Value of Endotracheal Tube Culture in Ventilated Septic Neonates

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Abstract: Objectives: to study endotracheal tube aspirate culture results and its relation to other clinical and laboratory finding **Background:** Sepsis is a common complication in the NICU, Mechanical ventilation plays an important role because artificial airways bypass the body's defense against inhaled pathogens and offer new routes for non airborne pathogens.. Researchers reported 50% of sepsis occurrence among infants who had respiratory tract colonization. They also found that none of the neonates who had not colonization, had sepsis. ETA culture is less invasive and results appear earlier than blood culture **Materials & Methods:** the study was done on 80 newborns divided into 2 groups: (40 newborn with evidence of neonatal sepsis and 40 newborn with no evidence of sepsis) and fulfilling the selection criteria of ventilation for more than 7 days. All patients in the study were subjected to adequate assessment of history, full clinical examination, complete blood count C - reactive protein, blood culture, endotracheal tube aspirate cultures and arterial blood gases monitoring. Our selected cases were subjected to clinical evaluation and to the Hematological Scoring System of Sepsis. **Results:** We found that Endotracheal aspirate culture is not considered a gold standard as sensitivity and specificity in detecting organisms in ventilated septic newborns are low **Conclusion** Blood culture is still the gold standard for detection of organisms in ventilated septic neonates Endotracheal tube aspirate cultures has a lower sensitivity & specificity.
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Key words: Endo tracheal tube aspirate culture, blood culture, Mechanical ventilation, Neonatal sepsis

1. Introduction:

Sepsis is recognized as one of the most severe pathologies in newborns and young infants (1), responsible for almost one and half million deaths each year, worldwide (2).

Up to 10% of infants have infections in the first month of life, the matter which results in 30-50% of total neonatal deaths in developing Countries (2). And it is considered the single most important cause of death (3) accounting for up to 50% of neonatal mortality (4). Hospital acquired infections (nosocomial infections) are the most common complications encountered in the neonatal intensive care unit. Ventilator associated infections is the most common type of this Hospital acquired infections. They generally manifested 48 hours after hospitalization especially preterm and low birth weight newborns are more vulnerable (20 to 33%) to nosocomial infections ***(5).***

Mechanical ventilator increases the risk of oro-pharyngeal and tracheobronchial colonization with pathogenic bacteria. Ventilator associated pneumonia (VAP) occurs when bacterial, fungal, or viral pathogens enter the normally sterile lower respiratory tract and lung parenchyma **(6).**

Ventilator-associated pneumonia is divided into early onset VAP which occurs within 5 days of mechanical ventilation and late onset VAP which develops five or more days of mechanical ventilation. The importance of segregating VAP into early and late is that, the pathogenesis, microorganisms responsible and outcome in these two groups are different and so the therapeutic implications also differ **(7).**

Early onset VAP generally has a better prognosis and more likely to be due to aspiration of antibiotic sensitive bacteria colonizing the oropharynx, late onset caused by unusual or multidrug resistant pathogen (MDR) with greater mortality and morbidity **(8).**

There are few reports about the value of serial endotracheal tube aspirate culture in predicting sepsis in ventilated newborns. Researchers reported 50% of sepsis occurrence among infants who had respiratory tract colonization. They also found that none of the neonates who had not colonization, had sepsis. ETA culture is less invasive and results appear earlier than blood culture ***(5).***

2. Materials and Methods

After approval of the Local Institutional Ethical Committee of Menoufia University Hospital, and obtaining written consents from all patients to participate in our study, this study was carried out in

menoufia University-Neonatal Intensive Care Unit over a 12 months period, from Jan 2016 to Jan 2017.

The neonates were divided into two groups: Group 1 (sepsis group), It included 40 neonates diagnosed with neonatal sepsis on the basis of clinical and laboratory data. Group 2 (no sepsis group), It included 40 newborn with no evidence of sepsis clinical and lab) This study was carried out on full-term neonates and preterm neonates.

Inclusion criteria

All mechanically ventilated preterm and full term new born infant with clinical evidence of sepsis e.g.: poor activity, poor capillary filling, convulsion…… etc, confirmed by laboratory evidence of sepsis.

Exclusion criteria

Full term or preterm neonate on nasal CPAP.

Full term or preterm neonate suffering from congenital anomalies e.g. congenital heart disease, CNS anomalies. ect.

All patients were subjected to the following:

Clinical history including type of labor, diagnosis at admission and drug therapy.

