ORIGINAL RESEARCH

Association of gastric aspirate shake test with respiratory distress in new-borns in a tertiary care hospital, Southern Kerala: A cross sectional study

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Received: 12March, 2023 Accepted: 18April, 2023

ABSTRACT

Introduction: Surfactant is a heterogeneous mixture of lipids and protein and it is produced by type II alveolar epithelial cells, preventing alveolar collapse during expiration. Before 34 weeks of gestation the type II pneumocytes are not sufficiently formed and thus the risk of respiratory distress is high. This study has made an attempt to estimate the association of newborns with respiratory distress while using gastric aspirate Shake test. **Objective:** To estimate the association of newborns with respiratory distress while using gastric aspirate shake test (GAST) in Dr. Somervell Memorial CSI Medical college, Hospital, Karakonam from November 2018-November 2020. **Method:** This cross sectional study included 67 newborns delivered at a tertiary care Centre, for whom nasogastric tube insertion was indicated. Shake test was performed with 0.5 ml of the gastric aspirate and the entire babies with Shake test were assessed with Silverman Anderson retraction score. **Results:** Out of the 67 babies enrolled only 12 babies developed Respiratory distress using SA score. The distribution of gender showed that, there were 36(53.7%) males and 31(46.3%) females. The mean GA of the study population is 35.58(±1.86wks.). About 55 (82.1%) newborns were moderate PT. (32-37 wks.); 1(1.5%) was an early PT. (<32 wks.) and remaining 11(16.4%) babies were Term Babies (>37 wks.).Out of the total 67 babies observed only 12 had Respiratory Distress using SA Retraction score of 4-6 and 55 had no significant respiratory distress The Gastric Aspirate Shake Test was positive in 59 babies and negative in 8 babies. There was a significant association between the Respiratory distress p=0.011 and no significant association with Gestational age P=0.1. The Sensitivity, Specificity, Positive Predictive value (PPV), Negative Predictive Value (NPV) and Accuracy in Relation to Respiratory Distress Score was found as 66.67%, 7.27%, 13.56%, 50% and 17.91%. **Conclusion:** Although the Gastric Aspirate Shake Test is rapid, simple and inexpensive it may not be a ideal primary test in early diagnosis of respiratory distress and to provide necessary special attention in suspected cases of the same.

Key words: Gastric aspirate shake test, birth weight, preterm, respiratory distress syndrome

INTRODUCTION

Respiratory distress is identified to be one of the most common reasons for entry into neonatal intensive care unit which is more prominent in newborns below 34 weeks of gestation[1, 2].Regardless of the causes,it can worsenleading to Respiratory failure and cardiopulmonary arrest. Respiratory Distress Syndrome (RDS) is a common problem faced by neonatologists and paediatricians in Newborn intensive care with an incidence that is inversely related to the gestational age (GA) and birth weight (BW); Respiratory distress syndrome observed in 60-

80% of newborns below 28 weeks (wks.) and 30% between 32-36 weeks (wks.) of gestation[3].

Despite major advances in the understanding and management of respiratory distress in the newborn, hyaline membrane disease (HMD) due to Inadequate surfactant synthesis in newborns has remained the most common cause of death and handicap in preterm (PT) babies that is associated with a 30% mortality rate in the neonatal population[4, 5].Therefore an urgent work up and appropriate therapy seems to be essential to reduce the morbidity and subsequent mortality.

Surfactant is a heterogeneous mixture of lipids and protein which predominatly contains Dipalmitoyl Phosphatidyl Choline as the main component of pulmonary surfactant produced by the type II alveolar cells also called as Clara cells. It spreads in the lung tissue-air interface, preventing alveolar collapse during expiration and allowing the alveoli to open easily at the next inspiration. Before 24 weeks, the type II pneumocytes are not sufficiently formed to release the surfactant leading to increased surface tension in the alveoli and consequently causes respiratory distress in the newborns which is manifested as respiratory distress.

Clinical diagnosis of respiratory distress in the newborn is suspected after birth when the respiratory rate (RR) is greater than 60 per minute (min) in a quiet resting baby in addition of findings suggestive of intercostals recessions or expiratory grunt or cyanosis or even hypoxia suggested by saturations of below 95% room air or with Oxygen therapy with or without radiological findings [5, 6].

