



The Fetomaternal Outcome in Acute Respiratory Tract Infection in Third Trimester of Pregnancy

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Abstract

Background: Respiratory diseases in pregnancy gained much attention in the background of H1N1 influenza which has emerged as a killer of pregnant women. According to the confidential review of maternal deaths, 2006-09 Kerala, respiratory diseases form the sixth most common cause of maternal death.

Aim: To analyze then maternal and perinatal outcome of acute lower respiratory tract infection in the third trimester of pregnancy among antenatal women attending a tertiary care hospital of South Kerala

Method: Prospective Cohort Study

Study Setting: Conducted among antenatal women attending SAT hospital Trivandrum. 254 cases diagnosed to have acute lower respiratory tract infection were consecutively recruited as study cohort and an equal number of unexposed groups of similar gestational age as control.

Both groups followed up to find out the fetomaternal outcome.

Results: History of bronchial asthma ($p<0.001$), passive smoking ($p=0.001$) and recent history of contact with respiratory infection/ exanthematous fever ($p<0.001$) are significantly associated with acute lower respiratory tract infection in third trimester of pregnancy. There is increased rate of cesarean section (16.9% vs 26.8%), intrapartum maternal pyrexia (14.6% vs 0.4%), prolonged duration of hospital stay (58.7% vs 17.3%). Fetal distress (25.2% vs 11.4%), MSAF (14.2% vs 7.5%), RDSAB (38.6% vs 13%), increased rate of IBN admission (38.2% vs 14.6%) and increased requirement of ventilator support for babies (7.9% vs 2.4%).

Conclusion: The significant adverse outcomes of acute LRTI in third trimester of pregnancy are increased CS rate, intrapartum maternal pyrexia, MSAF, foetal distress, RDSAB and increased IBN admission. Prompt diagnosis and adequate treatment of acute LRTI including early initiation of antiviral therapy in indicated cases is needed to avoid these adverse outcomes.

Keywords: Acute lower respiratory tract infection, Maternal outcome, perinatal outcome, third trimester of pregnancy, CURB'S Score.

Introduction

Respiratory disease occupies the sixth position among the most common cause of maternal death. In early 2010, H1N1 has emerged as a killer of pregnant women and cause significant maternal morbidity and mortality. Mortality was found to be high in the last three months of pregnancy and those complicated with pneumonia^[5]. According to CRMD, 2006-09 Kerala, sepsis forms the third most common cause of maternal death and respiratory diseases occupy sixth position. With this background, we have conducted our study focusing on the adverse perinatal and maternal outcome on acute LRTI in the third trimester of pregnancy in antenatal women attending SAT hospital, Trivandrum.

In second half of pregnancy, pulmonary physiology changes, oxygen consumption changes almost doubles, severe pneumonitis with significant loss of ventilator capacity is not well tolerated during pregnancy^[25/26]. Placental haematogenous infections may induce spontaneous or septic abortion, premature births, foetal damage or IUD. Respiratory infection has significant result on both maternal and foetal outcome of pregnancy

Aims and Objectives

1. To study the adverse perinatal outcome as measured by preterm birth LBW, foetal distress in pregnancies complicated by acute LRTI
2. To study the adverse maternal outcome as measured by increased rate of caesarian section, increased duration of hospital stay in pregnancies complicated by LRTI

Inclusion Criteria

Antenatal women in the third trimester of pregnancy (>28weeks of gestation) with acute illness (<21 days) presenting with

1. cough of any duration(<21days) with
2. at least one symptom or sign localising to lower respiratory tract

- purulent sputum
 - chest pain
 - dyspnea/wheeze
- OR

3. at least one systemic feature (either a symptom complex of sweating fevers, shivers, aches and pains and/or temperature more than 38°C)

Exclusion Criteria

1. Multiple pregnancy
2. Women in control group who developed respiratory tract infection during the study period
3. Women who are not willing to participate in the study

