

Does Downes Vidyasagar score have a correlation with the outcome of Respiratory distress in Term neonates ? - A prospective study from Andhra Pradesh, India

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Abstract

Background: Respiratory distress occurs among 4 - 7% of all neonates and is the reason for 30-40% of admissions in the NICU. The most common cause of respiratory distress in the late preterm and term neonates is transient tachypnoea of the newborn (TTN). Early recognition of the cause of the respiratory distress and initiating appropriate oxygen support is vital to reduce mortality and morbidity. The Respiratory distress of new-born is most commonly assessed by Silverman Anderson Score and Downes' Vidyasagar Score. We did this study to know the correlation between the initial Downes score and the outcome.

Aim: To assess the severity of respiratory distress at the time of admission and its correlation with the outcome.

Materials and Methods: This descriptive study-Prospective study, conducted in Government General Hospital, Vijayawada for a period of one year (May 2021-April 2022). It includes all the term inborn and out born babies referred to our NICU with respiratory distress.

Results: The initial Downes score is correlating with the outcome as in, higher the score, worse the prognosis, The score ≤ 3 has a mortality rate of 11.8%, 4-6 score has a mortality rate of 40.2%. 75% mortality rate for score > 7 .

Conclusion: We conclude by saying that the Downes score can be used as a prognostic marker in case of respiratory distress of various etiologies except in Birth Asphyxia where we have to consider other markers. Overall, the initial Downes score (≥ 6), progression of Downes score, presence of Complications and shock can have a poor prognosis.

Key words: Respiratory distress, Downes Vidyasagar Score, term neonates

Background:

Respiratory distress occurs among 4-7% of all neonates^[1,2] and is the reason for 30-40% of admissions in the NICU. It is more common among preterm (30%) and post-term (21%) than among 2 term neonates (4.2%)^[2]. The most common cause of respiratory distress in the late preterm and term neonates transient tachypnea of the newborn (TTN) is the predominant cause. Other common causes of respiratory distress in term newborns are MAS, Sepsis, PPHN, Pneumothorax, Birth asphyxia, Congenital diseases of the heart, lungs, and other Congenital defects like CDH.

The Respiratory distress of new-born is most commonly assessed by Silverman Anderson Score^[3]

and Downes' Vidyasagar Score^[4]. These scores are mainly used to decide on the early initiation of management and follow the progression of respiratory distress. Downes' score had a good correlation with physiological parameters like arterial pH and blood-gas as well as mortality^[4]. They are easy to assess and give valuable information on the treatment plan. In our study, the Downes score is used to assess the term neonates for respiratory distress as it got more sensitivity (88%) and specificity (81%) and it correlates well with Hypoxemia^[5].

Most prior research includes preterm infants or mixed populations. Focusing exclusively on term neonates allows us to explore whether the Downes-Vidyasagar Score retains prognostic value in a more mature group,

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which is clinically significant yet under-studied. Rather than merely scoring severity, my study correlates the Downes score with outcomes. This offers prognostic insight, potentially guiding management decisions early in care.

Validating a simple clinical score- Downes-Vidyasagar Score for outcome prediction makes it especially useful in settings without access to advanced diagnostics like blood gases or imaging enhancing the practical value of my findings. While the Downes Vidyasagar score is commonly used to assess the severity of respiratory distress in neonates, limited data exists on its correlation with clinical outcomes specifically in term neonates. This prospective study from Andhra Pradesh, India, explores the score's prognostic value in predicting outcomes, offering insights applicable to resource-limited healthcare settings.

Materials and Methods

Our study was a Descriptive Study Prospective/ Longitudinal study, done in Government General Hospital, Vijayawada, Andhra Pradesh for a period of 1 year (May 2021-April 2022). We included all the full term, inborn, and out-born babies referred to our NICU with respiratory distress. We excluded all those not willing for consent and presented with other clinical presentations without respiratory distress.

