Original Article

Perinatal Outcome Following Genitourinary Tract Infection in Preterm Labour: A Hospital Based Cross-sectional Study

Obstetrics and Gynaecology Section

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ABSTRACT

Introduction: Preterm labour (PTB) is one of the major concerns in obstetrics with respect to both or neonates and the mother.

Aim: To study the genitourinary tract infections among the cases of preterm labour in a tertiary care hospital; and to estimate the Appearance, Pulse, Grimace, Activity, and Respiration (APGAR) scores and birth weights of preterm babies.

Materials and Methods: This was a descriptive cross-sectional study conducted in the Department of Obstetrics and Gynaecology of AJ Institute of Medical Sciences and Research Centre, Mangalore, India. All the preterm labours that occurred in the study setting in the calendar year of 2020 were considered as potential study participants. After screening for eligibility criteria, study participants were finalised. Intra-natal and immediate postnatal details (gestational age at delivery, mode of delivery, birth-weight of the baby, APGAR score, Neonatal Intensive Care Unit (NICU) admission) were noted. Investigations like C-Reactive Protein (CRP), urine routine and microscopy, urine culture and sensitivity,

high vaginal swab analysis were also noted. Data entry and analysis was done in Microsoft Excel version 2013.

Results: There were 130 study participants, out of which 102 were eligible for the study. Most of the preterm deliveries occurred in primigravida between 32 and 37 weeks. Symptoms and signs of genitourinary tract infection was found in many (29% to 99%) mothers delivered preterm. Common organisms found in culture from urine sample and high vaginal swab were *Escherichia coli (E.coli)* (23.5%) and *Candida* (43.9%), respectively. Among 102 preterm new-borns, 58.8%% were delivered vaginally and 42.2% of the new-borns required NICU care. Proportion of infection among those undergoing preterm labours was higher. Hence, preterm labour and the complications can be avoided by good hygienic practices and medications.

Conclusion: Proportion of infection among those undergoing preterm labours was higher. Hence, preterm labour and the complications can be avoided by good hygienic practices and medications.

INTRODUCTION

Preterm labour which is nothing but onset of labour after the period of viability and before completion of 37 weeks [1]. This inadvertent event is an important health issue, which is known to cause various maternal as well as foetal complications including pregnancy loss. Hence, it is necessary to explore the risk factors of preterm labour, so that they may be predicted and timely interventions can be taken to prevent/reduce the severity of complications [2].

Preterm labour is a multifactorial event. Many potential risk factors have been identified, such as low socio-economic status, smoking, periodontitis, previous preterm labour, and multiple pregnancies [3]. One of the many causes has been proposed to be genitourinary tract infections including bacterial vaginosis, symptomatic/asymptomatic bacteriuria etc. Infections cause inflammatory response leading to release of numerous cytokines such as TNF-alpha, interleukins, and prostaglandins (PGE2, PGD2, and PGF2a); these cytokines are proven uterine contractors [4].

This probable association between preterm labour and infections becomes one of the issues of major concern in developing countries like India, where the prevalence of preterm labour ranges from 5% to as high as 25% and the prevalence of infection is high, tagged to poor hygienic practices [5]. Though there are a good number of studies conducted in this regard, it is important to understand the infection patterns and their implications on preterm labour in different geographical locations at different timelines.

Hence, the study was planned to understand the genitourinary tract infections among the pregnancies that terminate with preterm

labour. The results from this study are expected to explain how the infections maybe associated with preterm labour; and may direct the timely clinical care to be provided by the obstetricians.

MATERIALS AND METHODS

This cross-sectional descriptive study was conducted in the Department of Obstetrics and Gynaecology of AJ Institute of Medical Sciences and Research Centre, Kuntikana, Mangalore in the month of January 2021, after obtaining ethical clearance from the Institutional Ethical Committee. Study participants included all the pregnant mothers who were admitted to the hospital for preterm labour. Timeframe sampling was adopted i.e., all the preterm labours that occurred in the study setting in the calendar year of 2020 were considered as potential study participants. They were screened for eligibility criteria, which were as follows:

Inclusion criteria: All pregnant women, aged between 18 and 35 years, with period of gestation between 24 weeks and 36 weeks, who presented to the hospital with symptoms and signs of preterm labour in the calendar year of 2020 (January 2020 to December 2020) were included.

Exclusion criteria: Pateints with multiple gestation, foetal anomalies, mal-presentations, intra-utrine deaths were excluded.

Details of all the eligible study participants were taken from hospital records, maintained in the Medical Records Department of the institute. Permission was obtained from the concerned administrative authorities of the hospital before obtaining the data from the Records Department. Study variables included intra-natal and immediate postnatal details (gestational age at delivery, mode of delivery, birth-weight of the baby, APGAR score, NICU

admission) and investigations done at the time of admission to the hospital specifically looking for genitourinary tract infection (Urine routine and microscopy, Urine culture and sensitivity, High vaginal swab analysis).