Sample Size

$$n = \frac{(p_1 q_1 + p_2 q_2) \times f(\alpha, \beta)}{(p_1 - q_1)^2}$$

p_1 =Incidence among exposed

p_2 = Incidence among unexposed

q_1 = 100- p_1

q_2 = 100- p_2

$f(\alpha, \beta)$ = 7.9 (where α error allowed is 5% and β error allowed is 20%)

Applying this equation Applying this equation sample size is set as 254 in each group

Observations and Results

Majority of patients with acute lower respiratory tract infection belong to the age group of 20-24 years. More number of patients in the age group more than 30 years had respiratory infection when compared to control. But there is no significant difference in age distribution in the study cohort compared to those not having respiratory tract infection.

Table.1: Acute Lower Respiratory Tract Infection in Pregnancy and History of Bronchial Asthma

History of Bronchial Asthma	Acute lower respiratory tract infection					
	Present		Absent		Total	
	N	%	N	%	N	%
Present	31	12.2	3	1.2	34	6.7
Absent	223	87.8	251	98.8	474	93.3
Total	254	100	254	100	508	100

$\chi^2= 24.713$ df=1 p<0.001

There is significantly higher number of patients in the study cohort with history of bronchial asthma (12.2% versus 1.2%; p<0.001) compared to control group.

More number of patients in the study cohort had history of heart disease (3.9% versus 1.6%). There is no statistically significant difference when compared to control group (p=0.104).

Table.2: Acute Lower Respiratory Tract Infection in Pregnancy and History of Chronic Lung Disease (Other Than Bronchial Asthma)

History of chronic lung disease	Acute lower respiratory tract infection					
	Present		Absent		Total	
	N	%	N	%	N	%
Present	2	0.8	1	0.4	3	0.6
Absent	252	99.2	253	99.6	505	99.4
Total	254	100	254	100	508	100

$\chi^2= 0.335$ df=1 p=0.563

Only 0.8% of patients in the study cohort had history of chronic lung disease other than bronchial asthma (bronchiectasis, interstitial lung disease) and there is no statistically significant difference compared to control group (p=0.563).

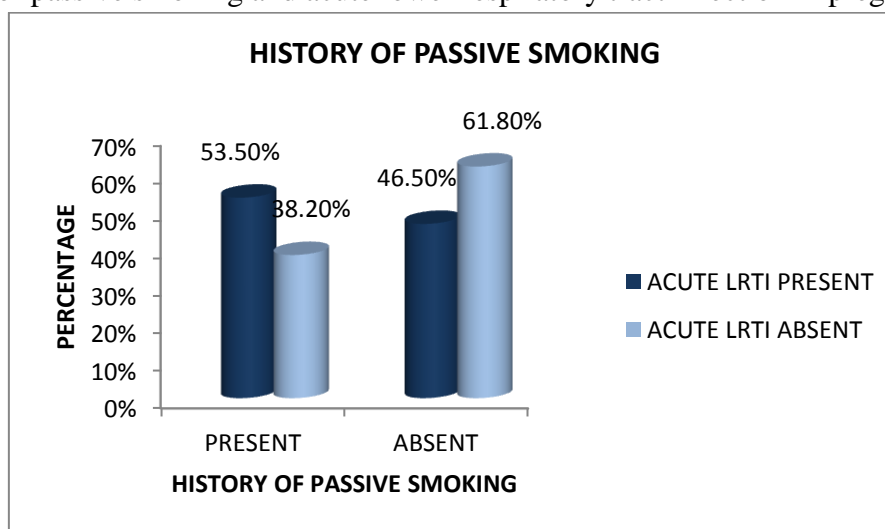
There is no statistically significant difference between the study cohort and control group in terms of history of any immunological conditions like SLE,ITP,APLA syndrome.(p=0.523).