Methodology

Study samples were recruited using inclusion criteria. After obtaining proper consent, clinical information was obtained using proforma. Scoring was done after 4-6 hours and 12 hours along with clinical information. Then the results obtained using appropriate Statistical analysis.

Definition of respiratory distress: Any two of the following features: Respiratory Rate (RR) >60/min, Chest retractions (subcostal/intercostal) and/or Expiratory Grunting.

The severity of respiratory distress is assessed using Downes Vidyasagar scoring:

Score	0	1	2
RR	<60	60-80	>80/apnea
Cyanosis	None	In-room air	With 40% oxygen
Retractions	None	Mild	Moderate to severe
Grunt	None	Audible with stethoscope	Audible with stethoscope
Air entry	Clear	Decreased	Barely audible

According to the Russian Federation United States of America^[6] and PONE^[7],

Grade	Mild	Moderate	Severe
Score	≤ 3	4-5	≥ 6

The necessary details to be taken were Patient's details (name/age/sex), Gestational age, Downes score at the time of admission (within 30 mins), repeat Downes score after initiation of treatment (4 - 6 hrs & 12 hrs), Risk factors (maternal & fetal), Oxygen support provided at the time of admission, Presence of shock during treatment, Duration of hospital stay, Outcome (death/discharge). The final diagnosis of respiratory distress was made with history, clinical features, and radiological findings.

Results

A total of 1827 babies were admitted to our SNCU. 852 (46.6%) were full-term babies admitted to our SNCU for various reasons. Out of which 316 (37%) were admitted with respiratory distress.

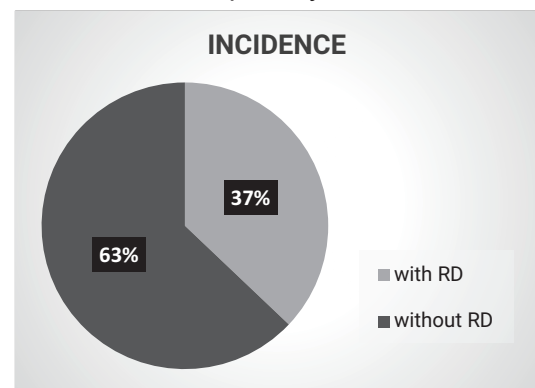


Figure 1: Incidence of Respiratory Distress In Term Neonates

Table 1: Causes of respiratory distress in term infants (n = 316)

Causes	Number (n)	Percentage (%)
Sepsis	41	12.9
TTNB	99	31.3
BA	91	29.1
MAS	103	32.6
PPHN	22	7
Pneumonia	8	2.8
Pneumothorax	6	1.8
CHD	7	2.2
Hypoglycaemia	1	0.3
Pulmonary haemorrhage	3	1
NEC	2	0.6
VAP	6	2
Hypothermia	4	1.2
IEM	1	0.3
Aspiration	3	1
CDH	2	0.6
Electrolyte imbalance	3	1
IVH	1	0.3
Subgaleal hematoma	2	0.6
Vein of galen malformation	1	0.3
Dehydration	2	0.6

Here on seeing the etiology for respiratory distress in term neonates, meconium aspiration syndrome stands first with 103 (32.6%), followed by Transient Tachypnea of New Born with 99 (31.3%), Birth asphyxia (n=91 (29.1%)), sepsis (n=41 (12.95%)), PPHN (n=22 (7%)), Pneumonia (n=8 (2.8%)), CHD (n= 7 (2.2%)), pneumothorax (n=6 (1.8%)), other causes includes pulmonary haemorrhage (n=3 (1%)), NEC (n=2 (0.6%)), VAP (n=6 (%)), hypothermia (n=4 (1.2%)), IEM (n=1 (0.3%)), Aspiration (n=3 (1%)), CDH (n=2 (0.6%)), electrolyte disturbances (n=3 (1%)), IVH (n=1 (0.3%)), Subgaleal hematoma (n=2 (0.6%)), dehydration (n=2 (0.6%)), Vein of Galen malformation (n=1 (0.3%)).