Preterm deliveries are further classified based on gestational age at the time of delivery and birth-weight. Based on gestational age, there are three categories: (i) Extremely preterm: <28 weeks; (ii) Very preterm: 28 to 32 weeks; and (iii) Moderate to late preterm: 32 to 37 weeks [6]. Based on birth-weight, there are four categories: (i) extremely low birth-weight: <1,000 grams; (ii) very low birth-weight: 1,000 to 1,500 grams; (iii) low birth-weight: 1,500 to 2,500 grams; and (iv) Normal birth-weight: ≥2,500 grams [6].

STATISTICAL ANALYSIS

Data was entered and analysed in Microsoft Excel version 2013. Descriptive statistics i.e., frequencies, proportions were used to describe the variables related to genitourinary infections and the details of the new-borns.

RESULTS

There were 130 study participants, out of which 102 were eligible for the study, and all of them consented for participation. Their details are as given below. As shown in [Table/Fig-1], gestational age of the study participants ranged from as early as 25 weeks to 36 weeks, with mean (Standard deviation) gestational age of 33.80 weeks (2.43 weeks). Most of the preterm labours (77.5%) occurred between 32 and 37 weeks.

Categories of preterm	Gestational age at delivery (weeks)	Frequency	Percentage
Extremely preterm	<28 weeks	2	1.9%
Very preterm	28 to 32 weeks	21	20.6%
Moderate to late preterm	32 to 37 weeks	79	77.5%

[Table/Fig-1]: Distribution of study participants as per gestational age at delivery (N=102).

Most of the pregnancies (43.2%) that had preterm labour were pregnant for the first time [Table/Fig-2]. Another one-third (33%) were pregnant for the second time. Around 10% of their pregnancies were of higher order.

Gravida	Frequency	Percentage
Primigravida	44	43.2%
Gravida 2	34	33.3%
Gravida 3	14	13.7%
Gravida 4 and above	10	9.8%

[Table/Fig-2]: Gravida distribution.

Mode of delivery and outcome of preterm labour is shown in [Table/Fig-3]. A 58.8% of the preterm babies were delivered vaginally. As for NICU admission, 42.2% of the new-borns required NICU care.

Variable	Categories	Frequency (Percentage)
Mode of delivery	LSCS	42 (41.2%)
	Vaginal	60 (58.8%)
NICU admission	Required	43 (42.2%)
	Not required	59 (57.8%)

[Table/Fig-3]: Distribution of study participants based on delivery and outcome of preterm labour.
LSCS: Lower segment cesarian section; NICU: Neonatal intensive care unit

Birth weight of preterm newborns [Table/Fig-4] ranged from as low as 0.8 kg to 3.3 kg. Mean (Standard deviation) birth weight was 2.42 kg (0.503 kg). Half of the preterm babies weighed in the normal range. A 43.2% of them had low birth weight, 3% had very low birth weight and 3.9% had an extremely low birth weight.

Birth weight category	Frequency	Percentage
Extremely low birth weight	4	3.9%
Very low birth weight	3	2.9%
Low birth weight	44	43.2%
Normal birth weight	51	50.0%

[Table/Fig-4]: Distribution of preterm new-borns based on birth weight categories.

APGAR scores [Table/Fig-5] of preterm newborns in the present study was below the normal range in 32.4% and 12.7% cases, at the end of 5 minutes and 10 minutes, respectively.

APGAR score	Normal (7 and above)	Low (6 and below)
At the end of 1 minute	45 (44.1%)	57 (55.9%)
At the end of 5 minutes	69 (67.6%)	33 (32.4%)
At the end of 10 minutes	89 (87.3%)	13 (12.7%)

[Table/Fig-5]: APGAR scores of preterm new-borns at the end of 1, 5 and 10 minutes.
APGAR: Appearance, pulse, grimace, activity, and respiration

[Table/Fig-6] summarises the study findings related to risk factors of preterm labour. History of preterm labour is a strong predictor of preterm labour in the present pregnancy as well. C-reactive protein was high in 53.9% of the mothers who underwent preterm labour. On detailed history taking, it was evident that 53.9% of the mothers gave history suggestive of urinary tract infection and 99% gave history suggestive of white discharge per vagina. On investigation, 55.9% of the preterm mothers had >5 urinary pus cells. However, on urinary culture, only 30% showed growth. Also, high vaginal swab culture showed growth in 57.8% of the preterm mothers.

Risk factor		Frequency	Percentage
History of previous preterm		39*	67.2%
History of urinary tract infection		55	53.9%
History of white discharge per vagina		101	99.0%
Urine pus cells (per high power field)	0 to 1	25	24.5%
	2 to 4	19	18.6%
	>5	57	55.9%
Urinary culture (Growth present)		30	29.4%
High vaginal swab culture (Growth present)		59	57.8%
C-reactive protein (milligram per litre)		55	53.9%

[Table/Fig-6]: Risk factors/predictors for preterm labour in index pregnancies.
*Denominator for this risk factor is 58. For all others, it is 102

The organisms detected on urinary culture [Table/Fig-7] were *Escherichia coli* (23.5%), *Staphylococcus aureus* (4.9%) and *Klebsiella spp.* (1%). Prevalence of urinary tract infection among women with preterm labour is 29.4%.