Table.3: Acute Lower Respiratory Tract Infection in Pregnancy and Recent History of Contact with Respiratory Infection/ Exanthematous Fever

Recent history of contact with respiratory infection/ exanthematous Fever	Acute lower respiratory tract infection					
	Present		Absent		Total	
	N	%	N	%	N	%
Present	38	15	2	0.8	40	7.9
Absent	216	85	252	99.2	468	92.1
Total	254	100	254	100	508	100

$\chi^2= 35.169$ df=1 p<0.001

Figure 1: History of passive smoking and acute lower respiratory tract infection in pregnancy



There is significantly higher number of patients with acute lower respiratory tract infection in third trimester of pregnancy had history of passive smoking when compared to those did not have respiratory infection (53.5% versus 38.2%; $p = 0.001$).

Table.4: Presence of Severity Parameters In Acute Lower Respiratory Tract Infection In Pregnancy

Severity Parameter	Frequency (N=254)	Percentage
Respiratory rate >30	156	61.4
hypotension	11	4.3
chest signs	223	87.8
Saturation fall	27	10.6
Blood urea nitrogen>19	9	3.5
confusion	14	5.5

87.8% of the patients had chest signs,61.4% had tachypnoea..Other severity parameters were observed less frequently

Table .5: ‘Curb’ Score in Study Cohort

‘CURB’ SCORE	FREQUENCY (N=254)	PERCENTAGE
0	94	37
1	144	56.7
2	10	3.9
3	3	1.2
4	3	1.2
TOTAL	254	100

(CURB SCORE is calculated using the four severity parameters- Confusion, Blood Urea Nitrogen, Respiratory rate > 30 and Blood pressure (Systolic BP < 90 mm of Hg or Diastolic BP < 60 mm of Hg). A score of 2 or more is taken as severe lower respiratory tract infection)

Among the patients in the study cohort 6.3% had severe lower respiratory tract infection. (CURB score 2 or more)

Table 8: Acute Lower Respiratory Tract Infection in Pregnancy and Primary Caesarean Section

Type of delivery	Acute lower respiratory tract infection					
	Present		Absent		Total	
	N	%	N	%	N	%
Primary C.S.	68	26.8	30	11.8	98	19.3
Repeat C.S/vaginal delivery	186	73.2	224	88.2	410	80.7
Total	254	100	254	100	508	100

$\chi^2 = 18.257$ $df = 1$ $p < 0.001$
Relative risk=1.53(95% C.I.=1.29-1.81)

There is significantly higher (1.53 times) risk for primary C.S. in patients who had acute lower respiratory tract infection in third trimester of

Table 6: Treatment Taken in Acute Lower Respiratory Tract Infection in Pregnancy

Treatment	Frequency (N=254)	Percentage
In patient treatment	246	96.9
Intravenous antibiotics	246	96.9
Intake of oseltamivir	249	98
Inhalational medication	214	84.3
Steroids(oral/parenteral)	49	19.3

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Maternal Outcomes

Table.7: Acute Lower Respiratory Tract Infection In Pregnancy And Mode Of Delivery

mode of delivery	Acute lower respiratory tract infection					
	Present		Absent		Total	
	N	%	N	%	N	%
Caesarean Section	119	46.9	68	26.8	187	36.8
Vaginal	135	53.1	186	73.2	321	63.2
Total	254	100	254	100	508	100

$\chi^2 = 22.012$ $df = 1$ $p < 0.001$ Relative risk= 1.513(95% C.I.=1.27-1.70)

There is a significantly higher incidence of caesarean section delivery in antenatal women who had acute lower respiratory tract infection in third trimester of pregnancy compared to those who did not have (46.9% versus 26.8%; $p < 0.001$).There is 1.513 times risk of having caesarean section delivery in women who had acute lower respiratory tract infection in third trimester of pregnancy compared to control group (RR=1.513 with 95% C.I. =1.27-1.70)

pregnancy compared to those who did not have (RR=1.53; 95% C.I.=1.29 -1.81)($P < 0.001$)