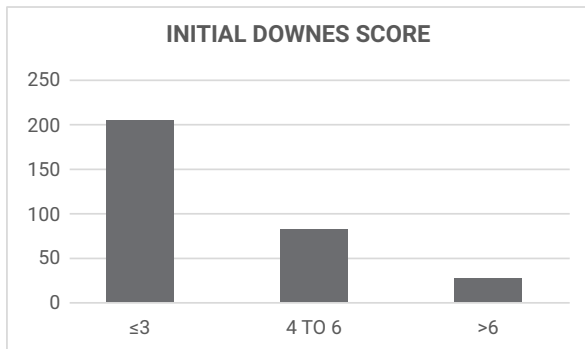


Figure 2: Distribution based on initial downes score (n=316)

Out of 316 cases, 205 cases had initial Downes score less than or equal to 3 (64.8%), 106 cases (33.5%) had score 4-6. 5 cases (1.6%) had Downes score more than 6.

Table 2: Progression of Downes score: (n=316)

Progression of downes score	Number (n)	%	Discharge N (%)	Death N (%)	Chi-square Value	P-value
Increase	32	10	9 (28%)	23 (72%)	118.8 (df=2)	<0.0001
Static	19	6	2 (10.5%)	17 (89.5%)		
Decrease	265	84	237 (89%)	28 (11%)		

On evaluating the Downes score at admission, 4-6 hours and 12 hours, the Downes score showed a raising trend in 32 cases (10%), out of which 28% discharged and 72% death. Score remained static in 19 cases (6%), out of which 10.5% cases discharged and 89.5% were dead, and progressively decreased in 265 cases (84%), out of which majority of cases (89%) discharged and 11% were dead. In the cases of TTNB, 96 cases showed decreasing trend in the Downes score, 3 cases showed a static trend. In cases of Birth Asphyxia, 10 cases showed an increasing trend in the Downes score, 10 cases showed a static trend, and the remaining 71 cases showed a decreasing trend. In cases of MAS, 13 cases showed an increase in Downes score, 12 cases showed a static trend and 78 cases showed decreasing Downes score. In cases of sepsis, 6 cases showed an increasing Downes score, 4 cases had a static score and 31 cases showed a

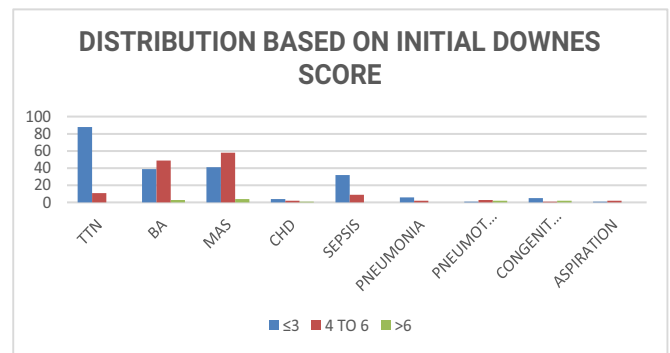


Figure 3: Aetiology wise-distribution based on initial Downes score:

Etiology-wise distribution showed all cases of TTNB had a Downes score less than 6. In the case of BA, 39 cases had a score ≤3, 49 cases had a score of 4-6, 3 cases had a score >6. In the case of MAS, 41 cases had scores ≤3, 58 cases had scores of 4-6, 4 cases had scores >6. In the case of CHD, 4 cases had a score ≤3, 2 cases had a score of 4-6, 1 case had a score >6. In the case of sepsis, 32 cases had a score ≤3, 9 cases had a score of 4-6, none had a score >6. In the case of pneumonia, 6 cases had scores ≤3, 2 cases had scores of 4-6, none had scores > 6. In the case of pneumothorax, 1 case had a score of ≤ 3, 3 cases had a score of 4-6, 2 cases had a score >6. In the case of congenital defects, 5 cases had scores ≤3, 1 cases had scores of 4-6, 2 cases had scores >6. In the case of Aspiration, 1 case had a score ≤3, 2 cases had a score of 4-6, none had a score >6.

decreasing trend. In CHD cases 1 showed an increasing trend and 6 showed decreasing trend. In Pneumonia cases, 1 showed an increasing trend, 1 showed static and 6 cases showed decreasing trend. In cases of Pneumothorax, all 6 cases showed decreasing Downes score once treatment is initiated. 1 case of aspiration showed a static trend, and the remaining 2 cases showed a decreasing trend.

