Section: Pediatrics

Original Research Article

A STUDY ON VARIOUS ETIOLOGIES AND OUTCOMES OF NEONATES SUPPORTED BY MECHANICAL VENTILATION

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ABSTRACT

Background: This study aims to investigate the diverse etiologies leading to the need for mechanical ventilation in neonates and to analyze the outcomes associated with this intervention.
Materials and Methods: A prospective observational study was conducted on a cohort of 60 neonates admitted to the neonatal intensive care unit (NICU) at Gandhi Hospital during a specified period. Data were collected from medical records, including demographic information, clinical presentation, and diagnostic findings. Etiologies necessitating mechanical ventilation were categorized, and relevant clinical parameters were assessed. Outcomes such as survival rates, duration of ventilation, and potential complications were analyzed.
Results: The study included a total of 60 neonates who required mechanical ventilation during the study period. The primary etiologies identified encompassed a range of conditions including respiratory distress syndrome (RDS), meconium aspiration syndrome (MAS), congenital anomalies, sepsis, and neurological disorders. Each etiology was further analyzed for its contribution to the need for mechanical ventilation and associated outcomes. The outcomes revealed varying survival rates among different etiological groups. Additionally, the duration of mechanical ventilation was assessed, and potential complications such as ventilator-associated pneumonia, bronchopulmonary dysplasia, and intraventricular hemorrhage were investigated.
Conclusion: This study sheds light on the intricate web of etiological factors leading to mechanical ventilation in neonates and provides valuable insights into the associated outcomes. Understanding the diverse challenges faced by neonates requiring mechanical ventilation is crucial for improving clinical management strategies and ultimately enhancing the overall care and survival rates of this vulnerable population. The findings of this study contribute to the existing body of knowledge on neonatal care and may guide future research and clinical practices in the field of neonatology.
Keywords: Etiologies, Neonatal Intensive Care Unit (NICU), Respiratory Distress Syndrome (RDS), Meconium Aspiration Syndrome (MAS), Ventilation, BronchoPulmonary Dysplasia(BPD).

INTRODUCTION

Neonatal health is a critical aspect of pediatric medicine, and mechanical ventilation stands as a vital intervention in neonatal intensive care. The requirement for mechanical ventilation in neonates is prompted by a spectrum of underlying etiologies that necessitate careful consideration. The understanding of these diverse causes and their impact on outcomes is essential for refining clinical strategies and advancing neonatal care.

The neonatal period is marked by unique physiological challenges, rendering neonates particularly susceptible to respiratory distress. Etiological factors such as Respiratory Distress Syndrome (RDS), Meconium Aspiration Syndrome (MAS), congenital anomalies, sepsis, and neurological disorders contribute to respiratory insufficiency, requiring the implementation of mechanical ventilation.[1,2]

The decision to initiate mechanical ventilation is multifaceted, involving a meticulous evaluation of the neonate's clinical presentation, diagnostic findings, and overall health. While mechanical ventilation can be life-saving, it is crucial to acknowledge potential complications associated with prolonged use, including ventilator-associated pneumonia, bronchopulmonary dysplasia, and intraventricular hemorrhage.[3,4]

This study seeks to explore the intricate web of etiological factors leading to mechanical ventilation in neonates and aims to provide a comprehensive analysis of the outcomes associated with this critical intervention. By investigating the varied etiologies and their impact on neonatal outcomes, we aim to contribute valuable insights that can inform and refine clinical practices in neonatal intensive care units (NICUs).

The ultimate goal of this study is to enhance our understanding of the challenges faced by neonates requiring mechanical ventilation, with the overarching objective of improving the overall care and survival rates of this vulnerable population. Through a detailed examination of etiological factors and outcomes, we hope to pave the way for more targeted and effective interventions, thereby advancing the field of neonatology and optimizing neonatal healthcare practices.