Table.9: Acute Lower Respiratory Tract Infection in Pregnancy and Intrapartum Maternal Pyrexia

Intra-partum maternal pyrexia	Acute lower respiratory tract infection					
	Present		Absent		Total	
	N	%	N	%	N	%
Present	37	14.6	1	0.4	38	7.5
Absent	217	85.4	253	99.6	470	92.5
Total	254	100	254	100	508	100

$\chi^2= 36.863$ df=1 p<0.001
Relative risk=2.11(95% C.I=1.89-2.36)

Significantly higher number of patients in the study cohort developed intra partum maternal pyrexia(14.6% versus 0.4%; p<0.001).In antenatal women with acute lower respiratory

tract infection in third trimester it is found that there is 2.11 times higher risk of intra partum maternal pyrexia(95% C.I.=1.89-2.36)

Table.10: Acute Lower Respiratory Tract Infection in Pregnancy and Duration of Hospital Stay

duration of hospital stay	Acute lower respiratory tract infection					
	Present		Absent		Total	
	N	%	N	%	N	%
Prolonged	149	58.7	44	17.3	193	38
Normal	105	41.3	210	82.7	315	62
Total	254	100	254	100	508	100

$\chi^2= 92.124$ df=1 p<0.001
Relative risk=2.316 (95% C.I=1.95-2.76)

Significantly higher number of patients in the study cohort had prolonged duration of hospital stay(more than 5 days for vaginal delivery and more than 7 days for caesarean section) compared to control group(58.7% versus 17.3%; p<0.001).

There is 2.316 times more risk of prolonged hospital stay following delivery in women who had acute lower respiratory tract infection in third trimester of pregnancy compared to those who did not have (RR=2.316; 95% C.I.=1.95-2.76)

Table 11 Acute Lower Respiratory Tract Infection in Third Trimester of Pregnancy and Foetal Growth Restriction

Foetal growth restriction	Acute lower respiratory tract infection					
	Present		Absent		Total	
	N	%	N	%	N	%
present	28	11	23	9.1	51	10
absent	226	89	231	90.9	457	90
total	254	100	254	100	508	100

$\chi^2= 0.545$ df=1 p=0.460

11% of the patients with acute lower respiratory tract infection had foetal growth restriction compared to 9.1% in the control group. There is no statistically significant difference in the

presence of foetal growth restriction in patients with acute lower respiratory tract infections compared to those without. (p=0.460).

Table.12: Acute Lower Respiratory Tract Infection in Pregnancy and Preterm Delivery

Gestational age at delivery	Acute lower respiratory tract infection					
	Present		Absent		Total	
	N	%	N	%	N	%
preterm	43	16.9	38	14.9	81	15.9
term	211	83.1	216	85.1	427	84.1
Total	254	100	254	100	508	100

$\chi^2= 0.367$ df=1 p=0.545

Table.13: Acute Lower Respiratory Tract Infection in Pregnancy and Premature Rupture of Membrane

Premature rupture of membrane	Acute lower respiratory tract infection					
	Present		Absent		Total	
	N	%	N	%	N	%
Present	44	17.3	34	13.4	78	15.4
Absent	210	82.7	220	86.6	430	84.6
Total	254	100	254	100	508	100

$\chi^2= 1.515$ $df=1$ $p=0.218$

There is no statistically significant difference in the incidence of preterm delivery and PROM in women with acute lower respiratory tract infection

in third trimester of pregnancy compared to those who did not have it.