Outcome:

Table 3: Outcome: (n=316)

Outcome	Number (n)	Percentage (%)
Discharge	248	78.5
Death	68	21.5

In a total of 316 cases of respiratory distress, 248 cases (78.5%) were discharged and 68 cases (21.5%) cases were dead.

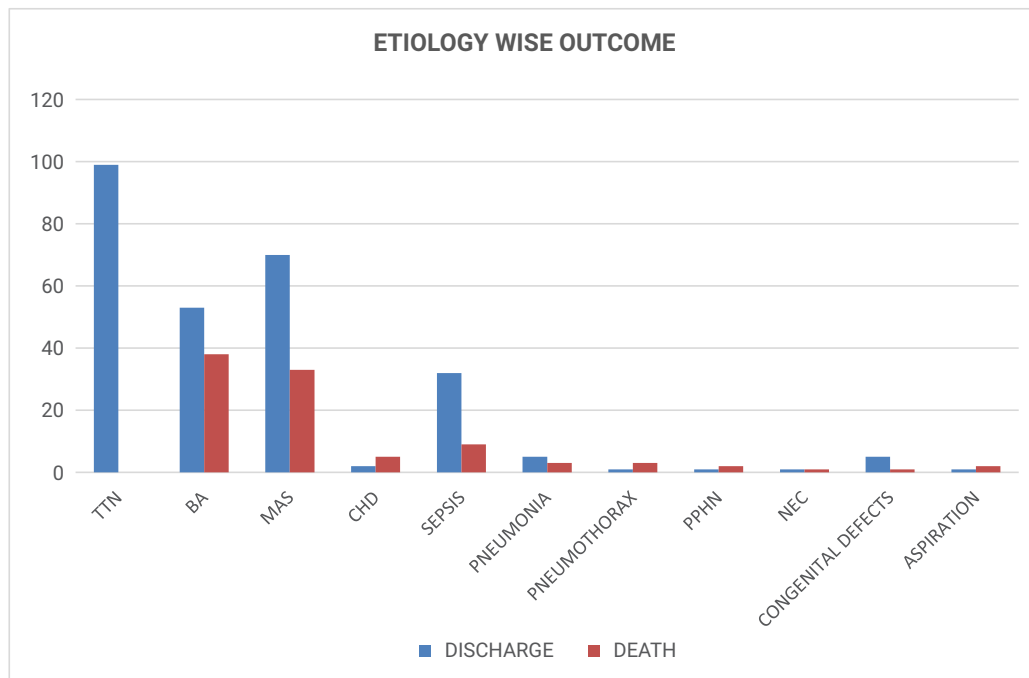


Figure 4: Etiology Wise Outcome

In cases of TTNB, all the cases were successfully discharged. In cases of Birth Asphyxia, 53 cases (58.3%) were discharged and 38 cases (41.1%) were dead. In MAS category, 70 cases (68%) were discharged and 33 cases (32%) were dead. In CHD babies, 2 babies were discharged and 5 babies died. In sepsis, 32 babies (78%) discharged and 9 babies (22%) were dead. In pneumonia, 5 cases (62%) were discharged and 3 cases (38%) were dead. In pneumothorax, 1 case was discharged and 3 cases died. In congenital defects, 5 cases survived and 1 case died. In cases of aspiration, 1 case is discharged and 2 died out of 3 cases.