MATERIAL AND METHODS

Study Design: This prospective observational study involved analyzing the medical records of neonates admitted to the Neonatal Intensive Care Unit (NICU) at Gandhi Hospital during a specified period.

The study included 60 neonates who required mechanical ventilation during their NICU stay. The primary reason for which the baby was ventilated was noted.

At admission, details of antenatal, natal, and postnatal history, the birth weight, gestational age, type of delivery, APGAR score, onset of respiratory distress, and other details were recorded in a predefined proforma. Diagnosis was made using standard clinical, laboratory, and radiological criteria. Babies who required ventilatory support were provided with it, along with supportive care and the treatment was initiated according to the unit protocol.

Babies were nursed under a servo-controlled open care system. Arterial blood gas analysis was done whenever indicated. Continuous non-invasive oxygen saturation monitoring was done. All the babies were monitored for any complications like air leak, congestive cardiac failure, tube blocks, etc. Chest physiotherapy was given during and after ventilation. Babies were weaned off the ventilator if they showed clinical, radiological, and blood gas improvement with bare minimum ventilatory support. Steroids were started 24 hours before the expected extubation time. After extubation, the baby was placed under oxygen support until indicated.

The endpoint of the study was

1. a hemodynamically stable neonate accepting feeds
2. and fit to be shifted out of the NICU.
3. When the baby succumbs during ventilatory care.

Inclusion Criteria

1. Neonates who are mechanically ventilated in the NICU for various indications.

Exclusion Criteria

1. Neonates on mechanical ventilator with major congenital anomalies
2. Post-operative cases that need mechanical ventilation.

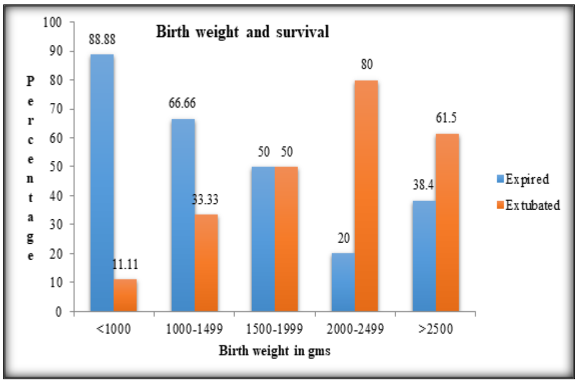
Data Analysis and Interpretation: Data were entered into Microsoft Excel (Windows 7; Version 2007), and analyses were conducted using the Statistical Package for Social Sciences (SPSS) software for Windows (version 22).0; SPSS Inc, Chicago). Descriptive statistics, such as the mean and standard deviation (SD)for continuous variables. Frequencies and percentages were determined for categorical Variables were determined. Association between variables was analyzed using the Chi-Square test for categorical variables. The comparison of means between quantitative variables was analyzed using an unpaired t-test. Bar charts and pie charts were used for visual representation of the analyzed data. The level of significance was set at 0.05.

RESULTS

The study group consisted of 57% males and 43% females. Out of 60 babies, weighing less than 1000gms were 15%), 1000-1499gms were 20.0%, 1500-1999gms were 13.3%, 2000-2499 gms were 8.33%), and >2500gms were 15 (25%).

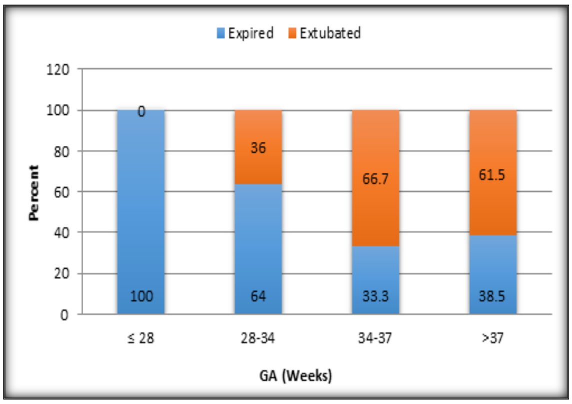
Frequency distribution in different gestational age groups varied with 5%) babies less than 28 weeks, 41.7% of the babies between 28-34 weeks, 10%) babies between 34-37 weeks, 43.3 babies more than 37 weeks.