Physical examination with recording vital signs, gestational age determination using modified Ballard score and clinical evidence of sepsis and pneumonia (e.g. lethargy, temperature instability, decreased peripheral perfusion and auscultatory chest findings).

Routine laboratory investigations including complete blood count (CBC) with differential leukocyte count, C-reactive protein (positive test above 6mg/l) kidney and liver functions, blood culture and arterial blood gases monitoring.

Chest X-ray was done as base line then 48 hours after mechanical ventilation to look for new persistent or progressive lung infiltrates. Otherwise routinely once weekly if no pneumonia was detected.

Sepsis was evaluated both clinically by clinical signs of sepsis e.g. poor reflexes, mottling, hypothermia etc…… combined with Hematological Scoring System of sepsis.

Sample collection

An end hole suction catheter size 8F is used for ETT of size 3.5mm, whereas 6F is used for tubes 3mm or smaller. 0.5-1 ml sterile water is directly injected into the endotracheal tube via a sterile disposable syringe. The suction catheter is then advanced immediately into ETT until 1cm beyond the tube tip and the sterile water from the lower airways is suctioned back.

Sample examination

The obtained samples was examined microscopically for micro-organisms and then centrifuged and the pellet was inoculated into blood, chocolate and MacConkey agars.

Statistical analysis

All data were collected, tabulated and statistically analyzed using SPSS 19.0 for windows (SPSS Inc., Chicago, IL, USA) & MedCalc 13 for windows (MedCalc Software bvba, Ostend, Belgium).

3. Results

According to Rodwell hematological classification of sepsis, 40 cases (50%) showed a score of < 2, denoting absent sepsis and 40 cases (50%) showed a score of (5 - 7) denoting that sepsis is eminent **Figure (1**).

This study showed that there was no significant difference between sepsis group and no sepsis group as regard to sex, mode of delivery, and gestational age. Birth weight and Apgar scores at 1 and 5 min.) but there was a highly significance regarding duration of admission in sepsis group than in no sepsis group (p. value 0.001**Figure (2)** table (1).

The commonest admission diagnoses among studied neonates was respiratory distress syndrome (43 cases, 53.75%) followed by recurrent apnea (14 cases, 17.5%), Meconium aspiration syndrome (9 cases, 11.25%), Hypoxic ischemic encephalopathy (9 cases, 11.25%), and seizures (5 cases 6.25%).

Asregard Number and percentage of cases in sepsis group regarding clinical manifestation on neonatal sepsis72% of the sepsis group had feeding intolerance,, 80% developed lethargy, 62.5% had poor perfusion, 80% had temperature instability, 65% had abdominal distention, 37% developed seizure, 87.5% developed poor reflexes as poor moro reflex which was the most common clinical manifestation No cases showed hypotension, Systolic Blood Pressure (SBP) ranged between 50 & 91 with a mean of 69.27 and SD ±10.76. Diastolic Blood Pressure (DBP) ranged between 30 & 53 with a mean of 38.70 and SD ± 7.42.

As regared Risk factors for neonatal sepsis in sepsis grouppremature rupture was the highest risk factors for sepsis in the case group (55%), followed by umblical catheterization (25%), premature rupture of the membrane (25%), chorioamnionitis (10%), intrauterine growth retardation (10%), and abruptioplacenta (5%).

Regarding laboratory investigations There were a highly significant increase in TLC (p- value 0.03), ANC (p- value 0.05), I\T ratio (p- value 0.00), and CRP (p-value 0.001), in sepsis group compared to no sepsis group and highly significant decrease in platelet in sepsis group compared to no sepsis group (p- value 0.00) also there was a significant difference between the 2 groups regarding PH (P-value 0.038), PCO2 (p-value 0.026), and oxygen saturation (p-value 0.01). On the other hand there was no significant difference in HB (p- value 0.66), urea (p- value 0.44) createnine (p- value 0.88) ALT (p- value 0.54) AST (p- value 0.59). **Figure (3)** table (2).

