SERUM MANNOSE BINDING LECTEN IN NEONTAL SEPSIS

By

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ABSTRACT

***Background**: Mannose-binding lectin (MBL) is a component of innate immunity and particularly important in neonates in whom adaptive immunity is not yet completely developed. MBL deficiency and MBL is associated with an opsonization defect and have been associated with recurrent infections.*

***Objectives**: The aim of our study was to determine whether serum MBL levels could serve as markers for predicting neonatal sepsis in neonatal intensive care (NICU).*

***Patients and Methods:** This case- control study was conducted on 75 neonates classified into 3 groups: The first group (septic) included 30 neonates who had clinical and laboratory signs of neonatal sepsis.. The second group (suspected) included 30 neonates who had clinical not laboratory signs of neonatal sepsis. The third group (control) included 15 healthy neonates who had no clinical nor laboratory signs of neonatal sepsis ELISA technique was used for measuring MBL serum concentration.*

***Results:** Serum MBL levels were significantly lower in the neonates with sepsis or suspected than in the control group. MBL had high sensitivity and specificity values to detect sepsis.*

***Conclusion:** MBL serum level could be considered a sensitive and specific marker for prediction of neonatal sepsis. Neonates with significant decrease in MBL are at increased risk for developing sepsis and septic shock.*

***Key words:** mannose-binding lectin, newborn infants, sepsis.*

INTRODUCTION

Neonatal sepsis is a leading cause of neonatal morbidity and mortality, particularly in the developing countries. Delays in the identification and treatment of neonatal sepsis are among the main contributors to the high mortality **(Gebremedhin et al., 2016)**.

Neonatal sepsis is defined as a clinical syndrome of bacteremia with systemic signs and symptoms of infection in the first 4 weeks of life. When pathogenic bacteria gain access into the blood stream, they may cause overwhelming infection without much localization (septicemia) or may be predominantly localized to the lung (pneumonia) or the meninges (meningitis) **(Mohamed NG et al., 2016)**.

According to the international pediatric sepsis consensus conference of neonatal sepsis, it is defined as systemic inflammatory response syndrome in the presence of or as a result of suspected or proven infection in a neonate. Infection could be of bacterial, viral, or fungal origin. Neonatal sepsis encompasses various systemic infections of the newborn, such as septicemia, meningitis, pneumonia, arthritis, osteomyelitis etc. **(Stefanovic, 2011)**.

Neonatal sepsis remains a major and commonest cause of death in the newborns around the world. As per the WHO reports, around 1 million deaths occurring globally per year are due to neonatal sepsis and that 42% of these deaths are in the 1st week of life. Thus, neonatal sepsis is a relevant public health issue **(Gajul et al., 2015)**.

Depending on the onset age of the disease, neonatal sepsis is divided into early neonatal sepsis or late onset sepsis. Early neonatal sepsis (EOS) is mainly due to organisms acquired before and during delivery (or maternal fetal infection), whereas late onset sepsis (LOS) is due to organisms acquired after delivery from the environment (nosocomial or community sources) **(Gebremedhin et al., 2016)**.

The diagnosis of neonatal sepsis is challenging because the clinical signs including changes in body temperature and tachycardia are nonspecific, and there is no single ideal reliable marker available for the diagnosis **(Krishnaveni et al., 2016)**.

Mannose Binding Lectin (MBL) is a key molecule in innate immunity, this acute phase protein, synthesized in the liver, binds to various microorganisms and damaged cells and destroys

them by opsonization of aggressive agents and activation of the complement by relevant serine associated proteases **(Asgharzadeh et al., 2015)**.

Consecutively, MBL could play a critical role in the first line defence during the neonatal period, when the maternal-derived antibodies disappear and the child's own immune system is immature **(Auriti et al., 2017)**.

Circulating MBL concentrations and functional activity are correlated with common genetic variants in the MBL2 gene. Three single nucleotide polymorphisms in codons 52, 54 and 57 of exon -1 lead to reduced functional plasma MBL concentrations **(Xue et al., 2017)**.