Frequency distribution among babies in different birth weight categories, 9 babies (10%) were <1000gms, 12 babies (20%) between 1000-1499gms, 8 babies (13.33%) between 1500-1999gms, 5 babies (8.33%) between 2000-2499gms, and 26 babies (43.33%) were >2500 gms. (Table 1 and Graph 1).



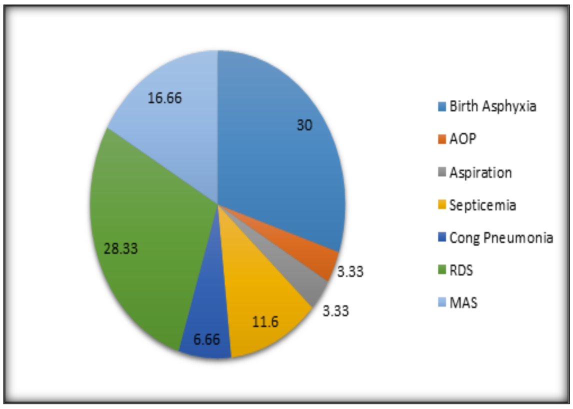
Graph 1: Showing survival rate in relation to birth weight

Male babies had a better outcome (52.9%), compared to females (42.3%). In the birth weight categories, 9 babies were less than 1000 gms, out of which 1 baby survived. Babies between 1000-1499 gms were 12, out of which 4 survived. Between 1500-1999 grams, survival and death rates were equal, i.e., 50%. The survival rate between 2000-2499gms was 80%. Babies whose birth weight was >2500gms were 26, out of which 61.5 survived (p value=0.04). According to gestational age, babies born less than 32 weeks 78.5% expired, and those born <28 weeks, there had a poor outcome. Survival rates were 36% for babies born between 28-34 weeks, 66.7% between 34-37 weeks, and 61.53% born between 34- 37 weeks (p value: 0.003). (Graph 2)

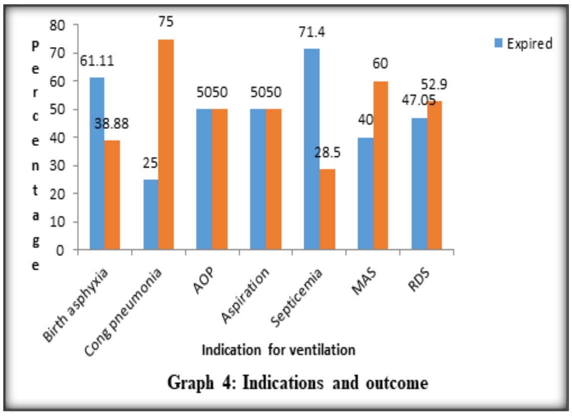


Graph 2 Survival rate in relation to gestational age

Out of 18 babies ventilated with indication for Birth asphyxia, 38.88% survived (p value: 0.037). RDS constituted 28.33 %, MAS 16.66% followed by septicemia 11.6%, pneumonia 6.66%, AOP and aspiration each constituting 3.33%. Survival rates were 52.9%,60%,28.5%,75%,50%, and 50% respectively. Pneumonia had the best survival rate with 75%, followed by MAS 60%, and RDS 52.9%(p value:0.015). Birth asphyxia and septicemia had comparatively poor outcomes with only 38.88% and 28.5 % respectively. Many of the babies had more than one indication. AOP and aspiration had a survival rate of 50%each. (Table 2 and Graph 3,4)



Graph 3: Indicationsof Ventilation



Graph 4: Indications and outcome

It is shown that regardless of the indication, the survival rate increases with increasing gestational age.

It shows that regardless of the indication, the survival rate increases with increasing weight.