Table.14: Acute Lower Respiratory Tract Infection in Pregnancy and Birth Weight

birth weight	Acute lower respiratory tract infection					
	Present		Absent		Total	
	N	%	N	%	N	%
<2.5kg	72	28.3	62	24.4	134	26.4
>2.5kg	182	71.7	192	75.6	374	73.6
Total	254	100	254	100	508	100

$\chi^2= 1.014$ $df=1$ $p=0.314$

More number of patients in the study cohort had low birth weight compared to control group (28.3% versus 24.4%). There is no statistically significant difference in incidence of low birth

weight for women who had acute lower respiratory tract infection in third trimester of pregnancy compared to those who did not have. (p=0.314)

Table.15: Acute Lower Respiratory Tract Infection in Pregnancy and Foetal Distress

Foetal distress	Acute lower respiratory tract infection					
	Present		Absent		Total	
	N	%	N	%	N	%
Present	64	25.2	29	11.4	93	18.3
Absent	190	74.8	225	88.6	415	81.7
Total	254	100	254	100	508	100

$\chi^2= 16.124$ $df=1$ $p<0.001$
Relative risk=1.50(95% C.I=1.27-1.75)

Significantly higher number of the patients in the study cohort had foetal distress compared to control group (25.2% versus 11.4%; p<0.001). There is 1.5(RR) times risk of foetal distress in

women who had acute lower respiratory tract infection in third trimester of pregnancy compared to those who did not have. (95% C.I.=1.27-1.75).

Table.16: Acute Lower Respiratory Tract Infection in Pregnancy and Meconium Stained Amniotic Fluid

Meconium stained amniotic fluid	Acute lower respiratory tract infection					
	Present		Absent		Total	
	N	%	N	%	N	%
Present	36	14.2	19	7.5	55	10.8
Absent	218	85.8	235	92.5	453	89.2
Total	254	100	254	100	508	100

$\chi^2= 5.893$ $df=1$ $p=0.015$
Relative risk=1.36(95% C.I=1.10-1.69)

Significantly higher number of the patients in the study cohort had meconium stained amniotic fluid compared to control group (14.2% versus 7.5%; p=0.015). There is 1.36(RR) times risk MSAF in

women who had acute lower respiratory tract infection in third trimester of pregnancy compared to those who did not have. (95% C.I.=1.10-1.69).

Table 17: Acute Lower Respiratory Tract Infection in Pregnancy and Respiratory Distress Soon after Birth

Respiratory distress soon after birth	Acute lower respiratory tract infection					
	Present		Absent		Total	
	N	%	N	%	N	%
Present	98	38.6	33	13	131	25.8
Absent	156	61.4	221	87	377	74.2
Total	254	100	254	100	508	100

$\chi^2=43.498$ df=1 p<0.001
Relative risk=1.81(95% C.I=1.55-2.11)

Significantly higher number of babies born to patients in the study cohort had respiratory distress soon after birth compared to control group (38.6% versus 13%; p<0.001). There is 1.81(RR)

times risk of developing RDSAB in babies born to women who had acute lower respiratory tract infection in third trimester of pregnancy compared to those who did not have.(95% C.I.=1.55-2.11).

Table 18: Acute Lower Respiratory Tract Infection in Pregnancy and Low APGAR at Five Minutes

Low APGAR at 5 minutes	Acute lower respiratory tract infection					
	Present		Absent		Total	
	N	%	N	%	N	%
Present	19	7.5	10	3.9	29	5.7
Absent	235	92.5	244	96.1	479	94.3
Total	254	100	254	100	508	100

$\chi^2=3$ df=1 p=0.083

More number of babies born to patients in the study cohort had low Apgar score at 5 minutes (which is a sign of perinatal depression) compared to control group (7.5% versus 3.9%). There is no statistically significant risk of developing perinatal

depression(as measured by low APGAR at 5 minutes) in babies born to women who had acute lower respiratory tract infection in third trimester of pregnancy compared to those who did not have (p=0.083).