Organism detected on culture	Frequency	Percentage
No growth	72	70.6%
Staphylococcus aureus	5	4.9%
Escherichia coli	24	23.5%
Klebsiella spp.	1	1.0%

[Table/Fig-7]: Bacteriological profile in urine sample.

High vaginal swab culture [Table/Fig-8] of preterm mothers in this study showed that the prevalence of vaginal infection in women with preterm labour is 57.8%. The culture grew two organisms: *Candida* (43.2%) and *Trichomonas* (14.7%).

Organism detected on culture	Frequency	Percentage
No growth	43	42.1%
Trichomonas	15	14.7%
Candida	44	43.2%

[Table/Fig-8]: Bacteriological profile of high vaginal swab culture.

DISCUSSION

Most of the preterm deliveries occurred between 32 and 37 weeks i.e., moderate to late preterm. Most preterm labours were encountered in primigravida. However, in study conducted by Yarlagadda S et al., in Andhra Pradesh in 2016, most preterm births were seen among multigravidas [7].

According to this study, 41.2% of the preterm births required caesarean section, we can write exact percentage birth weight of less than 'normal' range and required Neonatal Intensive Care Unit (NICU) admission. This is higher than the cumulative/term deliveries, which further highlights the importance that has to be given to preterm births.

In this study, symptoms and signs of genitourinary tract infection was found in many (29% to 99%) mothers delivered preterm. Prevalence of urinary tract infections and genital tract infections among women delivering preterm were 29.4% and 57.8%, respectively. This prevalence is high as compared to other similar studies, such as 22% of urinary tract infection and 38% of vaginal infection among preterm labour cases in a study conducted by Ghunage V et al., in Maharashtra [8]. Also, a similar study conducted by Rao C et al., in the neighbouring district in the year 2014 showed that the prevalence of infection was only 10% [9]. This difference could be due to the variation in the socio-economic strata to which the admitted preterm cases belong. Also, there has been better control of other risk factors such as medical conditions affecting the pregnancy, previous preterm or threatened preterm etc., because of which the genitourinary tract infections are one of the major causes of preterm labour. However, the high prevalence of infection in the present study requires further investigation to give a better picture.

Common organisms found in culture from urine sample and high vaginal swab were *Escherichia* coli and *Candida* respectively, which is similar to a study conducted by Yarlagadda S et al., in Andhra Pradesh in and by Fernandes F et al., in Goa in 2015 [7,10]. A cohort study conducted by Bernardo FMM et al., in Brazil in 2020 showed that the risk is pregnant mother with urinary tract infections developing a preterm labour is twice as that of those without urinary tract infection [11]. Also, this study suggests a weak connection between vaginal infection and preterm labour. Some other similar studies carried out in southern part of India are summarised in the [Table/Fig-9] [8,9,12-14].

Limitation(s)

Major strength of this study is that it provides a baseline to carry on further studies. Limitation of this study is that, on ethical grounds, comparison group was not taken; since investigations in term deliveries would be an unnecessary burden, both to the patients and the healthcare sector. However, for better understanding of the association between genitourinary tract infections and preterm labour, a study of larger magnitude maybe planned.

CONCLUSION(S)

Proportion of infection among those undergoing preterm labours is higher. Hence, infection may be taken care of by good hygienic

Author	Place, year	Findings
Rao C R et al., [9]	Karnataka, 2014	Prevalence of urinary tract infection is 1.3 times among preterm labours than in term labours. However, this was statistically insignificant.
Ghunage V et al., [8]	Maharashtra, 2014	Most common organisms: Escherichia coli, Candida albicans and Enterrococcus faecalis
Soundarajan P et al., [12]	Tamil Nadu, 2016	Prevalence of urinary tract infection is 1.5 times among preterm labours than in term labours. The difference was statistically significant.
Mathew S M and Kumar A, [13]	Kerala, 2018	Urinary tract and vaginal infections are important factors associated with preterm labour. Most common organisms: Escherichia coli (17.3%) and Staphylococcus aureus (7.9%).
Patil P et al., [14]	Maharashtra, 2019	Proportion of urinary tract infections and vaginal infections among preterm labour cases were 7% and 13% respectively. Most common organisms: Candida (5%), Escherichia (1%), Klebsiella (1%).

[Table/Fig-9]: Summary of findings of various south Indian studies related to genitourinary tract infections in preterm labour [8,9,12-14].

practices and timely medications (antibiotics as per reports of urine culture and high vaginal swab culture). For timely administration of antibiotics, antenatal mothers need to be educated regarding symptoms of genitourinary tract infection and to report to hospital in case of development of any symptoms, without any delay. With this approach, preterm labours and the following complications maybe avoided.

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