Out of 60 babies studied, maternal risk factors were present in 37 babies. The most common risk factor encountered in the study was Pre-eclampsia, observed in 14 babies (23.3%), followed by eclampsia found in 6 babies (10%), followed by oligohydramnios and PROM (6.7% each). Babies whose mother had placenta previa and abruption had poor outcomes (100% &66.7% mortality). Babies whose mother had PROM showed a better outcome (25.0%). [Table 4]

Out of 60 babies studied, 38 babies were delivered by NVD (36.3%), and 22 babies (36.7%) were delivered by LSCS. As observed in the above table, babies who were delivered by LSCS had better chances of survival (59.1%), compared to babies delivered by NVD (p=0.205). [Table 5]

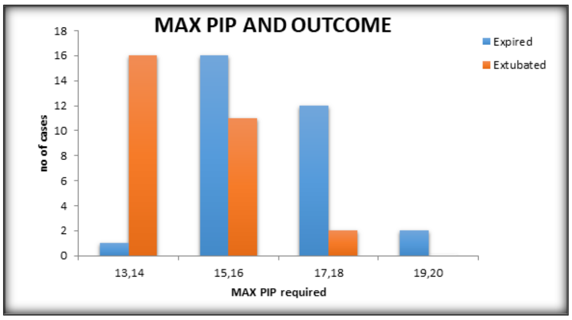
Out of 60 babies ventilated, an initial PH at ventilation was <7.2 in 58.3% of the subjects, between 7.2-7.4 in 30% of the subjects, and above 7.4 in 11.7 % of the subjects.

As evident from the above table, with a significant relation between the initial PH at ventilation and outcome of the babies, with increasing survival rates with higher PH. The average initial PH in expired babies was 7.09, where as in extubated babies, it is 7.27.

It is observed that, the extubation rates increased with increasing APGAR score, however, there was no statistical significance (p=0.880).

Out of 60 babies ventilated, 30 babies were put on PA/c mode and 30 babies were put on PC-SIMV mode. It is observed that there is no statistical significance between the mode of ventilation and survival rates (p=0.438).

It is observed from the above table that increasing PIP value decreases the chances of survival, whereas a lower PIP value has better chances of survival (p value: 0.001). [Table 7]



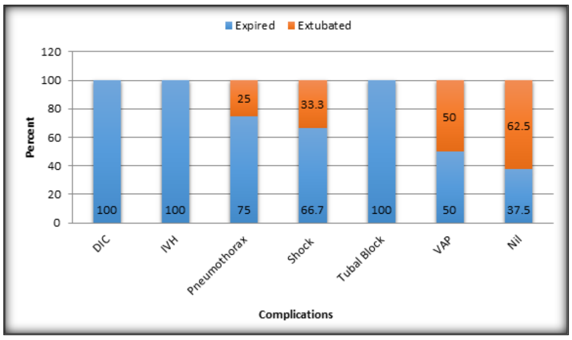
Graph 5: Influence of PIP on survival

It is shown from the above graphs and tables that survived cases needed less PIP. Maximum survival was shown in babies ventilated with a PIP below 15. In this group, 2 babies were ventilated with a maximum PIP of 20, out of which none survived. (p value:0.00003). [Table 10]

Mean ventilator settings used in different indications Maximum mean PIP was used in aspiration (17±3). Rates were almost similar in all groups. The duration of ventilation required was comparatively more in apnoea of prematurity (78.5±5.5) and birth asphyxia (67.3±65.11). [Table 11]

The range of duration of ventilation ranged from 2-240 hours, and the mean was 47.7±44.94 Hrs. The maximum number of babies (21) received ventilation for less than 20 hours. The survival rate was highest between 61-80 hours of ventilation, and the outcome was adverse with increasing and decreasing durations of ventilation.