PATIENT AND METHODS

This prospective study was carried out at neonatal intensive care unit (NICU) of Al-Hussein and Bab Al-Sheeria Hospital Al-Azhar University, 75 neonates were enrolled in the study which was subdivided in to 3 groups,The first group(septic) included 30 neonates who had clinical and laboratory signs of neonatal sepsis.. The second group(suspected) included 30 neonates who had clinical not laboratory signs of neonatal sepsis. The third group(control) included 15 healthy neonates who had no clinical nor laboratory signs of neonatal sepsis all were admitted to NICU between March 2018 and Octobar 2018.

Consent was obtained from the parents of all the subjects of the study, the study were approved by the ethics committee of Faculty of Medicine, Al-Azhar University.

Inclusion criteria:

Any neonate presented with clinical signs of neonatal sepsis in form of:

- Temperature instability, poor suckling and not doing well.
- Respiratory signs: increases oxygen requirement, apnea, cyanosis, intercostal retractions, tachypnea or grunting.
- Circulatory signs: weak pulses, delayed capillary refill, hypotension, tachycardia or shock.
- GIT signs: abnormal distension, diarrhea, bloody stool, feeding intolerance, hepatomegaly or jaundice.
- Neurological signs: irritability, hypotonia or lethargy.
- Hypoglycemia or hyperglycemia.
- Petechiae, bleeding (with thrombocytopenia) or DIC.

Exclusion criteria:

- Major congenital anomalies.
- Chromosomal abnormalities.

- Infants of diabetic mother.
- Hypoxic ischemic encephalopathy.

All neonates included in the study were subjected to:

1. History taking:

- Obstetric history (previous sibling death, previous admission to NICU,etc.).
- Prenatal history (diabetes mellitus, maternal fever >38°C, maternal UTI, etc.).
- Natal history (PROM, maternal fever, prolonged 2nd stage of labor, etc.).
- Postnatal history (low Apgar score, respiratory distress, cyanosis, jaundice, fever, etc.).
- Present history which includes symptoms of sepsis.
- History of antibiotics given (type, doses and duration).

2. Thorough clinical examination:

- Weight, length and head circumference measurement.
- GA assessment: using new Ballard score.
- Vital signs (pulse, temperature, blood pressure and respiratory rate).
- Complete clinical examination to detect clinical signs of sepsis.
- Temperature instability, poor suckling and not doing well.
- Skin signs: Pallor, cyanosis, rashes, petechiae, mottling, sclerema, Jaundice and umbilical stump infection.
- Respiratory signs: increases oxygen requirement, apnea, cyanosis, intercostal retractions, tachypnea or grunting.
- Circulatory signs: weak pulses, delayed capillary refill, hypotension, tachycardia or shock.
- GIT signs: abnormal distension, diarrhea, bloody stool, feeding intolerance, hepatomegaly or jaundice.
- Neurological signs: irritability, hypotonia or lethargy.
- Petechiae, bleeding (with thrombocytopenia) or DIC.

3. Investigations:

- Complete blood count.
- Blood culture.
- Blood urea nitrogen.
- Creatinin.
- Liver function test.
- Arterial blood gases.

- Chest X-ray
- C-reactive protein (CRP).
- Serum mannose binding lectin (MBL) level by ELISA**.**

Measurement of serum mannose binding lectin level:

Sample collection: Four milliliters of venous bloodwere collected on EDTA; 2 ml was left clotted to be separated for CRP. Other 2 ml was used for assuring Mannose binding lectin.The samples were submitted immediately to centrifugation for 15minutes. The plasma was obtained and stored at -20°C, for assessing Mannose binding lectin. Determination of plasma Mannose binding lectin levels by ELISA technique Plasma Mannose binding lectin level was assessed by an ELISA methodology using Mannose binding lectin **(human kit Tomaiuolo et al., 2012)**.

RESULTS

Table (1): Comparison between studied groups as regard demographic data

	Groups	Sepsis group (N = 30)	Suspected group (N = 30)	Control group (N = 15)	ANOVA p-value
GA	Mean	33.00	33.81	34.7	0.1
	±SD	2.89	3.19	1.79	
Post natal age	Mean	9.87	11.35	9.27	0.4
	±SD	5.56	4.92	6.99	
Sex	Male	16 (53.3%)	14 (46.7%)	8 (53.3%)	0.8
	Female	14 (46.7%)	16	7	
Mode of delivery	CS	25 (83.3%)	24 (80%)	12 (80%)	0.9
	NVD	5 (16.7%)	6 (20%)	3 (20%)	
Weight (gm)	Mean	2556.67	2724.84	2976.0	0.3
	±SD	964.34	841.39	264.11	

This table shows no statistical significant difference (p-value > 0.05) between studied groups as regard GA, post natal age, sex, mode of delivery and weight.

