

## Determinants of Neonatal Sepsis in Al-Nasiriayh City Public Hospitals at 2017

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**Background:** Sepsis during neonatal life is one of main leading attributer of the neonatal mortality, it consider as a major morbidity constituents, especially in the 3<sup>rd</sup> word and developing countries.

Identification, diagnosis and treatment delays of this main problem consider as the main cause of mortality for this group of population.

**Aims of the study:** to determine the main risk factors for neonatal sepsis in Al-Nasiriya public hospitals at 2017

**Methods:**A case control - hospital based study was done in Al-Nasiriya public hospitals –Southern of Iraq, extended over a period of 2017, neonates who had sepsis were the Cases, while with their index of pediatrician diagnosis while neonates who hadn't sepsis consider as controls. clinical and proper laboratory investigations was done for to prove the inclusion and diagnostic criteria for both Cases and controls. Control and cases had been selected by using systematic random sampling. Spss version 23 had been used for statistical analysis . graph Bad had been used for epidemiological analysis. P value < 0.05 consider as significant. dependent and independent association had been tested by using binary logistic regression model, while identification of the associated risk factors to neonatal sepsis was tested by multivariable logistic regression.

**Results:** A total of 150 neonate had been studied allover 2017, sixty cases and ninety control, with mean gestational age ( $37.5467 \pm 2.36753$ ), . near three quarters(72%) of NS were with EOS(<7 days), while the remainder were with LOS. The only Maternal age (21-35), CS as a mode of deliver, presence of( bleeding, PROM, maternal fever), and low birth weight of the of the neonate were strong risk factors for neonatal sepsis , APGAR <7, MSAFA<7 and Not crying immediately might be consider as neonatal sepsis predictors that might give hint for early initiation proper antibiotic

**Conclusion:** Both neonatal and maternal factors had contributed to the risk of NS. The crucial things are improvement of institutional delivery practices as well as Strengthening of the existing risk based prevention strategies.

### Introduction:

Neonatal sepsis (NS) is defined as "systemic inflammatory response syndrome in the presence of or as a result of suspected or proven infection in a neonate" this is recommended by the international pediatric sepsis consensus conference of 2005 ..different

microbiological infection, wether bacterial, viral or fungal or rickettsial origin (1). pneumonia, meningitis, septicemia, osteomyelitis, arthritis, etc. are the various systemic infections that encompassing the neonatal sepsis of the newborn(2). Early neonatal sepsis (EOS) or late (LOS) one are is

according to the onset age of the disease, neonatal sepsis is divided into early onset sepsis (EOS) and late onset sepsis (LOS). EOS is mainly due to organisms acquired from maternal fetal infection before and during delivery; it is ranging from 48 hours to 7 days after delivery, whereas organisms acquired after delivery is responsible for LOS, this is gotten from the environment (community or nosocomial sources). (3)

despite the neonatal deaths are preventable, the world is experiencing an increase in the proportion of under-five death occurring in the neonatal period. Maternal and neonatal deaths are concentrated in the world's poorest countries, where about 85% of all the neonatal deaths were occurred in low and middle income countries (LMICs), which they are homing to only 62% of the world's newborns (4,5).

World-wide, neonatal sepsis cause about 15% of neonatal deaths, particularly it is a major concern in the LMICs. NS is associated with increased direct medical costs, where, prolonged hospital stay and indirect medical costs potentially, where, poor long-term neurodevelopmental outcomes.

Regarding infants' survival, a significant neurological sequel as a consequence of CNS involvement occurring in approximately one-fourth of neonates, septic shock or hypoxemia secondary to severe parenchymal lung disease despite prompt institution of effective antibiotic therapy. Despite of this, the world is witnessing a steady decline in the number of neonatal deaths due to

sepsis, the neonatal mortality from sepsis declined by only 28 percent (4-6).

As a LMICS, In sub-Saharan Africa, 70% of neonatal deaths are attributed to NS as compared to only 6% of neonatal deaths are due to sepsis in high income countries (HIC). In Ethiopia, NS the major newborn killer, accounts for more than 1/3 of neonatal deaths. In Pakistani region, next to prematurity and birth asphyxia NS is a major cause of neonatal morbidity and deaths. It causes 24% of neonatal deaths with an incidence rate as high as 10% per 1000 live births (5,7-9).

