



MATERNAL RISK FACTORS ASSOCIATED WITH PRETERM BIRTH IN A TERTIARY RURAL CARE CENTER

Pediatrics

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ABSTRACT

Introduction. In India, according to 2010 data 3.5 million babies are born premature out of 27 million babies born every year which constitutes to 23.6% of world total preterm births. Preterm morbidity is not only limited to neonatal period but also extends to later life resulting in continuous physical, psychological and economic stress to the individual and family. Since few studies have been done on preterm babies in a rural setup to assess the common maternal risk factors responsible for preterm birth this observational study of maternal risk factors associated with preterm birth has been taken up.

Material and methods. This is a prospective observational study done from 1st August 2019 - 31st July 2020 in Adichunchanagiri Institute of Medical sciences, Mandya. Study sample comprised of 100 preterm babies born in the study period. Data was collected on a preformed Performa, it was compiled and entered in MS excel sheet.

Results. In this study majority of women who delivered prematurely were primigravida (53.8%). Majority of women in this study belonged to age group 19-22 years (43.9%). More babies were delivered via LSCS (52%) when compared to vaginal route. Majority of women belonged to class III socio economic status (54.9%). Common maternal risk factors were PROM (30.8%), preeclampsia (20.9%), APH (13.2%) and Anemia (6.6%). 19.8% of women had previous BOH of which most common was abortion (14.2%). Common fetal risk factors were Breech (11%), Multiple gestation (9.9%).

Conclusion. Identification of maternal risk factors and early intervention can reduce the number of preterm deliveries and their associated morbidity and mortality.

KEYWORDS

Preterm birth, Preterm labor, Premature rupture of membranes.

INTRODUCTION

Worldwide, Preterm deliveries lead to loss of more than 75 million person-years of productive life.¹

According to WHO preterm birth is defined as any birth before 37wks of gestation or less than 259 days since the first day of Last Menstrual Period.²

In India 10-12% of babies are born preterm compared to west where it is 5-7%.³

Preterm birth rate is more in lower income countries when compared in higher income countries.

The etiology of preterm labor is multifactorial. Premature rupture of membranes is the major cause of Preterm labor, conditions like uteroplacental insufficiency, uterine overdistension, intra uterine vascular lesions and also leads to preterm labor. In almost half of the preterm birth cause is not known.

WHO 2015 recommendations like use of tocolytics, corticosteroids, and magnesium sulphate are essential for the neuroprotection and survival of the neonate.

Hence it is a need of the hour to ascertain maternal antenatal factors contributing to preterm birth and need for improvement of perinatal care to increase the neonatal survival.

Since few studies have been done on preterm babies in a rural setup to assess the common maternal risk factors responsible for preterm birth this observational study of maternal risk factors has been taken up.

MATERIALS AND METHODS

Study Place	Study was conducted in Tertiary Rural Care Hospital i.e., Adichunchanagiri Institute of Medical Sciences
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Study Duration	1 st August 2019 to 31 st July 2020
Study Subjects	Preterm babies that are less than 37 weeks of gestation born at Adichunchanagiri Institute of Medical Sciences
Study Design	Prospective Observational Study
Study Size	100 preterm babies

INCLUSION CRITERIA:

1. All preterm born at less than 37 week of gestation age.
2. Preterm babies who are small gestational age (SGA), appropriate for gestational age (AGA), large for gestational age (LGA).

EXCLUSION CRITERIA:

1. All babies who were referred from outside.
2. Babies born to unbooked maternal cases.

A total of 100 preterm babies delivered at ADICHUNCHANAGIRI INSTITUTE OF MEDICAL SCIENCES in the study period were included in the study.

Gestational age was calculated from mothers LMP and New Ballard score (NBS).

In case of discrepancy between gestational age calculated from mothers LMP and New Ballard score, gestational age calculated via NBS was taken into consideration.

Babies were weighed using electronic weighing machine present in our NICU with standard error of ± 5 grams.

