The Professional Medical Journal
www.theprofesional.com

DOI: 10.29309/TPMJ/2019.26.11.2430

ORIGINAL PROF-0-2430

PNEUMOTHORAX IN NEONATES WITH MECONIUM ASPIRATION.

1. MBBS, DCH, MCPS, FCPS
Professor
Department of Pediatrics
Quaid e Azam Medical College/
Bahawal Victria Hospital,
Bahawalpur.
2. MBBS, DCH, FCPS
Associate Professor
Department of Pediatrics
Ghazi Khan Medical College,
Dera Ghazi Khan.
3. MBBS, DCH, FCPS
Assistant Professor
Department of Pediatrics
Quaid e Azam Medical College/
Bahawal Victria Hospital,
Bahawalpur.
4. MBBS
Postgraduate Registrar
Department of Pediatric Unit-1
Bahawal Victoria Hospital,
Bahawalpur.

Correspondence Address:
Dr. Muhammad Amin
Department of Pediatrics
Quaid e Azam Medical College/
Bahawal Victria Hospital, Bahawalpur.
dr.aminshbwp@gmail.com

Article received on:
14/12/2018
Accepted for publication:
25/03/2019

Muhammad Amin[1], Mukhtar Ahmad[2], Malik Muhammad Naeem[3], Muhammad Amir Ramzan[4]

ABSTRACT… Objectives: Recent years have seen advances in respiratory supports for meconium aspiration syndrome (MAS) but pneumothorax (PTX) still stands a significant indicator of disease severity. This study was aimed to determine the frequency of PTX in newborn with meconium aspiration. **Study Design:** Descriptive, cross-sectional study. **Setting:** Department of Pediatric Medicine, Unit 1, Bahawal Victoria Hospital, Bahawalpur, and Department of Pediatric Medicine, Ghazi Khan Medical College/Hospital, Dera Ghazi Khan. **Period:** 1st June 2017 to 30th September 2018. **Material and Methods:** A total of 736 patients with meconium aspiration of age 1-28 days and both genders were included. Patients with congenital heart anomalies and preterm infants were excluded. Presence or absence of PTX in each patient was noted. **Results:** Age range in this study was from 1 to 28 days with mean age of 12.80 ± 6.52 days. Majority of the patients 434 (58.97%) were between 1 to 14 days of age. Out of the 736 patients, 394 (53.53%) were male and 342 (46.47%) were females with male to female ratio of 1.2:1. Frequency of PTX in newborn with meconium aspiration was found in 176 (23.91%) patients. **Conclusion:** Frequency of PTX in newborn with meconium aspiration is quite high. In every newborn with meconium aspiration, proper management should be done for early prevention as well as taking therapeutic measures in this particular population.

Key words: Meconium Aspiration, Newborn, Pneumothorax, Neonates.

Article Citation: Amin M, Ahmad M, Naeem MM, Ramzan MA. Pneumothorax in neonates with meconium aspiration. Professional Med J 2019; 26(11):1844-1849.
DOI: 10.29309/TPMJ/2019.26.11.2430

INTRODUCTION

Meconium is a thick greenish black stuff holding various types of cells along with mucus, water, digestive acids and enzymes. The word meconium is derivative from Greek expression mekonion.[1] Meconium constitutes the 1st stool of a newborn. The passage of meconium happens within 48 hours following birth, though, it can occur in utero. Post-term fetus usually passes the meconium physiologically. Intrauterine meconium passage is connected with feto-maternal stress and preterm pregnencies.[2] In term and post-term newborns devoid of fetal distress, intrauterine meconium passage occurs from usual GI flourishing. Meconium staining of the amniotic fluid emerges in ~13% of live births that augments with rising gestational age.[3]

MAS is linked with notable respiratory morbidity,[4] characterized by early inception of respiratory distress in a meconium stained infant coupled with poor lung compliance and hypoxemia, clinically and patchy opacification, and radiographically visible PTX. Intubation and mechanical ventilation is needed in more than 30% of infants with MAS along with many other modern therpies.[6,7]

Numerous perinatal risk factors have been related with MAS including placental insufficiency, maternal hypertension, maternal diabetes mellitus, pre-eclampsia, oligohydramnios and maternal tobacco use.[8,9] Post-term delivery is described as the most significant risk factor. According to Yoder BA et al, MAS lowered from 6% to <2% in an eight year duration through decline in births at>41 weeks gestation.[10]

Spectrum of MAS varies from mild to severe.[11] Reduction in the incidence of MAS have been reported globally,[12-14] credited to improved obstetric practices and prompt delivery where fetal distress found.[15,16]