Table 4: Correlation between Downes score and outcome (n=316)

Downes score	Discharges		Deaths		Total	Chi-square	P-value
	N	%	N	%			
≤3	183	89.2	22	11.8	205	42.98 (df=2)	<0.0001
4-6	64	59.8	43	40.2	107		
>6	1	25	3	75	4		
Total	248	78.5	68	21.5	316		

In a total of 248 cases discharged, 183 cases had Downes score ≤3, 64 cases had scored 4-6 and 1 case had a score >6. In death cases, 22 had a score ≤3, 43 has a score of 4-6 and 3 had a score >6.

Discussion

Respiratory distress is common in term neonates with significant morbidity and mortality. Many of the conditions causing respiratory distress are preventable if necessary steps are taken antenatally and during delivery. Early recognition and necessary intervention are required for a better outcome. The appropriate mode of ventilation as early as possible and supportive treatment with intravenous fluids and antibiotics sometimes inotropes support is needed for a better outcome. Overall view of risk factors, causes, scoring system, management of respiratory distress

helps in enhancing the approach to bring down mortality and morbidity associated with respiratory distress. Continuous monitoring of respiratory distress to watch for the progression of distress, plays a vital role in changing the treatment plan for a better outcome.

Various scores of respiratory distress are used, out of which Downes score with high sensitivity and specificity is used to assess the severity of respiratory distress in our study. Many studies have shown the clinico-etiological details of respiratory distress in term babies. But none so far has compared the initial Downes score with the outcome of the respiratory distress. In our study in addition to the clinico-etiological details of respiratory distress in term neonates, We have also planned to study the etiology-wise outcome and progression of respiratory distress

and how it is correlating with the initial Downes score at the time of admission.

Out of 1827 babies admitted to our NICU, 852 babies (46.6%) were term babies. Out of 852 term babies, 316 babies (37%) had respiratory distress, in which 185 (59%) were inborn and 131 (41%) were outborn babies. 203 (64.2%) were male babies and 113 (35.8%) were females babies.

The incidence of respiratory distress is 37% in our study, which is similar to Haque et al study and lesser than Abdelrahman SM et al., Wadi AM et al., studies

Table 5: Incidence of respiratory distress:

Studies	Incidence
Haque a et al ^[8]	34%
Wadi am et al ^[9]	50 %
Swarnkar k et al ^[10]	16.3%
Abdelrahman sm ^[11]	56.5%
Present study	37%

Table 6: Etiology of respiratory distress

Studies	Ttn %	Birth asphyxia %	Mas %	Sepsis & pneumonia %	Chd %	Rds %	Other Causes %
Haque et al ^[8]	43.2	25	1.5	28	10.4	30.2	2
Wadi am et al ^[9]	44.9	13.2	9.6	16.2	7.8	1.2	7.2
Swarnkar k et al ^[10]	40.7	11.4	9.3	7.9	3.5	17.1	10
Abdelrahman sm ^[11]	28		6	24	9	15	18
Dutta a et al ^[12]	32.3	12.5	13.15	24.3	3.3	7.9	3.94
Present study	31.3	29.1	32.6	15.7	2.2	0	4.2

The most common cause of respiratory distress is Meconium aspiration syndrome (32.65) followed by TTN (31.3%). Various congenital malformations include Congenital diaphragmatic hernia, trachea-oesophageal fistula, cleft palate and lips, a vein of Galen malformation, myelomeningocele.

Table 7: Distribution of outcome

Studies	Death %	Discharge %
Haque et al ^[8]	16.7	83.3
Wadi AM et al ^[9]	9	91
Swarnkar K et al ^[10]	22.86	77.14
Abdelrahman SM ^[11]	36	64
Present study	21.5	78.5

The outcome of respiratory distress shows 21.5% mortality and 78.5% discharged, similar to Haquea et al., Keerti Swarnkar et al and mortality less than Wadi AM et al study The case fatality rate is highest with CHD (71%) followed by birth asphyxia (41.7%), MAS (32%), and sepsis (29.7%).

According to Table 4, The initial Downes score is correlating with the outcome as in, the higher the score, the worse the prognosis, which is evident in this study even though appropriate treatment is started based on the Downes score. The score ≤ 3 has a mortality rate of 11.8%, 4-6 score has a mortality rate of 40.2% with more mortality in score 6. 75% mortality rate for score > 6 .