Mothers of preterm babies were analyzed for the following factors:

1. Age of the mother
2. Socio-economic class
3. Antenatal care
4. Weight of the mother

5. Height of the mother
6. Maternal diseases
7. Treatment profile
8. Delivery outcome

Babies were analyzed for the following factors till discharge:

1. Weight of the babies
2. Mortality of babies

STATISTICAL ANALYSIS:

Patient data was entered into the MS Excel sheet and was analyzed using SPSS v23.

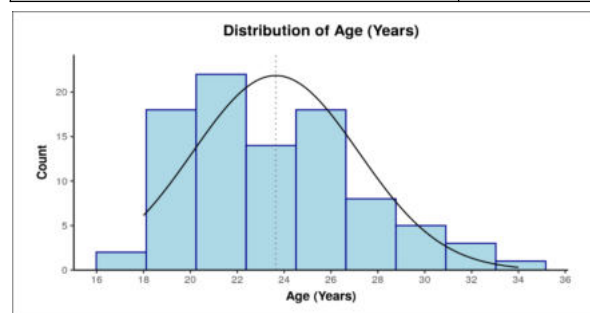
Data analysis was done using Shapiro-Wilk Test, Wilcoxon-Mann-Whitney U Test, t-Test, Spearman Correlation, Kruskal Wallis Test and Fisher's Exact Test.

A 'p' value less than 0.05 is taken to denote significant relationship. If value of 'p' is more than 0.05 then it is taken to denote absence of relationship between the two variables.

RESULTS

Table 1: Distribution of the Participants in Terms of Age (Years)

Mean (SD)	23.64 (3.54)
Median (IQR)	23 (21-26)
Range	18 – 34

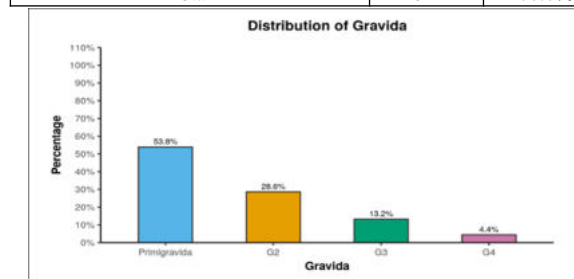


Graph 1- Distribution of age

Table 2- Different mothers age group	Mother	
	No.	%
Up to 18 years	2	2.1
19-22 years	40	43.9
23-26 years	32	35.1
27-30 years	13	14.2
>30 years	4	4.3
Total	91	100

Table 3: Distribution of the Participants in Terms of Gravida (n = 91)

Gravida	Frequency	Percentage
Primigravida	49	53.8%
G2	26	28.6%
G3	12	13.2%
G4	4	4.4%
Total	91	100.0%

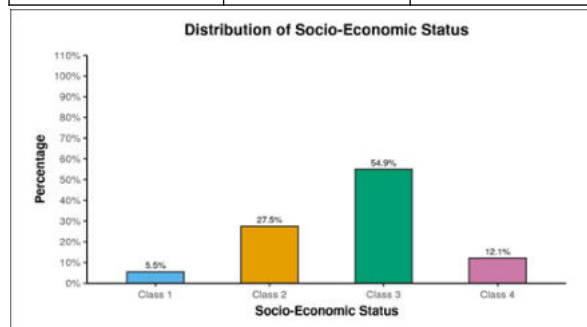


Graph 2- Distribution of Gravida

Table 4: Distribution of the Participants in Terms of Socio-Economic Status (n = 91) as per Modified Kuppuswamy Scale

Socio-Economic Status	Frequency	Percentage
Class 1	5	5.5%

Class 2	25	27.5%
Class 3	50	54.9%
Class 4	11	12.1%
Total	91	100.0%

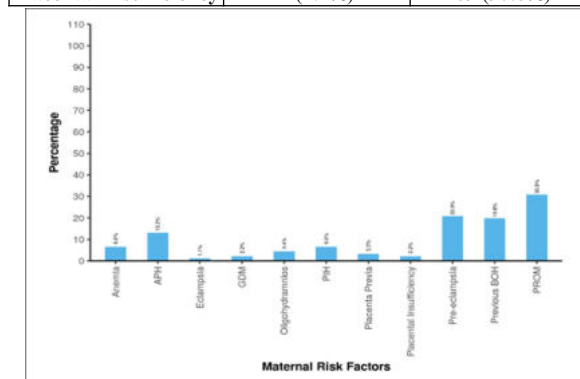


Graph 3- Distribution of Socio-Economic Status

No mothers belonged to class V of SES.