Table (2): Comparison between studied groups as regard clinical data

	Groups	Sepsis (N = 30)	Suspected (N = 30)	Control (N = 15)	ANOVA p-value
Temp. inst.	**Positive**	19 (63.3%)	18 (60%)	0 (0%)	**< 0.001***
	Negative	11 (36.7%)	12 (40%)	15 (100%)	
Lethargy	**Positive**	19 (63.3%)	17 (56.7%)	0 (0%)	**< 0.001***
	Negative	11 (36.7%)	13 (43.3%)	15 (100%)	
Prolonged CRT	**Positive**	16 (53.3%)	14 (46.7%)	0 (0%)	**0.002****
	Negative	14 (46.7%)	16 (53.3%)	15 (100%)	
Poor suckling	**Positive**	16 (53.3%)	15 (50%)	0 (0%)	**0.001****
	Negative	14 (46.7%)	15 (50%)	15 (100%)	
Irritability	**Positive**	10 (33.3%)	12 (40%)	0 (0%)	**0.02****
	Negative	20 (66.7%)	18 (60%)	15 (100%)	
Hypotonia	**Positive**	15 (50%)	16 (53.3%)	0 (0%)	**0.001****
	Negative	15 (50%)	14 (46.7%)	15 (100%)	
Apnea	**Positive**	16 (53.3%)	17 (56.7%)	0 (0%)	**0.001****
	Negative	14 (46.7%)	13 (43.3%)	15 (100%)	
Tachypnea	**Positive**	23 (76.7%)	23 (76.7%)	3 (20%)	**< 0.001***
	Negative	7 (23.3%)	7 (23.3%)	12 (80%)	
Retraction	**Positive**	19 (63.3%)	15 (50%)	0 (0%)	**< 0.001***
	Negative	11 (36.7%)	15 (50%)	15 (100%)	
Grunting	**Positive**	15 (50%)	15 (50%)	0 (0%)	**0.002****
	Negative	15 (50%)	15 (50%)	15 (100%)	
Cyanosis	**Positive**	19 (63.3%)	11 (36.7%)	0 (0%)	**0.02****
	Negative	11 (36.7%)	19 (63.3%)	15 (100%)	
Abd. Distention	**Positive**	10 (33.3%)	7 (23.3%)	0 (0%)	**0.04****
	Negative	20 (66.7%)	23 (76.7%)	15 (100%)	
Feeding int.	**Positive**	10 (33.3%)	7 (23.3%)	0 (0%)	**0.04****
	Negative	20 (66.7%)	23 (76.7%)	15 (100%)	

**: p-value < 0.05 is considered significant. *: p-value < 0.001 is highly significant.

This table shows:

- Highly statistical significant difference (p-value < 0.001) between studied groups as regard regards temperature instability, lethargy, tachypnea, retraction.
- Statistically significant difference (p-value < 0.05) between studied groups as regard feeding intolerance, abdominal distention, cyanosis, grunting, apnea, hypotonia, irritability, poor suckling, prolonged CRT.