Out of 60 subjects studied, complications were seen in 20 babies, out of which 5 babies had DIC (8.3%), and the least incidence of complications was tubal block seen in 1 baby (1.6%). [Table 12]



Graph 6: Complications and Outcome

Tube block, IVH, and DIC had the highest mortality, followed by pneumothorax (75% mortality) and shock (66.7% mortality), and VAP had the best outcome with 50% of the cases being improved.

Weight was in the range of 610-3500gms, with a mean of 2015±833, and gestational age was in the range of 27-43 weeks with a mean of 35±4.14. It is shown that the mean weight and gestational age are higher in survived cases compared to expired cases. [Table 13]

Out of 60 babies ventilated for various conditions, 29 (48.33%) survived.

Table 1: Frequency distribution in sex, weight, and gestational age

CHARACTER	BIRTH WEIGHT	No of cases	(%)
SEX	**MALE**	34	57
	FEMALE	26	43
WEIGHT	**<1000 GMS**	9	15.0
	1000-1499 GMS	12	20.0
	1500-1999 GMS	8	13.33
	2000-2499 GMS	5	8.33
	>2500 GMS	26	43.33
GEST.AGE	**<28WEEKS**	3	5
	28-34 WEEKS	25	41.7
	34-37 WEEKS	6	10
	>37 WEEKS	26	43.33

Table 2: survival rates with respect to indication for ventilation

INDICATION	N (%)	SURVIVED	EXPIRED	P Value
Birth asphyxia	18 (30)	7(38.88)	11(61.11)	**0.037***
AOP	2 (3.33)	1 (50)	1 (50)	0.961
Aspiration	2 (3.33)	1 (50)	1 (50)	0.961
Cong. Pneumonia	4 (6.66)	3 (75)	1(25)	0.269
Septicemia	7(11.6)	2(28.5)	5(71.4)	0.265
RDS	17 (28.33)	9 (52.9)	8 (47.05)	0.015*
MAS	10 (16.66)	6 (60)	4 (40)	0.049*

Table 3: Association between Age at Ventilation and Outcome (N=60)

Age at Ventilation (Hours)	Outcome	
	Expired (n=31) n (%)	Extubated (n=29) n (%)
0	11 (45.8)	13 (54.2)
6-Jan	7 (87.5)	1 (12.5)
12-Jul	1 (33.3)	2 (66.7)
13-24	1 (25.0)	3 (75.0)
25-48	3 (42.9)	4 (57.1)
>48	8 (57.1)	6 (42.9)
Chi-Square Test, P Value = 0.272, Not Significant		

Table 4: Association between Maternal Risk Factors and Outcome (N=60)

Maternal Risk Factors	Outcome		P Value
	Expired (n=31) n (%)	Extubated (n=29) n (%)	
Abruption	2 (66.7)	1 (33.3)	0.593
Anaemia	1 (50.0)	1 (50.0)	0.961
Eclampsia	5 (83.3)	1 (16.7)	0.101
Oligohydraminos	2 (50.0)	2 (50.0)	0.945
Placenta Previa	1 (100.0)		0.329
Post-Datism		3 (100.0)	0.066
Pre-Eclampsia	8 (57.1)	6 (42.9)	0.639
PROM	1 (25.0)	3 (75.0)	0.269
Nil	11 (47.8)	12 (52.2)	0.638
Chi-Square Test, P Value Not Significant			

Table 5: Association between Mode of Delivery and Outcome (N=60)

Mode of Delivery	Outcome	
	Expired (n=31) n (%)	Extubated (n=29) n (%)
LSCS	9 (40.9)	13 (59.1)
NVD	22 (57.9)	16 (42.1)
Chi-Square Test, P Value = 0.205, Not Significant		

Table 6: Association between APGAR score and outcome (N=60)

APGAR Score	Outcome	
	Expired (n=31) n (%)	Extubated (n=29) n (%)
3	1 (100.0)	
4	3 (60.0)	2 (40.0)
5	8 (61.5)	5 (38.5)
6	4 (50.0)	4 (50.0)
7	8 (44.4)	10 (55.6)
8	5 (50.0)	5 (50.0)
9	2 (50.0)	2 (50.0)
Chi-Square Test, P Value = 0.880, Not Significant		