There was highly statistically significance between positive blood culture results and sepsis as regards the distribution of +ve culture (P value 0.00). ppv100% npv 65.5% accuracy 72% **Figure (4).**

Table (1): demographic data of the studied groups

		Group				Fisher's Exact Test	p.value
		No sepsis		Sepsis			
Gender	**Male**	26	65.0%	24	60.0%	0.213	0.409
	Female	14	35.0%	16	40.0%		
Total		40	100.0%	40	100.0%		
Gestation age Mean±SD Median Range		35.3±2.44 36 30-39		34.4±2.9 34 29.32		1.52	0.133
Weight Mean±SD Median Range		2.27±0.61 2.2 1.19-3.47		2.29±0.79 2.1 1-3.8		0.136	0.89
Duration on mechanical ventilation Mean±SD Median Range		18±6.5 15 10-35		24.9±7.6 21 13-42		4.36	0.001
Type of delivery						**Fisher's Exact Test**	**p.value**
CS		21	52.5	17	42.5		
NVD		19	47.5	23	57.5	0.802	0.251
Total		40	100%	40	100%		

Table (2): Laboratory data of the studied cases

	Groups		T.test	p.value
	No sepsis	Sepsis		
HB (gm\dl) Mean ±SD	14.04±1.89	13.8±2.6	0.44	0.66
TLC (10^3\cmm) Mean ±SD	13.39±6.50	17.45±9.82	1.03	0.048
I\T ratio Mean ±SD	0.099±0.04	0.402±0.15	12.46	0.00
ANC (10^3\cmm) Mean ±SD	7.5±4.39	11.78±10.9	1.97	0.05
PLT (cell\cmm) Mean±SD	341.1±127.5	177.6±151.2	5.2	0.00
PH Mean±SD	7.41 ± 0.14	7.36 ± 0.18	0.72	0.38
PCO2 Mean±SD	34.05 ±13.05	38.41 ±14.65	1.23	0.026
PO2 Mean±SD	79.52 ±44.54	79.32 ±45.51	0.135	0.897
HCO3 Mean±SD	22.01 ± 7.66	21.28 ± 6.34	0.51	0.361
SO2 Mean±SD	82.65 ±15.89	81.51 ±14.88	0.68	0.432
Urea Mean ±SD	20.97±4.7	20.2±4.15	0.78	0.44
Creat Mean ±SD	0.47±0.13	0.48±0.16	0.155	0.88
ALT Mean ±SD	20.03±4.2	20.6±4.5	0.62	0.54
AST Mean ±SD	21.6±6.25	22.38±6.77	0.53	0.59
CRP (mg\dl) Mean ±SD	3.45±6.8	19.4±21.05	4.6	0.001

Table (3): Comparison between sepsis and no sepsis group regarding results of blood culture.

Blood culture	Group				Total		X2	p.value
	No sepsis		Spssis					
	No	%	No	%	No	%		
-ve	40	100	27	67.5	67	83.8	15.52	0.000
+ve	0	0	13	32.5	13	16.3		

Table (4): Comparison between sepsis and no sepsis group regarding to results of early endotracheal tube culture.

		Group				Total		X^2	p.value
		No sepsis		Sepsis					
		No	%	No	%	No	%		
Early Ett aspirate culture	**-ve**	34	85	26	65	60	75	4.26	0.35
	+ve	6	15	14	35	20	25		
Total		40	100%	40	100%	80	100%		

Table (5): Comparison between sepsis and no sepsis group regarding to results of late endotracheal tube aspirate culture.

		Group				Total		X^2	p.value
		No sepsis		Sepsis					
		No	%	No	%	No	%		
Late Ett aspirate culture	**-ve**	32	80	29	72.5	61	76.3	0.621	0.300
	+ve	8	20	11	27.5	19	23.8		
Total		40	100%	40	100%	80	100%		

Table (6): Correlation between Early Ett aspirate culture and Blood culture.

		Blood culture				Total		X^2	p.value
		-ve		+ve					
		No	%	No	%	No	%		
Early Ett aspirate culture	**-ve**	19	70.3	7	53.9	26	65.0	5.6	0.02
	+ve	8	29.1	6	46.1	14	35		

Table (7): Correlation between late Ett aspirate culture and Blood culture.

		Blood culture				Total		X^2	p.value
		-ve		+ve					
		No	%	No	%	No	%		
Late ett aspirate culture	-ve	19	70.4	10	76.9	29	72.5	0.189	0.486
	+ve	8	29.6	3	23.1	11	27.5		

Among studied cases in sepsis group 13 cases showed +ve blood cultures while 27 cases showed –ve blood cultures but in no sepsis group all blood cultures were –ve. Among the culture +ve cases, Klebsiella was the most commonly detected organism 7 cases (53.8 %) followed by staphaureus acintobacter candida were detected in (15.4 %) of cases. Table (3).