Table (3): Comparison between studied groups as regard laboratory data

Groups		Sepsis group (N = 30)	Suspected group (N = 30)	Control group (N = 15)	ANOVA p-value
Hb (g/dl)	**Mean**	11.28	14.78	15.00	**< 0.001***
	±SD	2.74	2.11	1.72	
TLC (x103/ul)	**Mean**	20.59	13.27	11.69	**0.001****
	±SD	11.24	6.99	4.64	
PLT (x103/ul)	**Mean**	137.10	291.55	261.60	**< 0.001***
	±SD	75.35	104.90	83.96	
I/T	**Mean**	0.24	0.13	0.13	**< 0.001***
	±SD	0.06	0.01	0.01	
Urea (mg/dl)	**Mean**	68.30	27.61	29.00	**< 0.001***
	±SD	31.83	7.07	7.88	
Creat (mg/dl)	**Mean**	0.87	0.68	0.64	**0.003****
	±SD	0.29	0.20	0.18	
AST (U/L)	**Mean**	73.33	21.71	23.93	**< 0.001***
	±SD	38.89	5.73	6.58	
ALT (U/L)	**Mean**	73.67	26.90	27.33	**< 0.001***
	±SD	41.26	5.80	6.08	
ALB (g/dl)	**Mean**	3.22	4.41	3.47	0.5
	±SD	0.46	6.06	0.57	
TSB (mg/dl)	**Mean**	12.52	11.68	12.08	0.8
	±SD	6.58	2.27	1.78	
DSB (mg/dl)	**Mean**	2.26	0.95	0.99	0.4
	±SD	6.65	0.16	0.19	
CRP (mg/dl)	**Mean**	41.43	4.32	3.80	**< 0.001***
	±SD	38.69	1.50	1.31	

**: p-value < 0.05 is considered significant. *: p-value < 0.001 is highly significant.

This table shows:

- Highly statistical significant difference (p-value < 0.001) between studied groups as regard Hb, PLT, I/T, urea, AST, ALT and CRP.
- Statistically significant difference (p-value < 0.05) between studied groups as regard TLC and creat.

Table (4): Comparison between studied groups as regard MBL

Groups		Sepsis group (N = 30)	Suspected group (N = 30)	Control group (N = 15)	ANOVA p-value
MBL	**Mean**	447.67	376.90	603.06	**< 0.001***
	±SD	153.1	161.6	216.4	

*: p-value < 0.001 is considered highly significant.

This table shows highly statistical significant difference (p-value < 0.001) between studied groups as regard MBL.

Table (5): Correlation study between MBL and other studied parameters (CRP, GA, TLC, I/T, PLT, weight and post natal age) in suspected group

Suspected group / Variables	(r)	p-value
MBL vs GA	0.01	0.9
MBL vs TLC	- 0.03	0.8
MBL vs PLT	0.06	0.8
MBL vs I/T	- 0.2	0.4
MBL vs CRP	0.1	0.5
MBL vs post natal age	- 0.7	0.09
MBL vs WT	0.2	0.1

(r): Pearson correlation coefficient.

This table shows on statistical significant (p-value > 0.05) correlation between MBL and other studied parameters (CRP, GA, TLC, I/T, PLT,WT and post natal age) in suspected group.

Table (6): Correlation study between MBL and other studied parameters (CRP, GA, TLC, I/T, PLT, weight and post natal age) in sepsis group

Sepsis group / Variables	(r)	p-value
MBL vs GA	0.5	**0.01***
MBL vs TLC	- 0.3	0.1
MBL vs PLT	0.3	0.1
MBL vs I/T	- 0.5	**0.002***
MBL vs CRP	- 0.4	**0.04***
MBL vs post natal age	0.05	**0.8**
MBL vs WT	-0.3	**0.2**

(r): Pearson correlation coefficient.

*: p-value < 0.05 is considered significant.

This table shows:

• Statistically significant (p-value < 0.05) Positive correlation (r = 0.5) between MBL and GA in sepsis group.

• Statistically significant (p-value < 0.05) Negative correlation (r = - 0.5) between MBL and I/T in sepsis group.

• Statistically significant (p-value < 0.05) Negative correlation (r = - 0.4) between MBL and CRP in sepsis group.

• No statistical significant (p-value > 0.05) Positive correlation (r = 0.3) between MBL and PLT in sepsis group.

• Statistically significant (p-value < 0.05) Negative correlation (r = - 0.3) between MBL and TLC in sepsis group.

• No statistical significant (p-value > 0.05) Positive correlation (r = 0.05) between MBL and post natal age in sepsis group.

• No statistical significant (p-value > 0.05) Negative correlation (r = - 0.3) between MBL and post natal age in sepsis group.

Table (7): Diagnostic performance of MBL in discrimination of sepsis group and control group

Cut off	Area under the curve	Sensitivity	Specificity	PPV	NPV	p-value
< 601.5	0.7	80 %	66.7 %	70.6 %	76.9 %	0.01

PPV: positive predictive value.

NPV: negative predictive value.