In TTN, most of the score is ≤ 3 , so good prognosis. **In the case of birth asphyxia, the Downes score is not correlating with the initial Downes score as there is not much difference in outcome with the initial Downes score.**

In the cases of TTN, MAS, sepsis, Pneumonia, CHD, the initial Downes score can be used as a prognostic marker as the score is correlating with the outcome.

Table 8: Progression of Downes score & its correlation with outcome:

Progression of Downes score	Number (n)	Percentage (%)	Discharge N(%)	Death N(%)
Increase	32	10	9(28%)	23(72%)
Static	19	6	2(10.5%)	17(89.5%)
Decrease	265	84	237(89%)	28(11%)

Here, progression of the Downes score is seen using scores at the time of admission, intervals 4-6 hours, and 12 hours. With the results, we concluded that when the score is static and or the score is increasing, then the prognosis is poor. None other studies have shown the progression of Downes score and its relation with the outcome. Necessary escalation in treatment is needed if the score is static and progressively increasing.

Table 9: Correlation with initial Downes score and its progression with outcome:

Initial Downes score	Progression	Discharge	Death	Total
≤3	Increase	12 (50%)	12 (50%)	24
	Static	14 (63.6%)	8 (36.4%)	22
	Decrease	157 (98%)	3 (2%)	160
4-6	Increase	2 (18%)	9 (72%)	11
	Static	5 (29.4%)	12 (70.6%)	17
	Decrease	57 (73%)	21 (27%)	78
>6	Increase	0	0	0
	Static	0	0	0
	Decrease	1 (25%)	3 (75%)	4
Total		248	68	316

In any score, if it is in the increasing trend, the prognosis is poor with an increased mortality rate (in score ≤3, the mortality rate is 50%, in scores 4-6, the mortality rate is 72%, and if score >6, the mortality rate is 75% if the score is in increasing trend). In cases of static Downes score, the mortality rate is 36.4% if the initial score is ≤3, 70.6% if the score is 4-6 and nil cases in score >6.

Conclusion

Respiratory distress stays as one of the commonest causes of admissions in term babies in NICU. Our study concluded that Meconium aspiration Syndrome is the commonest cause of respiratory distress followed by TTN.

Various complications causing significant mortality and morbidity in various etiologies include Persistent Pulmonary Hypertension (PPHN), Ventilator Associated Pneumonia (VAP) and Pneumothorax. About 16.5% of cases were of low birth weight. Most of the cases had a hospital stay for less than 7 days.

The initial Downes score at the time of admission can be used as a prognostic marker as it is correlating with the outcome. Etiology wise considering, In Birth asphyxia, the outcome is independent of the initial Downes score as many systems are involved and other scoring systems should be considered. All other etiologies have outcomes and prognoses correlating with the initial Downes score. We conclude by saying that the Downes score can be used as a prognostic marker in case of respiratory distress of various etiologies except in Birth Asphyxia where we have to consider other markers.

While providing airway management, always be careful with the moderate Downes score of 4-6 and how it is progressing over time as the timely escalation in management can significantly reduce mortality and morbidity. Overall, the initial Downes

score (≥6), progression of Downes score, presence of Complications and shock can have a poor prognosis. So, it is advised to use Downes score as long as respiratory distress subsides at least every 6th hour for a better Outcome.

Recommendations:

Scoring of respiratory distress using Downes scoring system, even after starting in appropriate respiratory support is essential for better outcome.

Moderate Downes score can progress rapidly and careful escalation on treatment will help in better outcome.

Limitations

1. Sample size is small and needs further studies to justify the results concluded by this study.
2. The Downes score was not documented throughout illness beyond 12 hrs and its correlation with the outcome is not yet studied.
3. Downes score is very subjective and it needs skilled labourers to document Downes score. Furthermore, studies are needed to support the evidence found in this study.

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