There was no statistically significant difference between positive early endotracheal tube culture| & sepsis as regards the distribution of +ve culture (P value 0.35) with sensitivity 35 % and specificity 85% positive predictive value 70% and negative predictive value 56.66% accuracy 61.5% **Figure (5).**

Among studied cases in sepsis group 14 cases (35%) showed +ve early endotracheal tube culture (performed on day 3), while 26 cases (65%) showed –ve early ETT culture. Among the culture +ve cases, Klebsiella was the most commonly detected organism (64. 3%), followed by Acinetobacter (14.3%), whilest Staph coagulase, Pseudomonas and mixed klebseilla and pseudomonas were detected in 7.1% of cases each. Table (4).

Among studied cases in no sepsis group 6 cases (15 %) showed +ve early endotracheal tube culture, while 34 cases (85%) showed –ve early ETT culture. Among the culture +ve cases, Klebsiella was the most commonly detected organism (66.7 %), followed by Staph coagulase 2 cases (33.3%).

There was no statistically significant difference between positive late endotracheal tube culture & Sepsis as regards the distribution of +ve culture (P value.30). With sensitivity 27.5% and specificity 80% and positive predictive value 57.89 and negative predictive value 52.45% accuracy 61.25% **Figure (6)** table (5).

Among the studied cases, in sepsis group 11 cases (27.5%) showed +ve late endotracheal tube culture (performed on day 7), while 29 cases (72.5%) showed –ve late ETT culture., Klebsiella was the most commonly detected organism (54. 3 %), followed by Acinetobacter (18.2%), E.coli (18.2%) while Staph aureus only one case (9.1%).

Among the studied cases, in no sepsis group 8 cases (20%) showed +ve late endotracheal tube culture while 32 cases (80%) showed –ve late ETT culture. klebseilla was detected in 5 cases (62.5%) followed by staph coagulase (25%) and E.coli (12.5%).

There was no statistically significant difference between positive late endotracheal tube culture & Sepsis as regards the distribution of +ve culture (P value.30). with sensitivity 27.5% and specificity 80% and positive predictive value 57.89 and negative predictive value 52.45% accuracy 61.25%.

Six cases having a positive blood culture, were also +ve for early endotracheal culture, they had different organisms, Klebsiella, Candida, Staph aureus and acinobacter were detected in blood culture, on the other hand, as Klebsiella, acinobacter, Pseudomonas were detected by early endotracheal culture, which was statistically significant (p.value 0.02). They only

agreed together in 2 cases with klebsiella being the organism in common. Table (6).

There was a non significant correlation between blood culture and late endotracheal culture as regards the distribution of +ve cultures (P value 0.486). three cases having a positive blood culture, were also +ve for late endotracheal culture, they had different organisms. Klebsiella was detected in blood culture, on the other hand acintobacter and E.COLI were detected by late endotracheal culture table (7).

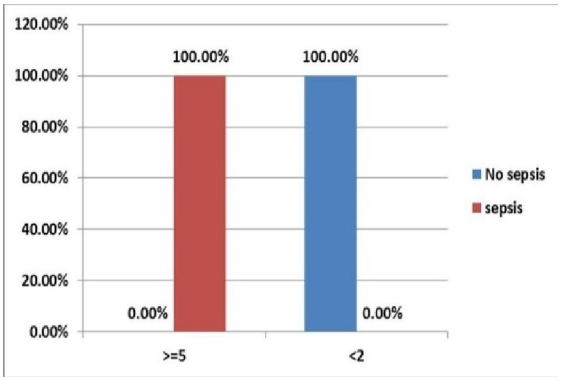

Figure (1): haematological scoring system hss of the studied cases

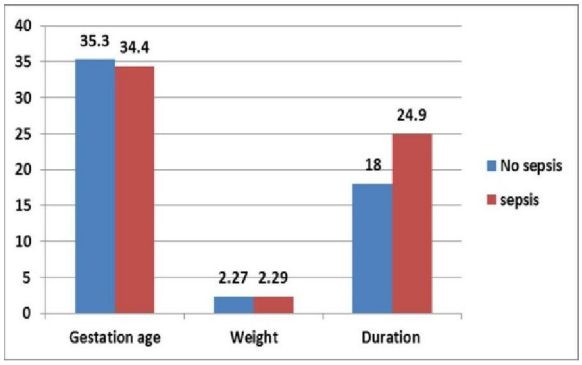

Figure (2): comparison between 2 groups regarding sex weight gestational age duration on mechanical ventilation mode of delivery and APGAR score