Table 5: Summary of Maternal Risk Factors

Maternal Risk Factors	Present	Absent
Previous BOH	18 (19.8%)	73 (80.2%)
Pre-eclampsia	19 (20.9%)	72 (79.1%)
Eclampsia	1 (1.1%)	90 (98.9%)
PIH	6 (6.6%)	85 (93.4%)
GDM	2 (2.2%)	89 (97.8%)
Anemia	6 (6.6%)	85 (93.4%)
PROM	28 (30.8%)	63 (69.2%)
APH	12 (13.2%)	79 (86.8%)
Oligohydramnios	4 (4.4%)	87 (95.6%)
Placenta Previa	3 (3.3%)	88 (96.7%)
Placental Insufficiency	2 (2.2%)	89 (97.8%)

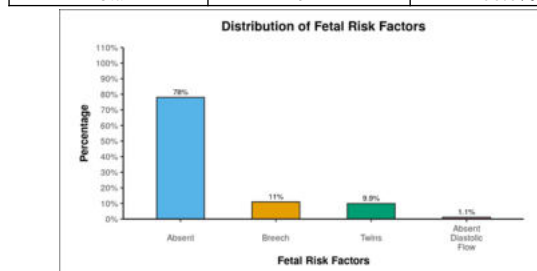


Graph 4- Distribution of Maternal Risk factors

24.1 % (22) of preterm birth were idiopathic

Table 6: Distribution of the Participants in Terms of Fetal Risk Factors (n = 91)

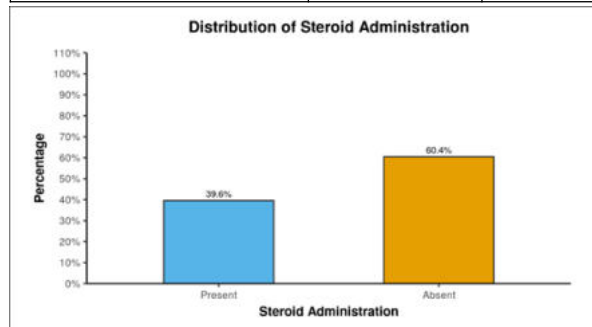
Fetal Risk Factors	Frequency	Percentage
Absent	71	78.0%
Breech	10	11.0%
Twins	9	9.9%
Absent Diastolic Flow	1	1.1%
Total	91	100.0%



Graph 5- Distribution of Fetal Risk Factors

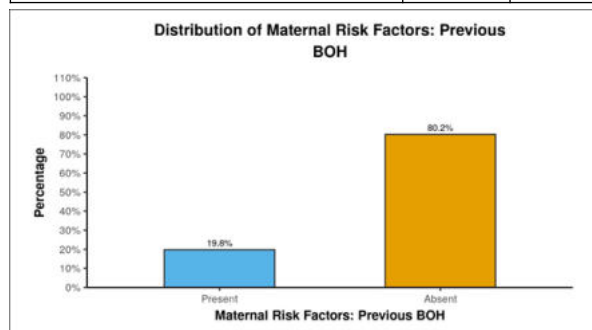
Table 7: Distribution of the Participants in Terms of Steroid Administration (n = 91)

Steroid Administration	Frequency	Percentage
Present	36	39.6%
Absent	55	60.4%
Total	91	100.0%

**Graph 6- Distribution of Steroid Administration****Table 8: Distribution of the Participants in Terms of Maternal Risk Factors:**

Previous BOH (n = 91)		
Maternal Risk Factors: Previous BOH	Frequency	Percentage
Present	18	19.8%
Absent	73	80.2%
Total	91	100.0%