Using roc curve, it was shown that MBL can be used to discriminate between sepsis and controls at a cutoff level of < 601.5, with 80% sensitivity, 66.7% specificity, 70.6% PPV and 76.9% NPV.

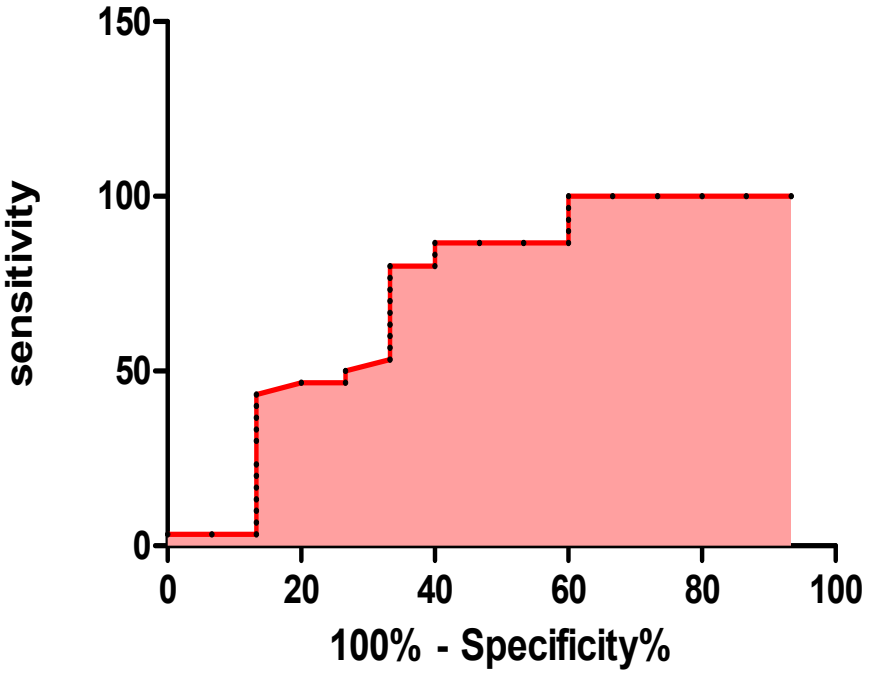

Figure (1): ROC curve between sepsis group and control group as regard MBL

Table (8): Diagnostic performance of MBL in discrimination of suspected group and control group

Cut off	Area under the curve	Sensitivity	Specificity	PPV	NPV	p-value
< 641	0.8	90 %	60 %	69.2 %	85.7 %	0.001

PPV: positive predictive value.

NPV: negative predictive value.

Using roc curve, it was shown that MBL can be used to discriminate between suspected group and controls at a cutoff level of < 641, with 90% sensitivity, 60% specificity, 69.2% PPV and 85.7% NPV.