Table 7: Association between mode of ventilation and outcome (N=60)

Mode of Ventilation	Outcome	
	Expired (n=31) n (%)	Extubated (n=29) n (%)
P A/C	17 (56.7)	13 (43.3)
PC-SIMV	14 (46.7)	16 (53.3)
Chi-Square Test, P Value = 0.438, Not Significant		

Table 8: Association between Ventilation Parameters and Outcome (N=60)

Parameter	Outcome		P Value
	Expired (n=31) Mean (SD)	Extubated (n=29) Mean (SD)	
Max PIP	16.68 (1.42)	14.62 (0.86)	<0.001*
Max PEEP	5.16 (0.63)	4.93 (0.53)	0.135
Max Fio2	89.68 (14.25)	65.86 (19.36)	<0.001*
Max Rate	52.13 (10.48)	52.76 (5.91)	0.778

Unpaired t Test, P Value *Significant

Table 9: Association between PIP value and outcome

	13-14	15-16	17-18	19-20	P value
EXPIRED	1	16	12	2	0.00003*
EXTUBATED	16	11	2	0	

Table 10: Showing mean ventilator settings used in different disease states

Birth Asphyxia	15.38±13.7	4.7±0.62	73.88±24.06	50±4.71	67.3±65.11
RDS	16.35±1.36	5.9±0.49	80.5±15.5	56.8±12.7	36.7±27.3
MAS	14.8±0.74	4±0.7	84±16.85	51±5.38	35.3±26.43
Septicemia	15.85±0.98	5.14±0.34	85.7±21.28	51.42±6.38	38.5±35.8
AOP	16±2	5±0	55±5	50±0	78.5±5.5
Aspiration	17±3	5±0	80±20	55±5	30±14
Pneumonia	15.25±2.16	5±0	70±17.3	50±0	42.25±17.8

Table11: Survival in relation to duration of ventilation

DURATION (HRS)	TOTAL(No of cases)	IMPROVED	EXPIRED
<20	21	10	11
21-40	8	4	4
41-60	12	6	6
61-80	12	7	5
81-100	4	1	3
>100	3	1	2

Table 12: Distribution of Study Subjects according to Complications (N=60)

Complications	No.	Percent
DIC	5	8.3
IVH	3	5.0
Pneumothorax	4	6 67
Shock	3	5.0
Tubal Block	1	1 6
VAP	4	6 67
Nil	40	67

Table 13: Showing overall survival rate

Total	Improved (%)	Expired (%)
60	29 (48.33)	31(51.66)

DISCUSSION

Mechanical ventilation has dramatically improved the survival rates of sick neonates. It is reported by A.I.Murdock,[5] that artificial ventilation improved survival in neonates weighing more than 2000gms from 15% to 43% (4/27 versus 29/67, P <0.025). In our 18 months study, out of 100 babies who required mechanical ventilation, 60 babies were included after considering exclusion criteria.

The sex distribution in our study was 56.66% males and 43.34% females.

Indication: The most common indication for mechanical ventilation in our study was birth asphyxia (30%) seen predominantly in term babies followed by RDS seen in preterm babies (28.33%), whereas those reported in other studies by Sharma R et al,[6] are RDS (52.77%), followed by MAS (22.22%). The most common indication in the study done by Anantharaj A, et al,[7] was RDS in preterm and Birth asphyxia in term babies. In L. Krishnan,[8] series the commonest indication is septicemia followed by RDS (23%), Birth asphyxia (16%) and apnea (15%). Septicemia constituted 11.6% & Apnea of prematurity constituted 3.33% in our study which is comparable to study done by P K Riyas et al,[9] 14.7% for septicemia and 5.9% for AOP. The NNPD 2002 places birth asphyxia as the commonest primary cause of neonatal mortality, with an incidence of 28.8% among all intramural deat. [10]

The survival rates of babies according to the indication were congenital pneumonia -75%, MAS-60%, RDS -52.9%, AOP -50%, Aspiration -50%, Birth asphyxia -38.88%, septicemia- 28.5%. This is comparable to the study done by P.K.Riyas et al [9], where MAS has the highest survival rate of 63.6%, followed by pneumonia 62.5%. With the least chances of survival in babies ventilated for septicemia (40%).