It is obvious that severe MAS is allied with high risk of PTX, longer duration of respiratory supports and oxygen therapy. Variation in mortality rates related to PTX have been observed ranging from 5% to 35%.[16] Marked differences in published figures are recognized related to problems identifying the cause of mortality.[16] PTX is a significant indicator of disease severity, accounting to 42% of infants who eventually died of MAS.[8] Sindhu et al noted the frequency of PTX as 25% in neonates having MAS.[17]

PTX in newborn from any cause can be a concern for later lung diseases.[15-17] As PTX in pediatric population is increasing and available stats of PTX in newborn with MAS are very scarce, so, this study was planned to be a useful addition in the existing literature and help the clinicians to take further steps in managing these particular patients in order to improve their outcome.

MATERIALS AND METHODS

Department of Pediatric Medicine, Unit 1, Bahawal Victoria Hospital, Bahawalpur, and department of Pediatric Medicine, Ghazi Khan Medical College/ Hospital, Dera Ghazi Khan, were the venues for this descriptive, cross-sectional study, done spanning 1st June 2017 to 30th September 2018. A total of 736 neonates (age 1 to 28) days, of both genders, with MAS (infant's skin, umbilical cord, or nail beds was of green color on clinical examination and diffuse 'wet' crackles and rhonchi on auscultation) were included in the study using non-probability, consecutive sampling. All neonates were excluded who were preterm (<37 weeks of gestation) or had congenital heart anomalies as assessed on echocardiography.

Approval from ethical review committee of the institution was taken. Written informed consent was taken from the parents / guardians. Presence or absence of pneumothorax in each patient was noted. All data including age, gender, weight of infant, mode of delivery, gestational diabetes mellitus, pregnancy induced hypertension, place of living and PTX were noted. Age, birth weight, weight and height were presented as mean and standard deviation. The frequency of pneumothorax (yes/no), gender, residence (rural/ urban), birth weight, mode of delivery (vaginal/ cesarean), gestational diabetes mellitus (yes/no) and pregnancy induced hypertension (yes/no) were calculated. Stratification was performed to control effect modifier like age, gender, residence (rural/urban), birth weight, mode of delivery (vaginal/cesarean), gestational diabetes mellitus (yes/no) and pregnancy induced hypertension (yes/no). The Chi square test was applied to see the effect of these on outcome variable i.e. pnumothorax. P value ≤ 0.05 was taken as significant.

RESULTS

Age range in this study was from 1 to 28 days with mean age of 12.80 ± 6.52 days. Majority of the patients 434 (58.97%) were between 1 to 14 days of age as shown in Table I.

Out of the 736 patients, 394 (53.53%) were male and 342 (46.47%) were females with male to female ratio of 1.2:1. There were 290 (39.40%) neonates who belonged to urban areas whereas 446 (60.60%) to rural areas. A total of 412 (55.98%) neonates were delivered using vaginal delivery while 324 (44.02%) with cesarean. Mean birth weight was 3.09 ± 0.40 kg. Mean height was 38.41 ± 5.33 cm. Pregnancy induced hypertension was noted in 546 (74.2%) while GDM 452 (61.4%). Frequency of pneumothorax in newborn with meconium aspiration was found in 176 (23.91%) patients, whereas there was no pneumothorax in 560 (76.09%) patients as shown in Figure-1. When stratification of pneumothorax was done, it showed no significant different (P >0.05) with respect to age groups, gender, area of residence mode of delivery, birth weight, PIH and GDM as shown in Table-I.

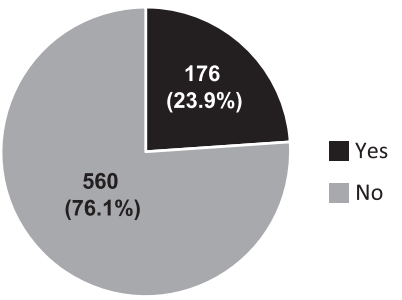

Figure-1. Frequency of PTX in newborn with MAS (n=736)

Variables		Pneumothorax		P-Value
		Yes (n=176)	No (n=560)	
Age (Days)	1-14	98 (55.7%)	336 (60%)	0.473
	15-28	78 (44.3%)	224 (40%)	
Gender	Male	108 (61.4%)	286 (51.1%)	0.091
	Female	68 (38.6%)	274 (48.9%)	
Residence	Rural	110 (62.5%)	336 (60%)	0.675
	Urban	66 (37.5%)	224 (40%)	
Mode of Delivery	Vaginal	92 (52.3%)	320 (57.1%)	0.422
	Cesarean	84(47.7%)	240 (42.9%)	
Birth Weight (kg)	≤3	78 (44.4%)	220 (39.3%)	0.402
	>3	98 (55.6%)	340 (40.7%)	
PIH	Yes	134 (76.1%)	412 (73.6%)	0.632
	No	42 (33.9%)	148 (26.4%)	
GDM	Yes	108 (61.4%)	344 (61.4%)	0.991
	No	68 (38.6%)	216 (38.6%)	