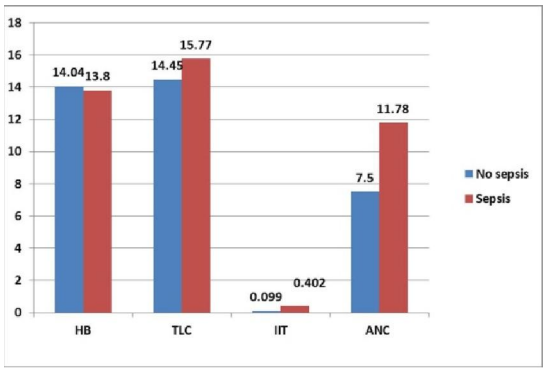

Figure (3): laboratory data of the studied cases

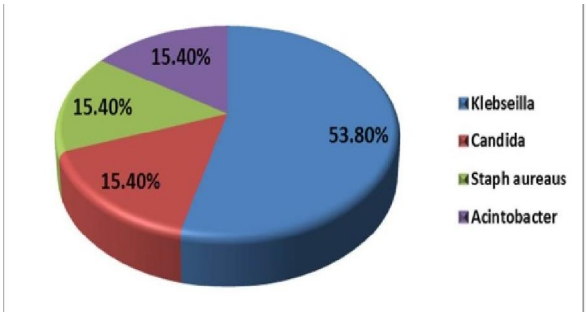

Figure (4): organisms detected by blood culture

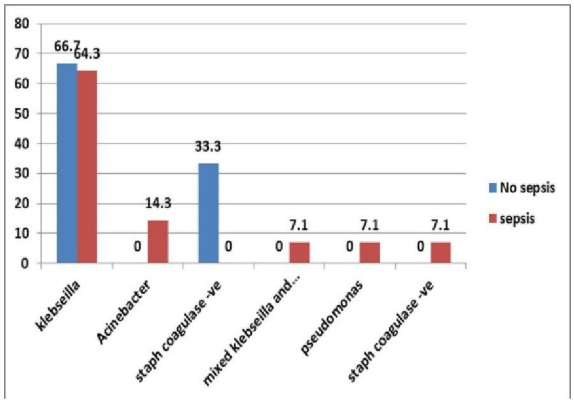

Figure (5): organisms detected by early endotracheal tube aspirate culture

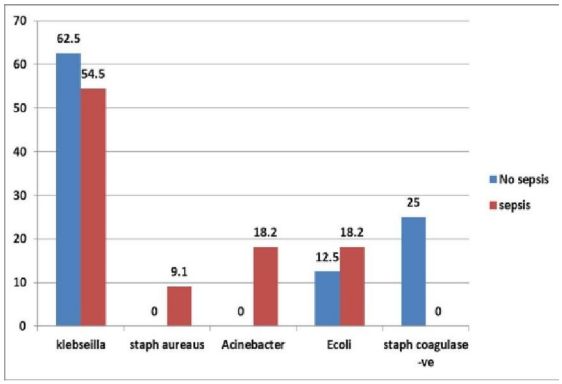

Figure (6): organisms detected by late endotracheal tube aspirate culture

4. Discussion

It is estimated that four million neonatal deaths occur worldwide every year, and approximately one third of these are caused by infections. Sepsis and bacterial meningitis continue to be one of the main causes of neonatal mortality, especially among very low birth weight newborn infants **(9).**

Early diagnosis and treatment of the newborn infant with suspected sepsis are essential to prevent severe and life-threatening complications. **(10).**

Mechanically ventilated babies face a particular risk because artificial airways by pass the body's defense against inhaled pathogens and offer new routes for non air borne pathogens. Intubation associated lesions of the pharynx and trachea lead to bacterial colonization by the deterioration of the swallowing reflex and the ciliary functions. Subsequently, these babies may develop pneumonia and sepsis **(5).**

In our study, we found that there was no statistical difference between sex of patients and incidence of sepsis. This agrees with **(11)** who found that the rates of infection were similar in males and females, However, this is in discordance with **(12)** who found that the incidence of bacterial sepsis and meningitis, especially for gram negative enterobacilli is higher in males than in females, male: female ratio is 2:1. The cause is unknown according to **(13).**

In our study, there were no statistically significant differences between body weight (BW) & incidence of sepsis. Birth weight of cases ranged between 1190 gm and 3800 gm. This is in discordance with **(14)** who found that the incidence of sepsis is significantly higher in infants with very low birth weight (<1000g), at 26 per 1000 live birth, than in infants with birth weight of 1000-2000g, at 8-9 per 1000 live births.