Gestational age: In our study group babies below 28 weeks of gestational age were 5%, 28-34 weeks were. 41.7%, between 34- 37 weeks were 10%, more than 37 weeks were 43.3%. This is comparable with studies done by Sharma R et al,[11] (51% preterms,48% terms) and Anantharaj A, et al,[7] (54% preterms and 44% terms). In contrast the number of babies below 32 weeks is 43.06% in study done by N.C.Mathur.[12]

Weight: In this study, the weight distribution was 15% in less than 1000gms, 20% in 1000-1499gms, 13.33% in 1500-1999gms, 8.33% in 2000-2499gms, and 43.33% in more than 2500gms. This is comparable to the study done by Sharma et al,[11] and P. K. Riyas (57.85% terms),[9] but in contrast to the study done by S.Nangia,[5] in which there were more babies between 1500-2500gms (61%).

Maternal risk factors, Mode of delivery and age at ventilation:

The most common risk factor encountered in the study was Pre-eclampsia, observed in 14 babies (23.3%), followed by eclampsia found in 6 babies (10%), followed by oligohydramnios and PROM (6.7% each). Babies, whose mother had, placenta previa and abruption had poor outcome (100% &66.7% mortality). Babies whose mother had PROM showed a better outcome (25.0% mortality)

In this study babies delivered by LSCS, had a better outcome than babies delivered by NVD, this is in contrast to the results done by Mohini Yadav et al,[6] (46.7% vs 37.1%). There is no significance in relation to age at ventilation and outcome

APGAR score and initial Ph:

There is no significant relation between the APGAR score at 5th min and outcome, in contrast to the study done by Mohini Yadav et al, [6] where an APGAR score >7 had a better outcome (56.3%; p <0.03).

There is significant relation between the initial ph at ventilation and outcome of the babies, with increasing survival rates with higher ph.

The average initial ph in expired babies was 7.09, where as in extubated babies, it is 7.27. This is comparable to study done by Qazi iqbal et al,[13] where an initial ph of < 7.1 was a significant predictor of mortality. This is in contrast to the study conducted by Anantharaj. A et al,[7] where the initial Ph did not correlate with survival.

Ventilator settings

Mean PIP used in the current study in relation to various indications was birth asphyxia 15.38±, RDS 16.35±1.36, MAS 14.8±0.74, Septicemia 15.85±0.98, AOP 16±2, pneumonia 15.25±2.16, aspiration 17±3. Ventilator settings varied in all the studies (L. Krishnan,[8] M.Singh.[14]) This may be because the ventilator settings used is individualized to the need of the baby considering various factors. Therefore every baby requires different settings and should be taken as an individual case. But it is noted that PIP needed in RDS is high all studies(L.krishnan,[8] M.Singh.[14]) PIP, rate and Fio2 were needed more in expired cases than in improved cases comparable with study done by E.O.R.Reynold,[15] (mean PIP 24.6±0.5, rates 34.5±1.3 in survived cases versus 32.7±0.9 and 50.6±6.3 in expired cases respectively)

The mean duration of ventilation was given in table no. The mean duration needed in birth asphyxia was 67.3±65.11, MAS 35.3±26.43, RDS 36.7±27.3, septicemia 38.5±35.8, AOP 78.5±5.5, aspiration 30±14, pneumonia 42.25±17.86. This is contrast to study done by N.C.Mathur.[12] In survived cases of our study the maximum PIP was given in aspiration and RDS. The mean PEEP and rate did not differ much. Duration of ventilation needed was maximum in AOP (78.5 ± 5.5), Birth asphyxia (67.3±65.11). Aspiration needed the least of only 30±14)

Complications

During the present study one or the other complications occurred in 20% of cases. Major complications were seen in 20 babies, out of which, 5 babies had DIC (8.3%), 4 babies (6.66%) had pneumothorax and VAP and the least incidence of complications was tubal block seen in 1 baby (1.6%).