Table-I. Stratification of study variables with respect to PTX

DISCUSSION

Neonates are most commonly affected by PTX in comparison to any other age groups.[18] Symptomatic PTX is visible in 0.1% of all live births and in 5-7% of newborns having birth weight<1500 grams.[19,20] Continuous positive airway pressure and positive pressure ventilation are known to pronounce PTX.[19,20] Surfactant, synchronize or volume ventilation, and high-rate, low-tidal-volume ventilation lower the incidence of PTX.[21-24] PTX needs to be scrutinized in all newborns who have respiratory distress, restlessness and/or have a sudden change in condition.

Age range in this study was from 1 to 28 days with mean age of 12.80 ± 6.52 days. Majority of the patients 434 (58.97%) were between 1 to 14 days of age. Out of the 736 patients, 394 (53.53%) were male and 342 (46.47%) were females with male to female ratio of 1.2:1. Frequency of PTX in newborn with MAS was found in 176 (23.9%), whereas no PTX in 560 (76.1%). Sindhu et al noted the PTX in neonates with MAS as 25%.[17] The prevalence of PTX has been noted as 25% in 2001 and around 10% in 2009,[25,26] the former is closer to the present figures (23.64%).

PTX in NICU is reported as 1-2% and >40% if respiratory distress syndrome (RDS) is present.[27-30] Mortality rates have varied from 20-38%.[31] Contributing factors in the NICU are male gender, LBW neonates, prematurity, birth by cesarean section, RDS, and MAS needing resuscitation following birth.[32]

PTX in newborn intensifies chronic lung disease in VLBW neonates[33-35] and intraventricular hemorrhage in pre-term neonates.[36] Watkinson and Tiron[37] noted that 9% ventilated neonates went on to develop at least one PTX during the 1st 2-weeks of life. A higher incidence of upto 13% was reported from UK[38,39] and 26% by Malek and colleagues from Iran.[40] Morley et al[41] got incidence of PTX as 9% after CPAP. PTX was found in 11% VLBW infants in another 5-years study.[34,42] Razzaq et al[43] noted the prevalence of PTX in infants with MAS as 13% while Greenboughet et al got higher numbers, nearly 33%. Our study differs from these data, less use of mechanical ventilation could be the reason behind this as mechanical ventilation is known to be a common risk factor for development of pneumothorax.[45,46]

Underlying lung pathology was a cause of pneumothorax in neonates rather than being a complication of mechanical ventilation when noted by Esme and coworkers.[47] Vigorous monitoring and maneuvering of ventilation can reduce the risk of pneumothorax, including

optimizing PEEP and minimizing PIP.[48,49]

CONCLUSION

Frequency of PTX in newborn with MAS is quite high. In every newborn with MAS, proper management should be done for early prevention as well as taking therapeutic measures in this particular population.

REFERENCES

1. Velaphi S, Vidyasagar D. **Intrapartum and post-delivery management of infants born to mothers with meconium-stained amniotic fluid: Evidence-based recommendations.** ClinPerinatol. 2006; 33(1):29-42.

2. Ahanya SN, Lakshmanan J, Morgan BL, Ross MG. **Meconium passage in utero: Mechanisms, consequences, and management.** ObstetGynecolSurv. 2005; 60(1):45-56.

3. Walsh MC, Fanaroff JM. **Meconium stained fluid: Approach to the mother and the baby.** ClinPerinatol. 2007; 34(4):653-65.

4. Liu C, Ma L, Tang L, He X, Wei S, Wang S. **A randomized controlled study on the efficacy of inhaled nitric oxide in treatment of neonates with meconium aspiration syndrome.** Zhonghua ErKeZaZhi. 2008; 46(3):224-8.

5. Reuter S, Moser C Baack M. **Respiratory distress in the newborn.** Pediatr Rev. 2014; 35(10):417-29.

6. Swarmam k, Soraisham AS, Sivanandan S. **Advance in the management of meconium aspiration syndrome.** IntJpediatr internet 2012; 2012:1-7.