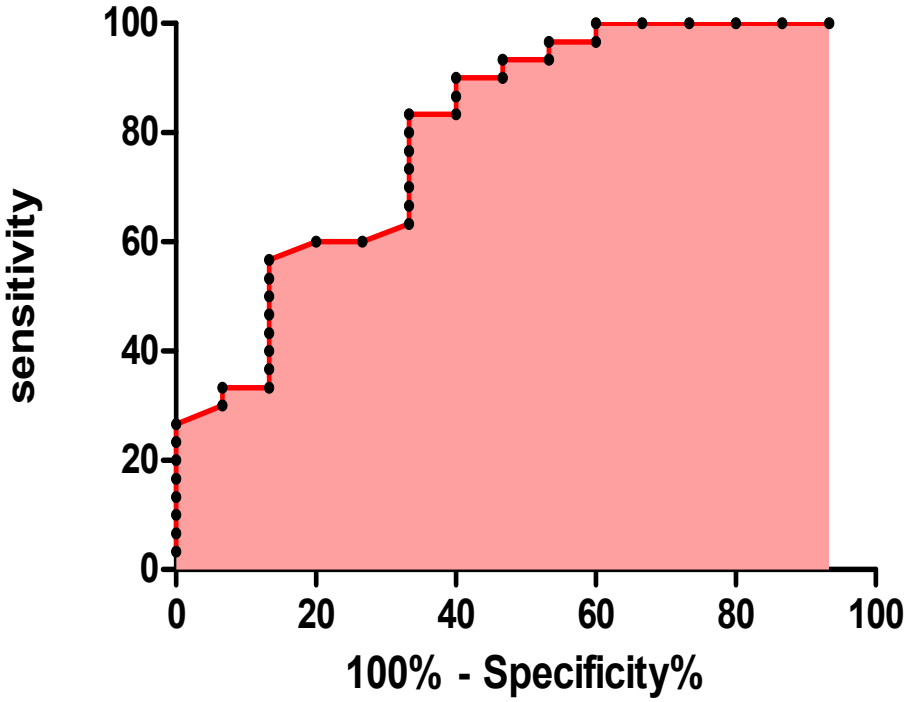

Figure (2): ROC curve between suspected group and control group as regard MBL

DISCUSSION

Neonatal sepsis remains one of the leading causes of morbidity and mortality both among term and preterm infants. Although advances in neonatal care have improved survival and reduced complications in preterm infants, sepsis still contributes significantly to mortality and morbidity among very-low-birth-weight (VLBW, <1500 g) infants in Neonatal Intensive Care Units (NICUs) **(Shah and Padbury, 2014)**.

In the present study, clinical evaluation of neonates with sepsis revealed that feeding intolerance (33.3%), respiratory distress (76.7%), Hypotonia (50%), poor suckling (53.3%), abdominal distension (33.3%), poor perfusion (53.3%), temperature instability (63.3%) and lethargy (63.3%) were the most common clinical presentations.

In the present study, clinical evaluation of suspected neonates revealed that feeding intolerance (23.3%), respiratory distress (76.7%), Hypotonia (53.3%), poor suckling (50%), abdominal distension (23.3%), poor perfusion (46.4%), temperature instability (60%) and lethargy (56.7%) were the most common clinical presentations.

In the study of **(Ilke et al., 2010)** poor feeding (73%) was the most frequent presentation , followed by depressed newborn reflexes (65%), hypotonia (52%), lethargy (44%), tachypnea (42%), jaundice (33%), and fever (31%) respectively.

In the current study, we found that there was no significant statistical difference between septic, suspected and control groups as regard sex. The same results were observed in the study of **(Abdel-Hady and Zaki, 2003) (Betty and Inderpreet, 2005)**, there was no significant statistical difference as regard post natal age, weight in grams this was in agreement with the study of **(Dzwonek AB et al., 2008)**. There was no significant statistical difference as regard mode of delivery this came in agreement with **(Xue et al., 2017)**.

In the current study there is highly significant decrease in hemoglobin (Hb) levels among sepsis group in agreement with the study of **(Dhananjay BS and Sunil KN., 2011)**. Also there is highly significant increase in the total leucocytic count (TLC) among sepsis group this came in agreement with the study of **(Mohamed WA and Saeed MA, 2012)**. Highly significant

reduction in the platelets count (PLT) among sepsis group this came in agreement with the study of **(Mondal SK et al., 2012)** and highly significant increase in I/T ratio among cases group. This came in agreement with the study of (Narasimha and Kumar MLH, 2011).

In the current study, our results revealed that CRP level was significantly higher in sepsis group with Mean +SD (41.43 +38.69 mg/L) compared to suspected group with Mean +SD (4.3 +1.50mg/L) and control group with Mean +SD (3.80 + 1.31 mg/L) MBL level was significantly lower in patients group with Mean +SD (447.67+ 153.1 ng/ml) compared to suspected group with Mean +SD (376.90+ 161.6 ng/ml) control group with Mean +SD (603.06 + 216.4 ng/ml). This came in agreement with the study of **(Frakking et al., 2007)**, **(Benedetti et al., 2007)**, **(Mohamed WA, Saeed MA, 2012)** and **(Ozkan et al., 2012)**.

In the current study, There was no significant correlation between MBL level and post natal age, platlet, there was significant positive correlation between serum MBL and G.A in patients group This came in agreement with the study of **(Hilgendorff A et al., 2005)**, there was no correlation between MBL level and birth weight This came in agreement with the study of **(Xue et al., 2015)** was significant negative correlation between MBL and I.T ratio As **(Rodwell et al., 1993)**.