But reports from N.C.Mathur,[12] and Maiyya P.P,[16] shows pneumonia in 28.8% and 25% cases respectively. Careful attention to endotracheal toilet and chest physiotherapy would have contributed to the lower incidence of tubal block. Pneumothorax and VAP occurred in 6.66% of cases in our study, which comparable with study done by N.C.Mathur,[12] (6.1%) and L.Krishnan,[8] (8.8%)

Tube block encountered was 1.66% of cases in our study. In contrast to 5.8% reported by L.Krishnan.[8] High index of suspicion and early intervention would have contributed to the lower incidence in our study. Other studies have not mentioned this complication. 3 cases had IVH and shock in our study. DIC, IVH and tubal block were the leading cause of death in our study.

Survival

The overall survival rate in our study was 48.33%. It is comparable with studies reported from other parts of the country by S.Nangia,[5] (46.54%), M.Singh,[14] (55.5%), Maiyya,[16] (48.76%), Sreshta,[17] (33%), Anantharaj. A,[7] (58%). Male babies had a better survival rate (52.9%) compared to female babies. Irrespective of the indications survival rate was better with increasing birth weight and gestational age. This trend is consistent with all studies.

Table 14: showing comparsion of survival rates in different studies

Study	Survival rates in %
Present study	48.33
S.Nangia[5]	46.54
M.Singh[14]	55.55
Maiyya[16]	48.76
Anantharaj A[7]	58

P.K.Riyas[9]	50.98
Krithuka et al[18]	62
Regmi et al[19]	37

CONCLUSION

This study offers a wide exploration of the diverse etiologies and outcomes associated with neonates requiring mechanical ventilation in the Neonatal Intensive Care Unit (NICU). Through an in-depth analysis of medical records, we aimed to enhance our understanding of the challenges faced by this vulnerable population and contribute valuable insights to inform clinical practices in neonatology.

The primary etiologies identified in our study, including respiratory distress syndrome (RDS), meconium aspiration syndrome (MAS), congenital anomalies, sepsis, and neurological disorders, underscore the complex nature of neonatal respiratory distress. Each etiology presents unique challenges, necessitating a tailored approach to mechanical ventilation and neonatal care. Our findings highlight varying survival rates among neonates with different underlying etiologies, emphasizing the need for personalized and targeted interventions. The duration of mechanical ventilation was also a critical parameter, with implications for potential complications such as ventilator-associated pneumonia, bronchopulmonary dysplasia, and intraventricular hemorrhage.

The identification of these outcomes provides clinicians with valuable information to guide decision-making in the NICU. Understanding the factors influencing the success of mechanical ventilation and the potential risks associated with prolonged ventilation is crucial for optimizing neonatal care protocols. While our study contributes valuable insights, it is essential to acknowledge certain limitations. The retrospective nature of the study and reliance on medical records may introduce biases, and prospective studies could provide additional depth to our understanding of these complex issues. Furthermore, the study was conducted at a specific institution, and generalizability to other settings should be approached with caution.

In summary, this study serves as a foundation for future research endeavors in neonatology. The insights gained from examining the etiologies and outcomes of neonates supported by mechanical ventilation contribute to the ongoing efforts to refine and advance clinical practices, ultimately aiming to improve the overall care and outcomes for this fragile population. Continued research and collaboration are essential to further unravel the complexities of neonatal care and enhance the well-being of neonates requiring mechanical ventilation.

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