Table 9- Distribution of BOH in mothers		Mother	
		No.	%
Abortion		13	14.2
Infertility		3	3.2
Death		2	2.1
Total		18	19.8

**Graph 7- Distribution of Previous BOH****Table 10- Association between Birth weight and Maternal risk factors.**

Parameters	Birth Weight (Kg)	p value
Maternal Age (Years)	Correlation Coefficient (rho) = -0.16	0.113
Gravida		0.377
Primigravida	1.89 ± 0.40	
G2	1.90 ± 0.57	
G3	1.70 ± 0.63	
G4	1.61 ± 0.10	
Socio-economic Status		0.273
Class 1	2.05 ± 0.44	
Class 2	1.87 ± 0.47	
Class 3	1.78 ± 0.45	
Class 4	2.04 ± 0.62	
Maternal Risk Factor: Previous BOH		0.325
Present	1.95 ± 0.51	
Absent	1.83 ± 0.47	
Maternal Risk Factor: Pre-eclampsia***		0.020
Present	1.64 ± 0.43	

Absent	1.91 ± 0.48	
Maternal Risk Factor: Eclampsia		0.166
Present	2.50 ± 0	
Absent	1.85 ± 0.48	
Maternal Risk Factor: PIH		0.608
Present	1.94 ± 0.47	
Absent	1.84 ± 0.48	
Maternal Risk Factor: Anemia***		0.013
Present	1.82 ± 0.47	
Absent	2.31 ± 0.47	
Maternal Risk Factor: PROM		0.678
Present	1.89 ± 0.56	
Absent	1.84 ± 0.45	
Maternal Risk Factor: APH***		0.022
Present	1.58 ± 0.32	
Absent	1.89 ± 0.49	
Maternal Risk Factor: Oligohydramnios***		0.010
Present	1.28 ± 0.17	
Absent	1.88 ± 0.47	
Maternal Risk Factor: Placental Insufficiency		0.074
Present	1.29 ± 0.16	
Absent	1.86 ± 0.48	
Maternal Risk Factor: Placenta Previa		0.293
Present	1.61 ± 0.17	
Absent	1.86 ± 0.48	
Fetal Risk Factors***		0.044
Present	1.70 ± 0.49	
Absent	1.92 ± 0.47	
Maternal Steroid Administration***		<0.001
Present	1.58 ± 0.42	
Absent	2.04 ± 0.42	

Table 11: Association between Fetal Mortality and Maternal risk factors

Parameters	Fetal Mortality		p value
	Present (n = 3)	Absent (n = 97)	
Maternal Age (Years)	25.00 ± 6.08	23.59 ± 3.51	0.855
Gravida			0.608
Primigravida	1 (1.9%)	53 (98.1%)	
G2	1 (3.7%)	26 (96.3%)	
G3	1 (7.1%)	13 (92.9%)	
G4	0 (0.0%)	5 (100.0%)	
Socio-economic Status			0.470
Class 1	0 (0.0%)	7 (100.0%)	
Class 2	0 (0.0%)	27 (100.0%)	
Class 3	2 (3.6%)	53 (96.4%)	
Class 4	1 (9.1%)	10 (90.9%)	
Maternal Risk Factor: Previous BOH (Present)	0 (0.0%)	21 (100.0%)	1.000
Maternal Risk Factor: Pre-eclampsia (Present)	0 (0.0%)	20 (100.0%)	1.000
Maternal Risk Factor: Eclampsia (Present)	0 (0.0%)	1 (100.0%)	1.000
Maternal Risk Factor: PIH (Present)	0 (0.0%)	7 (100.0%)	1.000
Maternal Risk Factor: Anemia (Present)	0 (0.0%)	6 (100.0%)	1.000
Maternal Risk Factor: PROM (Present)	1 (3.3%)	29 (96.7%)	1.000
Maternal Risk Factor: APH (Present)	1 (8.3%)	11 (91.7%)	0.321
Maternal Risk Factor: Oligohydramnios (Present)	0 (0.0%)	4 (100.0%)	1.000
Maternal Risk Factor: Placental Insufficiency	0 (0.0%)	2 (100.0%)	1.000
Maternal Risk Factor: Placenta Previa (Present)	0 (0.0%)	3 (100.0%)	1.000

Fetal Risk Factors (Present)	2 (6.9%)	27 (93.1%)	0.201
Maternal Steroid Administration (Present)	3 (7.3%)	38 (92.7%)	0.066

DISCUSSION

Prematurity poses a heavy burden of death and disability in the neonate, suffering and pain to the families.