7. Mokra D, Mokry J. **Glucocorticoids in the treatment of meconium aspiration syndrome.** Eur J Pediatr. 2011; 170(12); 1495-505.

8. Spain JE, Tuuli MG, Macones GA, Roehl KA, Odibo AO, Cahill AG. **Risk factors for serious morbidity in term nonanomalous neonates.** Am J Obstet Gynecol. 2015; 212(6):799.e1-7.

9. Frey HA, Tuuli MG, Shanks AL, Macones GA, Cahill AG. **Interpreting category II fetal heart rate tracings: does meconium matter?.** Am J Obstet Gynecol. 2014; 211(6):644.e1-8.

10. Yoder BA, Kirsch EA, Barth WH, Gordon MC. **Changing obstetric practices associated with decreasing incidence of meconium aspiration syndrome.** Obstet Gynecol. 2002; 99(5 Pt 1):731-9.

11. Wiswell TE, Bent RC. **Meconium staining and the meconium aspiration syndrome.** Unresolved issues. PediatrClin North Am. 1993; 40(5):955-81.

12. Wakefield MA, Loken B, Hornik RC. **Use of mass media campaigns to change health behavior.** Lancet 2010; 376(9748); 1261-71.

13. Torre LA, Bray F, Seigel RL, Ferlayj, Iortet-tieulent J, Jernal A. **Global cancer statistics.** Cancer J Clin. 2015; 65(2):87-108.

14. Boujenah J, Oliveira J, De La Hosseraye C, Benbara A, Tigaizin A, Bricou A, et al. **Should fetal scalp blood sampling be performed in the case of meconium-stained amniotic fluid.** J Matern Fetal Neonatal Med. 2016; 29(23):3875-8.

15. Dargaville PA. **The epidemiology of meconium aspiration syndrome; incidence, risk factors, therapies and outcome.** Pediatr. 2006; 117(5); 1712-21.

16. Cleary GM, wiswell TE. **Meconium stained amniotic fluid and the meconium aspiration syndrome; An update.** PediatrClin North Am. 1998; 45:551-29.

17. Sindhu II, Jabeen S, Yasmeen S. **To determine the frequency of meconium aspiration syndrome in infants and its effect and treatment with relevance to pneumothorax and sepsis.** Pak J Med Health Sci. 2016; 6:625-7.

18. Trevisanuto D, Doglioni N, Ferrarese P, Vedovato S, Cosmi E, Zanardo V. **Neonatal pneumothorax: comparison between neonatal transfers and inborn infants.** J Perinat Med. 2005; 33 (5):449–54.

19. Fanaroff AA, Stoll BJ, Wright LL. **Trends in neonatal morbidity and mortality for very low birth weight infants.** Am J Obstet Gynecol. 2007; 196(2):e1–e8.

20. Horbar JD, Carpenter JH, Buzas J. **Collaborative quality improvement to promote evidence based surfactant for preterm infants: A cluster randomized trial.** BMJ. 2004; 329(7473):1004.

21. Soll RF, Morley CJ. **Prophylactic versus selective use of surfactant in preventing morbidity and mortality in preterm infants.** Cochrane Database Syst Rev. 2001; 2:CD000510.

22. Soll RF, Blanco F. **Natural surfactant extract versus synthetic surfactant for neonatal respiratory distress syndrome.** Cochrane Database Syst Rev. 2001; 2:CD000144.

23. Greenough A, Milner AD, Dimitriou G. **Synchronized mechanical ventilation for respiratory support in newborn infants.** Cochrane Database Syst Rev. 2004;4.

24. Watkinson M, Tiron I. **Events before the diagnosis of a pneumothorax in ventilated neonates.** Arch Dis Child Fetal Neonatal Ed. 2001;85:201–3.

25. Wiswell TE. **Handling the meconium-stained infant.** Semin Neonatol 2001; 6:225-31.

26. Dargaville PA, Copnell B. Australian and New Zealand neonatal network 2006. **The epidemiology of meconium aspiration syndrome: Incidence, risk factors, therapies, and outcome.** Pediatrics 2006; 117:1712-21.

27. Klarc RH, Singh BS, Power RJ, Spitzer AR. **Meconium aspiration syndrome remains a significant problem in the NICU: outcomes and treatment patterns in term neonates admitted for intensive care during a ten-year period.** J Perinatol. Jul 2009; 29(7):497-503.

28. Ogata ES, Gregory GA, Kitterman JA, Phibbs RH, Tooley WH. **Pneumothorax in the respiratory distress syndrome: Incidence and effect on vital signs, blood gases, and pH.** Pediatrics. 1976; 58:177–83.