In our study, there were no statistically significant differences between Gestational ages (GA) & incidence of sepsis. Our study agrees with **(15)** who reported no statistically significant difference between sepsis and non septic groups as regards gestational age.

This is in discordance with **(14)** who found that the incidence and severity of sepsis is inversely related to the gestational age of the infant. Also our study disagree with **(16)** who found that the premature neonates in particular have a relatively permeable mucosal surfaces that allow for the trans-epithelial passage of bacteria and other pathogens. Also loss of protective maternal antibodies, as well as nonspecific alterations in macrophage phagocytes and clearance of invading pathogens, impaired T-cell and B cell responses and altered production of complement and antibodies. Additionally, premature infants are at higher risk of progression to sepsis or severe sepsis and adverse outcomes **(17).**

In our study, there was no statistically significant differences between the median apgar score & incidence of sepsis.. this agree with **(18),** while **(19),** diagrees with our study, and stated that, a 5 minute Apgar score less than 7 carries a significantly higher risk of sepsis than infants with higher scores and that Apgar score less than 5 at one minute may be due to sepsis, especially with the presence of risk factors of infection. Furthermore, low Apgar score usually necessitate more prolonged and aggressive resuscitation which is a known risk factor for sepsis **(20).**

As regards mode of delivery, it was found that the mode of delivery was not significantly associated with increased frequency of sepsis, 42 cases (52.5%) were born normally and 38 cases (47.5%) were born by C S. This agrees with **(21)** and **(22)** who found that mode of delivery not related to increased incidence of sepsis. On the contrary, this disagrees with **(23)** who observed that, babies born by vaginal delivery were more likely to have early onset sepsis than those delivered by caesarean section. This may be related to good sterilization and intrapartum chemoprophylaxis which dramatically decreased the risk of sepsis in neonates delivered by caesarean section.

Respiratory distress syndrome, a condition almost exclusively seen in the premature infant, was the single most common reason for ventilation in the NICU, accounted for 63% of admissions **(5).**

In our study the commonest admission diagnoses was respiratory distress syndrome (43 cases, 53.75%) These results simulate those of **(24),** who perceived respiratory distress syndrome as the commonest diagnosis in the NICU.

Prolonged endotracheal intubation and mechanical ventilation change the bacterial colonization of the respiratory tract, lead to pneumonia and even sepsis **(5)**.

Regarding risk factors for neonatal sepsis, we found that prematurity was the highest risk factors among the case group shows (52.5%), This agrees with the study of **(25).**

In the present study, clinical evaluation of neonates with sepsis revealed that shows that 72% of the sepsis group had feeding intolerance,, 80% developed lethargy, 62.5% had poor perfusion, 80% had temperature instability, 65% had abdominal distention, 37% developed seizure, 87.5% developed poor reflexes as poor moro reflex which was the most common clinical manifestation This agrees with (22) who described them as the major clinical presentations of sepsis.

In this study, Regarding laboratory investigations There were a highly significant increase in TLC (p-value 0.03), ANC (p- value 0.05), I\T ratio (p- value 0.00), and CRP (p-value 0.001), in sepsis group compared to no sepsis group and highly significant decrease in platelet in sepsis group compared to no sepsis group (p- value 0.00) These results correlated with those results of **(26).**

As regards the CRP, it was found +ve in 25 cases (62.5%) and –ve in 15 cases (37.5%) in sepsis group with Mean ±SD (19.4±21.05).

And range (0-96) on the other hand in no sepsis group Mean ±SD (3.45±6.8) and range (0-24) with (p.value 0.001) which is statistically significantly different.

These results agree with. This comes in agreement with the results of the study of **(27).**

who found that CRP results rise in 50 to 90% of newborns by the time of onset of sepsis, while **(28)** found CRP levels are normal at the onset and 8 hours after infection by invasive bacteria but becomes apparent within one day, levels peak at 2 to 3 days and remain elevated until infection marker for the onset of infection.