In our study we tried to find the maternal factors associated with preterm birth.

Maternal age

In our study the age group of mothers ranged from 18-34 years. Maximum number of mothers who delivered prematurely were in the age group of 19-22 years (43.9%), with a mean age of 23 years.

In our study there were 2 (2.1%) women aged 18 years and 4 (4.3%) of women more than 30 years of age.

In a study done by Mahajan and Magon⁴, the maximum number of women who delivered prematurely were in the age group of 25-34 years and in a study done by Auger et al⁵ on the role of maternal age to the rate of preterm birth revealed that preterm rates increased the most in women of age group of 20-29 years, whereas the preterm rates decreased or remains stable in women over 35 years of age.

In a study by Singh Uma et al⁶ 32(7.7%) women were 18 years & 24(5.8%) > 35 years old, which was similar to our study.

Table 12- Comparison maternal age group in different studies	Age group of majorities of women delivering prematurely	%
Present study	19-22	43.9%
Satish et al	21-23	40.3%

In a study by Satish et al⁷ majority of women delivering prematurely belonged to age group of 21-23 (40.3%) which is similar to our study. However, the studies done by blessing C Umeigbo et al⁸ and Ananya Das et al⁹ showed that preterm birth is more common in women aged more than 35 years.

Mother Gravida-

In our study majority of women who delivered prematurely were primigravida 49 (53.8%) which were similar to study done by Blessing C Umeigbo et al⁸, Kou- Huang Chen et al¹⁰ and Mosayyebi Z et al¹¹ which found that nulliparous women are more likely to delivery preterm.

However, this finding is different than in studies done by Irshad M et al¹² and Shreshtha S et al¹³ which had shown that multiparous women are more likely to deliver preterm.

Socioeconomic status-

In our study majority of pregnant women belonged to Class III of SES (54.9%), followed by Class II (27.5%), Class IV (12.1%), and Class I (5.55%) in contrast to a study done by Ananya Das et al⁹ which found that 27.8% of mothers belonged to Class IV and V.

In our study there was no significant correlation between SES and birth weight (p value=0.273), and SES and Fetal mortality (P value=0.470).

Maternal Risk factors-

In our study PROM (30.8%) was the most common risk factor, followed by preeclampsia (20.9%), Previous BOH (19.8%) and APH= Anemia (6.6%) and 22(24%) mothers delivering prematurely didn't have any risk factors which similar to studies done by Laxman Paudel et al¹⁴, Kuppasamy et al¹⁵ and Uma et al¹⁶ which found PROM to be the most common risk factor. Hypertensive disorder of pregnancy were common risk factors in all this studies and it predisposes to acute and chronic uteroplacental insufficiency leading to antenatal and perinatal hypoxia leading to poor outcomes like prematurity.

Table 13- Comparison of maternal risk factors in different studies	Present study	Laxman Paudel et al
	%	%
PROM	30.8%	31.2%
Hypertensive disorders of pregnancy	27.8%	15.1%
APH	13.2%	8.6%
Idiopathic	24.1%	20.4%

In a study done by Vidyadhar B. Bangal et al¹⁷ risk factors were found in 57% of cases and other cases were idiopathic similar to our study.

However, in studies done by Sumit bansal et al¹⁸, Roy KK et al¹⁹ and Arvind Sehgal et al²⁰ anemia was the commonest maternal risk factor opposed to a study done by Shresta et al¹³ where APH was the commonest risk factor.

In our study there was no significant correlation between maternal risk factors and fetal mortality (P value=1.00).