Table.19: Acute Lower Respiratory Tract Infection in Pregnancy and IBN (Inborn Nursery) Admission

Inborn nursery admission	Acute lower respiratory tract infection					
	Present		Absent		Total	
	N	%	N	%	N	%
needed	97	38.2	37	14.6	134	26.4
Not needed	157	61.8	217	85.4	374	73.6
Total	254	100	254	100	508	100

$X^2=36.491$ df=1 p<0.001
Relative risk=1.72(95% C.I=1.47-2.02)

Table.20: Acute Lower Respiratory Tract Infection in Pregnancy and Ventilator Support For Baby

ventilator support for baby	Acute lower respiratory tract infection					
	Present		Absent		Total	
	N	%	N	%	N	%
needed	20	7.9	6	2.4	26	5.1
Not needed	234	92.1	248	97.6	482	94.9
Total	254	100	254	100	508	100

$\chi^2=7.945$ df=1 p=0.005
Relative risk=1.58(95% C.I=1.26-1.99)

Significantly higher number of babies born to patients in the study cohort required ventilator support compared to control group (7.9% versus 2.4%; p=0.005). There is 1.58(RR) times risk of need for ventilator support in babies born to

women who had acute lower respiratory tract infection in third trimester of pregnancy compared to those who did not have.(95% C.I.=1.26-1.99).

Discussion

Respiratory disease in pregnancy gained importance in the background of H1N1 influenza. Influenza in pregnant women has been associated with high morbidity and mortality. The case of influenza in pregnancy was first reported during the epidemic of 1918, when there were 308(23%) maternal death due to influenza. In 52% of these patients pregnancy was interrupted. 43% had pneumonia as a complication. Mortality was found to be high in last 3 months of pregnancy and in those cases complicated with pneumonia. ^[5]Hypoxia and acidosis affect foetus also, and stimulate preterm labour after mid – pregnancy. ^[1] In our study 73.2% of the patients with acute lower respiratory tract infection were coming from BPL family. And in literature it is found that neonatal morbidity due to maternal infectious illness is high among rural and poor urban infants. ^[2]

In our study 46.5% had LRTI at 34-37 weeks of gestation. 45.6% had LRTI at > 37 weeks. Only 7.9% had LRTI < 34 weeks of gestation. In another study conducted by Beijing hospital China to explore the outcome of severe or critical pregnant women with 2009 pandemic H1N1 influenza infection, found that 94.9% were infected in second and third trimester. 72.7% of mortality cases were in third trimester. ^[3]

Smoking is recognised as a risk factor for development of pneumonia and invasive pneumococcal disease in adults. A dose -response relationship shown that 20-32% of women with pneumonia in pregnancy are smokers. ^[4]As far pregnancy is considered, early hospitalisation and aggressive management is needed. And early initiation of antiviral therapy will alter the maternal and perinatal outcome. So it is clinicians' predilection to aggressively manage antenatal women with respiratory infection so that we can avoid complications like severe pneumonia, Adult respiratory distress syndrome and ICU admission.

In our study 96.9% of the cases were managed as in patients and all of them received intravenous

antibiotics. 98% of the cases received antiviral treatment with oseltamivir. 84.3% cases received inhalational medications. 19.3% cases received oral or intravenous steroids.

Oseltamivir is preferred for treatment of pregnant women because of its systemic absorption. Oseltamivir suppress influenza viral loads in placenta and prevent mother to child transmission. The treatment initiation as early as possible (within 48 hours) is crucial. ^[5]

Conclusion

The mean age of patients with acute lower respiratory tract infection in third trimester of pregnancy is 25.89±4.82 years. Bronchial asthma, passive smoking and recent history of contact with respiratory infection /exanthematous fever are significantly associated with acute lower respiratory tract infection in third trimester of pregnancy. The significant adverse maternal outcomes of acute lower respiratory tract infection in third trimester of pregnancy are increased rate of caesarean section, intra-partum maternal pyrexia and prolonged duration of hospital stay. The significant adverse perinatal outcomes of acute lower respiratory tract infection in third trimester of pregnancy are foetal distress, meconium stained amniotic fluid, respiratory distress soon after birth, increased rate of inborn nursery admission and increased requirement of ventilator support for baby. Even though only 6.3% had severe infection, acute lower respiratory tract infection in third trimester of pregnancy is associated with major adverse outcomes.

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