A rapid, simple, and reproducible test of pulmonary maturity in the newborn infant at risk would therefore be of great value for improving diagnosis and plan appropriate referral to higher centres. There are different biochemical tests available for measuring the lecithin to sphingomyelin (L/S) ratio and phosphatidylglycerol (PG) levels, or immunoassays for surfactant-associated proteins and other proteins that require technical skill and are time consuming cumbersome, expensive and may even be difficult in primary health care setup. So a common bedside test used for determining surfactant deficiency has been introduced, called the shake test to circumvent these problems [7, 8].

It is also useful in primary care hospitals to distinguish among babies with idiopathic respiratory distress and other mild causes of respiratory failure and therefore to decide early to refer them to specialized hospitals [9].

The purpose of this study was to determine whether there is an association of Gastric Aspirate Shake Test (GAST) and respiratory distress in neonates to determine the surfactant assessment with Hyaline Membrane Disease rapidly and reliably. If the test proves the association estimation can be made during bedside that the test is rapid, simple and inexpensive, it may prove useful in early diagnosis and treatment.

OBJECTIVE

To estimate the association of newborns with respiratory distress while using gastric aspirate shake test (GAST) in Dr. Somervell Memorial CSI Medical college, Hospital, Karakonam from November 2018-November 2020.

METHODS

STUDY DESIGN: Cross sectional study.

STUDY POPULATION

Newborns delivered at Dr. Somervell Memorial CSI Medical College Hospital, Karakonam during the study period for whom nasogastric tube insertion was indicated (Gestational diabetes mellitus and polyhydramnios mother and who underwent Caesarean section after ruling out oesophageal atresia).

SAMPLE SIZE: sample size studied was 67.

STUDY PERIOD: November 2018-November 2020 after getting the clearance from the Institutional Ethical committee data collection was started.

INCLUSION CRITERIA

NOTE: Nasogastric insertion is usually done in all newborns to rule out oesophageal atresia.

1. Maternal illness like Gestational diabetes mellitus (GDM), Pregnancy induced Hypertension (PIH).
2. Risk of prematurity.
3. Lower Segment Caesarean Section.
4. Placental or amniotic fluid anomalies like polyhydramnios.

EXCLUSION CRITERIA

1. Unable/not interested to give consent.
2. Meconium stained liquor.
3. Prolonged rupture of membranes (PROM).
4. Severe congenital anomaly or conditions incompatible with life.
5. Moderate or severe birth asphyxia (BA).
6. Persistent pulmonary hypertension of newborn.
7. Evidence (e/o)pneumothorax.

PROCEDURE

Shortly after birth (within 30 min), the Shake test was performed using gastric fluid. About 0.5 ml of gastric aspirate was pipette out in to new 10mm by 110mm test tubes containing 0.5ml saline and 1ml of 95% ethanol. The tube was then closed with a cork and vigorously shaken for 15 seconds and left to stand for 15 minutes before taking reading. The reading is interpreted visually by bubbles covering greater than two-third of the liquid surface as a positive test and covering of one-third to two-third or even less than one-third as negative test. Respiratory distress was assessed clinically using with Silverman Anderson retraction score was done for the babies with GAST [10, 11].

The Silverman-Anderson Retraction Score is used to assess the severity of respiratory diseases in newborn and preterm infants without respiratory support. The score comprises 4 inspiratory categories of movements name (I) thoracoabdominal, (II) Intercostal, (III) Xiphoid and (IV) Chin movements and one expiratory category (grunting) [12, 13]. (Refer Table 1)

DATA ANALYSIS

Data collected was entered into worksheet using MS Excel and analysis was done using SPSS trial version software. Qualitative variable was expressed as proportion& quantitative variables as mean and standard deviation. Proportion of babies with gastric Aspirate Shake test and with respiratory distress was calculated. Both were expressed as percentage value. The Sensitivity, Specificity, Positive Predictive value (PPV), Negative Predictive Value (NPV) and Accuracy are assessed by 2 by 2 Table.

RESULTS

Using gastric aspirate samples of 67 babies in whom nasogastric tube insertion was indicated, Gastric aspirate shake test was performed and compared with Silverman Anderson retraction score. The distribution of gender showed that, there were 36(53.7%) males and 31(46.3%) females. The mean GA of the study population is 35.58(±1.86wks.).About 55 (82.1%) newborns were moderate PT(32-37 wks.); 1(1.5%) was early PT (<32 wks.) and remaining 11(16.4%)babies were Term Babies (> 37 wks.) (Refer Table 2).