In the current study results showed that sensitivity of MBL in diagnosis of neonatal sepsis was 80% in septic group but 90% in suspected group and specificity of MBL was 66.7% in septic group compared to 60% in suspected group. This came in agreement with the study of **(Frakking F et al., 2007)**.

CONCLUSION

MBL serum level could be considered a sensitive and specific marker for prediction of neonatal sepsis. Neonates with significant decrease in MBL are at increased risk of developing sepsis.

Recommendations

1. Neonates with low MBL plasma levels appear to be at increased risk of sepsis. Therefore, MBL measurements might be used to identify which neonates are prone for infections and to be an early predictor of neonatal sepsis.
2. Large, well-designed prospective studies should confirm the association between low MBL plasma levels and development of neonatal sepsis

in different gestational ages and consolidate the value of serum mannose binding lectin (MBL) as an early predictor of neonatal sepsis.

3. Further studies are needed to study the relation between MBL and other neonatal diseases.
4. Measurement of serum MBL in other neonatal diseases is needed to estimate the value of serum MBL level as early indicator for diagnosis of these diseases.
5. Considering that the substitution therapy with MBL is now available and safe, we recommend further studies to provide the rationale for a controlled trial to evaluate the efficacy of early administration of MBL in the management of neonatal sepsis associated with low serum MBL levels.

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الملخص العربي

التسمم الدموي في الاطفال حديثي الولاده هو المصدر الرئيسي لحدوث الاعتلال والوفاه للاطفال حديثي الولاده وذلك رغم التقدم الهائل في مجال طب الاطفال حديثي الولاده في السنوات الاخير.

وفقا لمنظمة الصحة العالمية (WHO)، ما يقرب من 5 ملايين حالة وفاة في الأطفال حديثي الولادة تحدث كل عام في جميع أنحاء العالم، 98٪ منها في البلدان الأقل نموا والبلدان النامية.

التسمم الدموي في الاطفال حديثي الولاده يعرف بإعتباره متلازمة سريرية لتجرثم الدم مع وجود علامات وأعراض الإصابة بالعدوي في الأربع أسابيع الأولى من العمر .عند وصول البكتيريا المسببة للأمراض إلى مجرى الدم، فإنها قد تسبب العدوى الساحقة بدون كثير من التمركز (تسمم الدم)، أو قد تكون في الغالب متمركزة في الرئة (الإلتهاب الرئوي) أو السحايا (التهاب السحايا) .

البروتين المرتبط بالمانوز (MBL) هو بروتين يعتمد علي الكالسيوم وهو الذي يرتبط بالكربوهيدرات علي سطح مجموعة واسعة من الجراثيم (الفيروسات والبكتيريا والفطريات والطفيليات) حيث يمكن تفعيل النظام المتمم أو يعمل مباشرة كمحفز للبلعمة .

البروتين المرتبط بالمانوز (MBL) يكتسب أهمية خاصة في الأطفال حديثي الولادة حيث يعتمد جهازهم المناعي علي الاجسام المضادة للأم وآليات الدفاع الفطرية. القدرة على الإستجابة بشكل فعال للأخطار المعدية يحدد بشكل واضح النتيجة الحادة والطويلة الأجل خصوصا في الاطفال المبتسرين .

المرضي و طرق البحث: تم تنفيذ هذه الدراسة في وحدة العناية المركزة لحديثي الولادة في مستشفيات جامعة الازهر، 75 طفل حديثي الولادة سوف يكونوا مرشحين لهذه الدراسة.

وسيتم تقسيم الأطفال حديثي الولادة إلى3 مجموعات:

المجموعة 1: تشمل 30 طفل من حديثي الولادة المصابين بالتسمم الدموي الوليدي مؤكده بالفحص الاكلينيكي والاختتبارات المعمليه.

المجموعه 2: تشمل طفل30من حديث الولاده المشتبه اصابتهم بالتسمم الدموي الوليدي مؤكده اكلينيكيا وليس معمليا.

مجموعة المراقبة: سوف تشمل 15 طفل سليم صحيا من حديثي الولادة وسيرمز لها بالمجموعة 3.

