemia: As mentioned in literature, both the studies show anemia being prevalent in multigravidas and the choice of mode of delivery being Vaginal delivery.
IUFD: In patients with IUFD Preterm Delivery rates were high-risk at our centre with the rate of MSB almost double than that of FSB, which was equal in the study compared. LSCS was the least opted mode of delivery at the both places.

Breech presentation: AT our center, the breech presentation in a primigravida was more prevalent, resulting in delivery by LSCS in contrast to the study compared, which has more incidence of multigravida presenting with the breech in preterm labor and resulting into vaginal delivery.

Antepartum Heamorrhage:

APH incidence was equal in both multi and primigravida with the preferred mode of delivery being an emergency LSCS resulting in no NICU admissions at our center, whereas in the study compared mode of delivery was LSCS bu incidence was high-risk among multigravidas and resulted in increased NICU admissions and perinatal mortality & morbidity.

Multiple gestations is seen more commonly seen in multigravidas, with nn equal rate of delivery by FTVD, LSCS and Preterm delivery.

Hence it is evidently seen that the fetomaternal outcomes in various High-Risk Pregnancies were

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comparable and if can be said, were better at our institution, as compared to various individual studies done for the individual risk factors at different places.

IV. Conclusion

Our study is a retrospective study done at a tertiary care hospital in Mumbai, Maharashtra inclusive of 346 cases to assess fetomaternal outcomes in various High-Risk Pregnancies enrolled at our hospital. High-risk pregnancies included hypertension in pregnancy, PROM, Amniotic fluid diseases, Gestational Diabetes Mellitus, Anemia, IUFD, breech presentation, Multiple gestation and, APH. It can be said that the results for each of the high-risk states at tertiary care institutions are equivalent with a freedom to choose the appropriate method of termination and medical and surgical expertise and NICU facilities aiding to improved fetomaternal outcomes, proving the importance and evident good outcomes at a tertiary care center.

Of all the high-risk cases observed in this study only one was associated with maternal mortality, which stands out the critical role played by the modular infrastructure, expertise and facilities offered at a tertiary care centre, such as continuous NST monitoring, monitoring of fetomaternal well being, availability of expert obstetricians and anaesthesia - medicine team, availability of emergency interventions and medicines, well equipped operation theatre and post-operative and post-delivery monitoring, NICU and ventilator availability. All these facilities account to safe delivery and good health of both mother and the neonate with adequate care.

At any concerned center to have a good fetomaternal outcome it is essential to have a keen eye to pick out high-risk cases at the earliest on the OPD basis, cater to the required investigations and close follow up or in-patient admissions if required and essential active medical management at the minimal. Lastly but not least, a very vigilant labor monitoring is required to decide on a mode of delivery, to assess fetal well being and, to provide to the required care.

Limitations

The primary limitation of the study was that, since it was conducted in a tertiary-care hospital set-up, the number of high-risk cases maybe more, and it may not truly reflect the prevailing situation in a community setting.

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