In our study, we found a significant correlation between the duration of stay of neonates at NICU, prolonged stay on mechanical ventilation & incidence of sepsis. This is in concordance with **(29)** who found that ventilator-associated pneumonia in critically ill patients is associated with longer ICU stays, and prolonged mechanical ventilation.

Also, this is in concordance with **(30)** who concluded that intubation is associated with bacterial colonization of the respiratory tract and, therefore, may increase the risk of acquiring an infection. The infection may prolong the need for mechanical ventilation and increase the risk of chronic lung disease. The use of prophylactic antibiotics has been advocated for all mechanically ventilated newborns in order to reduce the risk of colonization and the acquisition of infection. Prolonged endotracheal intubation and mechanical ventilation change the bacterial colonization of the respiratory tract, lead to pneumonia and even sepsis **(5).**

Blood culture is the gold standard method for isolation of the organisms, blood culture should be obtained before the initiation of antibiotics **(31).**

In this study, blood culture yielded +ve results in 13 cases showed +ve blood cultures in sepsis group while 27 cases showed –ve blood cultures but in no sepsis group all blood cultures were –ve Similar results have been found in the study of (32) who found that culture proven sepsis occurred in 30% of cases with sepsis.

Klebsiella was the most commonly detected organism (53.8%), This comes in agreement with the study of (33) in which the most common organism in positive blood cultures was Klebsiella pneumoniae.

Our results are in disaggrement with a retrospective study done by **(34)** who study the prevalence of different organisms causing septicemia and the antibiotic susceptibility pattern. The most common organism isolated was Staphylococcus aureus (42.75%) followed by Klebsiella (18.32%).

In our study, in sepsis group 14 cases (35%) showed +ve early endotracheal tube culture (performed on day 3), while 26 cases (65%) showed –ve early ETT culture while in no sepsis group 6 cases (15%).

showed +ve early endotracheal tube culture and 34 cases (85%) –ve early ETT culture Among the culture +ve cases, again Klebsiella was the most commonly detected organism (65%). with sensitivity 35 % and specificity 85% positive predictive value 70% and negative predictive value 56.66% accuracy 61.5%.

Among the studied cases, in sepsis group 11 cases (27.5%) showed +ve late endotracheal tube culture (performed on day 7), while 29 cases (72.5%) showed –ve late ETT culture, while, in no sepsis group 8 cases (20%) showed +ve late endotracheal tube culture while 32 cases (80%) showed –ve late ETT culture, Klebsiella was the most commonly detected organism (57.9%). with sensitivity 27.5% and specificity 80% and positive predictive value 57.89 and negative predictive value 52.45% accuracy 61.25%.

This was in agreement with **(5)** who reported that the most common pathogens in the endotracheal aspirate culture were the gram-negative bacilli (76.7%) and among them Klebsiella (54.6%) was dominantly isolated Also, **(35)** found that; most common bacterial isolate from ETA of VAP patient was Klebsiella spp. (32.87%).

There was a significant correlation between blood culture and early endotracheal culture as regards the distribution of +ve cultures (p.value 0.02).

There was a non significant correlation between blood culture and late endotracheal culture as regards the distribution of +ve cultures (P value 0.486). Therefore:-Early ET culture showed higher diagnostic indices than late ETT culture in detecting +ve infection (as diagnosed +ve by blood culture).

This is in concordance with **(5)** who found that Blood and endotracheal cultures showed the same organisms only in 17.6% of the patients. There was no relationship among 86.4% of the patients. The rate of culture positivity increased as the birth weight decreased, gestation week got smaller and the duration of intubation prolonged. Similarly, **(35)** reported that the blood steam infection was significantly associated with VAP (P= 0.0001).

Also, our study is in aggrement with **(5)** who found that the practice of routine cultures of endotracheal aspirate and cultures obtained from multiple body sites is an expensive proposition with low yield. The sensitivity of this test is at best 50% and all studies report a very low positive predictive value. The specificity of this test is 80%, hence its role

is mainly limited to identifying infants who are at low risk for sepsis.

This is in discordance with **(34)** who found that the endotracheal aspirate of the patients on ventilator should be sent routinely for culture sensitivity and if the patient develops VAP, antibiotic should be changed as per report.

Conclusion

Early endotracheal tube aspirate cultures were more sensitive and specific more than late endotracheal tube aspirate cultures.

Blood culture is still the gold standard for detection of organisms in ventilated septic neonates; Endotracheal tube culture has a lower sensitivity & specificity.

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