المعايير المتضمنة:

أي طفل مبتسر حديث الولادة مع وجود علامات سريرية للتسمم الدموي الوليدي في شكل:

- عدم استقرار درجة الحرارة، وضعف الرضاعة أو ليس على ما يرام.
- علامات الجهاز التنفسي: زيادة متطلبات الأكسجين، وتوقف التنفس، زرقة، انجذاب بالقفص الصدري للداخل، تسرع النفس أو (نته) صوت عند الزفير.
- علامات الدورة الدموية نبضات ضعيفة، تاخر امتلاء الشعيرات الدموية، انخفاض ضغط الدم، عدم انتظام دقات القلب أو صدمة.
- علامات الجهاز الهضمي: انتفاخ غير طبيعي، والإسهال، البراز الدموي، والحساسية الغذائية المفرطة، تضخم الكبد أو اليرقان.
- علامات عصبية: التهيج،الضعف او الخمول.
- نقص السكر في الدم أو ارتفاع السكر في الدم.
- النمشات النزيفية، النزيف (مع قلة الصفائح الدموية) أو التجلط المنتشر داخل الأوعيه الدموية.

المعايير المستثناة:

- التشوهات الخلقية الكبرى.
- شذوذ الكروموسومات.
- حديثي الولادة لأم مصابه بالسكري.

- نقص الاكسجين والدم الدماغي.
- اخطاء الايض الوراثى.

وسيخضع جميع المرضى إلى ما يلي:

- التاريخ الكامل مع الأخذ بما في ذلك تاريخ ما قبل الولادة وبعدها.
- الفحص الطبى الكامل للكشف عن العلامات السريرية للتسمم الدموي الوليدي.

الفحوصات التي سوف تتم:

- صورة دم كاملة.
- بروتين سي التفاعلي.(CRP).
- اليوريا والنيتروجين في الدم.
- كرياتنين بالدم.
- اختبار وظائف الكبد.
- غازات الدم الشرياني.
- أشعه عادية علي الصدر.
- مزرعة دم.
- مستوي البروتين المرتبط بالمانوز (MBL) بواسطة ELISA.

سيتم الحصول على موافقه مسبقة من أولياء أمور جميع المرضي المشتركين بالدراسة.

الهدف من الدراسة:

الهدف من هذه الدراسة هو تحديد دور البروتين المرتبط بالمانوز MBL كعلامة تشخيصية تنبوئية مبكرة في التسمم الدموي في الأطفال حديثي الولاده.

النتائج: قد وجد ان متوسط تركيز المانوز بيندينج لكتين فى الدم 447.67 نانو جرام لكل مللى لترلدى الاطفال الذين لديهم تسمم دموى 376.90نانو جرام لكل مللى لتر لدى الاطفال المتوقع اصابتهم بالتسمم الدموي و 603 نانو جرام لكل مللي لتر لدى الاطفال الذين ليس لديهم تسمم دموى.

ايضا قد وجد ان الذين لديهم نقص فى مستوى المانوز بيندينج لكتين لديهم معدل اصابة بالتسمم الدموى اكثر من الذين ليس لديهم نقص و ان مستوى المانوز بيندينج لكتين اقل عند الاطفال الذين لديهم تسمم دموى عن الاطفال الذين ليس لديهم تسمم دموى بنسبة وصوله لفرق احصائى ذو مغزى.

و اخيرا مستوى المانوز بيندديج لكتين لم يختلف فى الاطفال الذين عمرهم الرحمى اقل من ٣٧ اسبوع عن الاطفال الذين عمرهم الرحمى اكثر من او يساوى ٣٧ اسبوع.

الخلاصة و التوصيات :

ان نقص مستوى المانوز بيندينج لكتين قد يؤدى لحدوث التسمم الدموى عند الاطفال حديثى الولادة وانه يمكن استخدام البروتين المرتبط بالمانوز MBL كعلامة تشخيصية تنبوئية مبكرة في التسمم الدموي في الأطفال حديثي الولاده و لذللك نوصى بعمل ابحاث اخرى تتضمن عدد اكبر من الاطفال حديثى الولادة من اجل تحديد اذا كان يمكن استخدام قياس مستوى المانوز بيندينج لكتين من اجل التنبؤ بحدوث التسمم الدموى عند الاطفال حديثى الولادة.