29. Yu VY, Wong PY, Bajuk B, Szymonowicz W. **Pulmonary air leak in extremely low birth weight infants.** Arch Dis Child. 1986; 61:239–41.

30. Jones RM, Rutter N, Cooper AC, Pullan CR. **Pneumothorax in the neonatal period.** Anaesthesia. 1983; 38:948–52.

31. Esme H, Dogru O, Eren S, Korkmaz M, Solak O. **The factors affecting persistent pneumothorax and mortality in neonatal pneumothorax.** Turk J Pediatr. 2008; 50:242–6.

32. Ramesh Bhat Y, Ramdas V. **Predisposing factors, incidence and mortality of pneumothorax in neonates.** Minerva Pediatr. 2013; 65:383–8.

33. Miller JD, Carlo WA. **Pulmonary complications of mechanical ventilation in neonates.** ClinPerinatol. 2008; 35:273–281.

34. Maksic H, Heljic S, Maksic S, Jonuzi F. **Pulmonary complications during mechanical ventilation in the neonatal period.** Medicinski Arhiv. 2000; 54(5-6):271–272.

35. Powers WF, Clemens JD. **Prognostic implications of age at detection of air leak in very low birth weight infants requiring ventilatory support.** J Pediatr. 1993; 123:611-7.

36. Hill A, Pariman JM. **Relationship of pneumothorax to occurrence of intraventricular hemorrhage in the premature newborn.** Pediatr. 1982; 69:144–149.

37. Watkinson M, Tiron I. **Events before the diagnosis of a pneumothorax in ventilated neonates.** Archiv Dis Childhood: Fetal and Neonatal. 2001; 85:F201–F203.

38. Baumer JH. **International randomised controlled trial of patient triggered ventilation in neonatal respiratory distress syndrome.** ArchivDise Childhood: Fetal and Neonatal Edition. 2000; 82:F5–F10.

39. Shaw BNJ, Cooke RWI, Gill AB, Saeed M. **Randomized trial of routine versus selective paralysis during ventilation for neonatal respiratory distress syndrome.** Arc Dis Childhood. 1993; 69:479–82.

40. Malek A, Afzali N. **Pneumothorax after mechanical ventilation in newborns.** Iranian J Pediatr. 2011; 21:45–50.

41. Morley CJ, Davis PG. **Nasal CPAP or intubation at birth for very preterm infants.** New England J Med. 2008; 358:700–8.

42. Khan I, Gul H. **Meconium aspiration syndrome: An experience in neonatology department of Children Hospital Lahore.** J Postgrad Med Inst 2017; 31(3):295-8.

43. Buzdar N. **Factors Leading to Meconium Aspiration Syndrome in Neonates.** Journal of Rawalpindi Medical College. 2017 Dec 30;21(4):371-5.

44. Greenough A, Pulikot A, Dimitriov G. **Prevention and management of meconium aspiration syndrome-assessment of evidence based practice.** Eur J Pediatr 2005; 164:329-30.

45. Terzic S, Heljic S, Panic J, Sadikovic M, Maksic H. **Pneumothorax in premature infants with respiratory distress syndrome: Focus on risk factors.** Journal of Pediatric and Neonatal Individualized Medicine 2016; 5(1):e050124.

46. Delgado-Peña YP, Torrent-Vernetta A, Sacoto G, de Mir-Messa I, Rovira-Amigo S, Gartner S, et al. **Pulmonary hypoplasia: An analysis of cases over a 20-year period.** AnPediatr (Barc). 2015; pii: S1695-4033(15)00405-1.

47. Esme H, Dogru O, Eren S. **The factors affecting persistent pneumothorax and mortality in neonatal pneumothorax.** Turkish J of pediatrics, 2008; 50: 242-6.

48. Klinger G, Ish-Hurwitz Sh, Osovsky M. **Risk factors for pneumothorax in very low birth weight infants.** Pediatric Critical Care Medicine 2008; 9(4):398-402.

45. Vellanki H, Antunes M, Locke R. **Decreased incidence of pneumothorax in VLBW infants after increased monitoring of tidal volume.** J pediatrics. 2012; 130(5): 1352-1358.

AUTHORSHIP AND CONTRIBUTION DECLARATION

Sr. #	Author(s) Full Name	Contribution to the paper	Author(s) Signature
1	Muhammad Amin	Methodology, Design, Data analysis, Supervision.	
2	Mukhtar Ahmad	Methodology, Design, Data analysis.	
3	Malik M, Naeem	Case Selection, Discussion.	
4	M. Amir Ramzan	Drafting, Data analysis, Literature Review, Reference.