Out of the total 67 babies observed only 12 had respiratory distress using SA Retraction score of 4-6 and 55 had no significant respiratory Distress.

Gastric aspirate shake test was positive in 59 babies (88.1%), Negative in 8 babies (11.9%) (Refer table 3).

DISCUSSION

There was a significant association between GAST and Respiratory Distress (p=0.011) (Refer table 5)and in relation to Gestational age it was not significant (p=0.1)(Refer table 4).The Sensitivity, Specificity, Positive Predictive value (PPV), Negative Predictive Value (NPV) and Accuracy in Relation to Respiratory Distress Score was found as 66.67%, 7.27%, 13.56%, 50% and 17.91%. (Refer Table 6). In the reviewed studies, the sensitivity, specificity, negative predictive value, and positive predictive value of the gastric aspirate shake test were reported to be 100%, 40.7%, 100% and 48.6%, respectively. In a study in India by Chaudhari *et al*. a negative gastric aspirate shake test(surfactant deficiency) in neonates with respiratory distress showed a sensitivity of 100%, a specificity of 70%, and a positive predictive value of 100% for the diagnosis of HMD[14].

Table 1: Showing Silverman-Anderson Retraction Score

Feature	0	1	2
Chest movements	Equal	Respiratory lag	Seesaw respirations
Intercostal recessions	None	Minimal	Marked
Xiphoid retractions	None	Minimal	Marked
Nasal flaring	None	Minimal	Marked
Expiratory grunt	None	Audible with Stethoscope	Audible to naked ear

0: No respiratory Distress. 4-6: Moderate respiratory distress. 7-10: Severe respiratory distress.

Table 2: Showing Mean Gestational Age, Sex, Classification of Gestational Age & Respiratory *D.istress*

Parameters	Data	
Mean GA (wks.)	35.58(± 1.86)	
M:F	36/31=1.16	
Respiratory Distress SA score	12	
Classification of Gestational Age		
Early PT (<32 wks.)		**Frequency (%)**
	1	1.5
Moderate PT (32-37 wks.)	55	82.1
Term (>37 wks.)	11	16.4

Table 3: Showing Gastric aspirate Shake test with classification of Gestational Age

Gast	<32 wks	32-37 wks	>37 wks.	Total (%)
Positive	1	47	11	59(88.1)
Negative	0	8	0	8(11.9)

Table 4: Showing Relationship of Gastric aspirate shake test and newborn gestational age

Gestational Age	Gastric Aspirate Shake Test		Chi Square Test
	Positive (n)	Negative (n)	
PT(<37 wks)	48	8	Test Value 1.785

Term(>37wks)	11	0	P=0.181
Total	59	8	

Table 5 showingRelationship of Gastric aspirate shake test and Respiratory Distress

Clinical Respiratory Distress	Gastric Aspirate Shake Test		Chi Square Test
	Positive (n)	Negative (n)	
Present	8	4	Test Value 6.363 P=0.011
Absent	51	4	
Total	59	8	

Table 6: Showing Diagnostic Measures of Gastric aspirate shake test and Respiratory Distress

Gastric Aspirate Shake Test	Clinical Respiratory Distress		Total	Diagnostic Measures		
	Positive	Negative			Values	95% CI
Positive	8(66.7%)	51(92.7%)	59(88.1%)	Sensitivity	66.7%	34.89%-90.0%
Negative	4(33.3%)	4(7.3%)	8(11.9%)	Specificity	7.27%	2.02%-17.59%
Total	12(100%)	55(100%)	67(100%)	PPV	13.56%	6.04%-24.98%
				NPV	50.00%	15.70%-84.30%
				Accuracy	17.91%	9.61%-29.20%

CONCLUSION

Although the Gastric Aspirate Shake Test is rapid, simple and inexpensive it may not be a ideal primary test in early diagnosis of respiratory distress and to provide necessary special attention in suspected cases of the same.

LIMITATIONS

1. Gastric Aspirate Shake test is a subjective tool. So it is prone to Subjective Errors.
2. This study included all the babiesirrespective of Gestational age and Prematurity number were low.

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