In our study 18 (19.8%) women have previous bad obstetric history in which majority had abortion 13(14.2%) followed by infertility 3(3.2%) and death 2 (2.1%) whereas history of previous abortion or previous preterm was seen in 28.4% of cases in a study done by Azam Mohsenzadeh et al²¹. It has been reported that history of one or more spontaneous/induced abortion increases the risk of preterm birth.

Carr-Hill and Hall have shown that in women who have history of one preterm delivery there is 15 percent chance of next preterm delivery and this chance is increased to 32 percent after two preterm deliveries.²² However, in our study there was no history of previous preterm delivery in the cases.

Fetal risk factors-

In our study 78% of cases didn't have any fetal risk factor, 11% had breech presentation followed by multiple gestation in 9.9% of cases and absent diastolic flow in 1.1%.

Table 14- Comparison of fetal risk factors in different studies	Present study	Satish D. Ashtekar et al
	%	%
Breech	11	5.9
Twin	9.9	17.9

However, studies done by Satish D. Ashtekar et al⁷ and Azam Mohsenzadeh et al²¹ multifetal pregnancies accounted for 17.9% and 19.7% respectively.

In our study there was no correlation between Fetal risk factors and fetal mortality (p value=0.201)

Steroid administration-

In our study 36(39.6%) of mothers received steroids, which was similar in a study done by Lulu M Muhe et al.²³

In our study there was no significant difference between fetal mortality and maternal steroid administration(p=0.066).

CONCLUSION

Majority of the women belonged in the age group of 19 to 22 years indicating younger women give birth to more preterm babies.

Majority of babies were delivered by LSCS which may be due to higher probability of preterm delivery via caesarean section due to obstetric complications such as PIH, APH.

Majority of pregnant women belonged to class III and class II socio economic status indicating that mothers in lower socio-economic group are more prone for preterm delivery due to various factors like poor antenatal care, poor accessibility to medical facilities, poor nutrition & inadequate awareness regarding preterm delivery & its consequences.

There are numerous risk factors for preterm birth of which previous bad obstetric history was present in 19.8% mothers of which the most common was previous abortions (14.2%) followed by previous infertility (3.2%) & previous intrauterine death (2.1%).

Maternal risk factors during pregnancy contributing to preterm delivery were PROM (30%) being the most common in our study followed by Pre-eclampsia (20.9%), PIH (6.6%), APH (13.2%) and anemia (6.6%). 24.1% of preterm birth were idiopathic.

Maternal conditions like Anemia, APH, pre-eclampsia and oligohydramnios had significant association with birth weight.

Hence it is of utmost importance to identify the maternal risk factors & intervene early which can reduce the number of preterm deliveries and their associated morbidity & mortality.

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CONFLICT OF INTEREST

There are no conflicts of interest.

REFERENCES

- Murray CJ, Vos T, Lozano R, Naghavi M, Flaxman AD, Michaud C, et al. Disability-adjusted life years (DALYs) for 291 diseases and injuries in 21 regions, 1990-2010: A systematic analysis for the global burden of disease study 2010. *Lancet* 2012;380:2197-223.
- Howson C.P., Kinney M.V., Lawn J. March of Dimes, PMNCH, Save the Children, WHO; 2012. Born Too Soon: the global action report on preterm birth.
- Preterm birth | National Health Portal Of India [Internet]. Nhp.gov.in. 2020 [cited 26 July 2020]. Available from: <https://www.nhp.gov.in/disease/reproductive-system/female-gynaecological-diseases/preterm-birth>
- Mahajan A, Magon S. Study of Risk Factors for Preterm Births in a Teaching Hospital: A Prospective Study. *International Journal of Medical and Dental Sciences*. 2017;6(1):1407.
- Auger N, Hansen A, Mortensen L. Contribution of Maternal Age to Preterm Birth Rates in Denmark and Quebec, 1981–2008. *American Journal of Public Health*. 2013;103(10):e33-e38.
- Singh U, Singh N, Seth S : A Prospective analysis of etiology and outcome of preterm labour. *J Obstet Gynecol India* 2007;57(1):48-52.
- Ashtekar, Satish D., et al. "Study of premature babies in relation to its outcome and antenatal risk factors at General Hospital Sangli." *Journal of Evolution of Medical and Dental Sciences*, vol. 3, no. 30, 2014, p. 8506+. *Gale OneFile: Health and Medicine*, Accessed 19 Aug. 2020.
- Blessing C Umeigbo, Ifeoma A Modebe, Ifeoma C Iloghalu, George U Eleje, Chukwuemeka C Okoro, Osita S Umeonih, Ekene A Emeka. Outcomes of Preterm Labor and Preterm Births: A Retrospective Cross-Sectional Analytical Study in a Nigerian Single Center Population. *Obstetrics and Gynecology Research* 3 (2020): 017-028.
- Das, A., Subrat, P., Ss, A., Gd, S., & Sg, B.P. (2015). Preterm Birth: Analysis of Risk Factors and Neonatal Outcome.
- Chen K, Chen I, Yang Y, Chen K. The trends and associated factors of preterm deliveries from 2001 to 2011 in Taiwan. *Medicine*. 2019;98(13):e15060.
- Mosayebi Z, Fakhraee S H, Movahedian A H. Prevalence and risk factors of low birth weight infants in Mahdih hospital, Tehran. *Feyz*. 2004; 8 (2) :58-67
- Irshad M, Ahmad A, Ahmed KF, Hayat M, Kareem R, Hussain M, et al. Risk Factors for Preterm Births in a Tertiary Care Hospital, Lady Reading Hospital, Peshawar. *J Postgrad Med Inst* 2012; 26(2): 158-64.
- Shrestha S, Dangol SS, Shrestha M, Shrestha RP. Outcome of preterm babies and associated risk factors in a hospital. *JNMA J Nepal Med Assoc*. 2010;50(180):286-290.
- Paudel, L., Kalakheti, B., & Sharma, K. (2018). Prevalence and Outcome of Preterm Neonates Admitted to Neonatal Unit of a Tertiary Care Center in Western Nepal. *Journal of Lumbini Medical College*, 6(2).
- Kuppusamy N, Vidhyadevi A. Prevalence of Preterm Admissions and the Risk Factors of Preterm Labor in Rural Medical College Hospital. *Int J Sci Stud* 2016;4(9):125-128.
- Singh Uma, Singh Nisha, Seth Shikha. A prospective analysis of etiology and outcome of preterm labour. *J Obstet Gynecol India*. 2007;57(1):48-52.
- Bangal V, Shinde K, Khanvelkar G, Patil N. A STUDY OF RISK FACTORS AND PERINATAL OUTCOME IN PRETERM LABOUR AT TERTIARY CARE HOSPITAL. *International Journal of Biomedical Research*. 2012;3(3).
- Bansal, Sumit, et al. "Pattern of morbidity and mortality in preterm newborns in a tertiary care teaching hospital." *Journal of Evolution of Medical and Dental Sciences*, vol. 4, no. 69, 2015, p. 11976+.
- Roy K, Baruah J, Kumar S, Malhotra N, Deorari A, Sharma J. Maternal antenatal profile and immediate neonatal outcome in VLBW and ELBW babies. *The Indian Journal of Pediatrics*. 2006;73(8):669-673.
- Sehgal A, Telang S, Passah S, Jyothi M. Maternal and Neonatal Profile and Immediate Outcome in Extremely Low Birth Weight Babies in Delhi. *Tropical Doctor*. 2004;34(3):165-168.
- Mohsenzadeh, A., Saket, S., Karimi, A. Prevalence of Preterm Neonates and Risk Factors. *Iranian Journal of Neonatology IJN*, 2011; 2(1): 38-42. doi: 10.22038/ijn.2011.5152
- CARR-HILL R, HALL M. The repetition of spontaneous preterm labour. *BJOG: An International Journal of Obstetrics and Gynaecology*. 1985;92(9):921-928.
- Muhe L, McClure E, Nigussie A, Mekasha A, Worku B, Worku A et al. Major causes of death in preterm infants in selected hospitals in Ethiopia (SIP): a prospective, cross-sectional, observational study. *The Lancet Global Health*. 2019;7(8):e1130-e11.