High mortality contributed to the infections due to delay in care seeking, under-recognition of illness, at the household level, delay in initiation of treatment, and lack of access to both appropriately trained health workers and to high quality services to manage sepsis. That resulting in delays in the diagnosis, and management of newborns with infection.

It is particularly, without newborn ever having contact with the appropriate health services a poignant proportion of neonatal deaths occur in the community (10,11).

Indeed, newborn survival can be improved by strategies that can prevent and treat neonates with sepsis. Identification of risk factors and early institution of therapy, thereby can improve neonatal mortality and morbidity (5,12)

## **Patient and method**

### **Design of the study :**

A case control analytical study in prospective pattern had been carried out in Bint Al-Huda, Mohammed Al-Musaway teaching hospital/ ThiQar/ Iraq. The data collection phase extend over a period of 11 months at 2017.

This type of study help the researcher to explore how and why a disease process is started or maintained in a given population or place, through the following benefits: 1-They are efficient for rare diseases or diseases with a long latency period between exposure and disease manifestation. 2-They are less costly and less time-consuming; 3- they are advantageous when exposure data is expensive or hard to obtain. 4- Respondant can be seen directly by researcher with all available reports, investigations, and treatment. 5- Questions can be delivered and translated to the respondents in simple and easy way to be well understood. It is also noticed that: It is pleasurable for the individuals to make interview with some examinations and investigations like those listed in the definition of the variables.

### **Study population :**

The study population includes the neonates (60) who had sepsis were the Cases, while with their index of pediatrician diagnosis while neonates who hadn't sepsis consider as controls (90) . they were the targeted population of the study at the period of the study.

All those chosen neonates by systematic random sampling technique are included regardless to their gender or age in days .

The non- participants whose parents disagreed to share in the study are excluded.

### **Sample size sampling process :**

A-Sample size : It was a convenience sample limited by the duration of work (of the study) and availability of the cases.

60 patients as a case and 90 healthy as a control who are fit for inclusion criteria were the targeted population of the study.

### **Ethical considerations:**

An ethical clearance was obtained from in Bint Al-Huda, Mohammed Al-Musaway teaching hospital and management directorate to perform the study . An informed consent also was taken from all participants or the parents . confirm willingness once the consent procedure was approved by the ERB and they were notified that they have the right to refuse or terminate at any point of the interview, it included the following principles : Research participants should not be subjected to harm in any ways, Respect for the dignity of research participants should be prioritized.

The forma of research proposal had been proved by the higher ethical committee of research in the hospital

directorates to do laboratory investigations. At the beginning the researchers explain the aims of this study.

### The study tools :

#### The questionnaire

Special form of questionnaire was constructed to gather data and it was reviewed and revised by three subject matter experts for testing the validity and enrichment of the questionnaire .

The questionnaire consisted of following sections : (1): Include questions

**Maternal age:** 15–20 ,21–34, equal or >35

**Residence** Urban  
Rural

**Educational level :** illiterate,  
Literate

**Place of delivery** Home  
Health centers Hospital

**Mode of delivery** SVD  
Instrumental CS

**Hypertensive disorder :** Yes  
No

**Bleeding disorder :** Yes No

**UTI/STI** Yes No

**PROM :** Yes No

#### Pervaginal examination

**Intrapartum fever :** Yes No

**Foul smelling liquor:** Yes No

**Neonate sex** Male female

#### Gestational age in weeks:

Birth weight in gram

**APGAR score in the first minute :**

<7 \_7

**APGAR score in the fifth minute <7**

\_7

**Cries immediately after birth :** Yes

No

**Resuscitated at birth:** Yes No

**Parity:** Primi Multi

**MSAF: Yes** No

**Maternal Fever :** Yes No

**PIH/PET/Eclampsia :** Yes No

**Foul smelling liquor:** Yes No

**APH :** Yes No

**Birth weight** <2.5 kg ≥2.5 kg

The hematological criteria along with the established" IMNCI (Integrated Management of Neonatal and Childhood Illness) clinical features of neonatal sepsis were used to diagnose neonatal sepsis in this study. Neonates in the presence of one or more of the established IMNCI clinical features [either of fever ( $\geq 37.5^{\circ}\text{C}$ ) or hypothermia ( $\leq 35.5^{\circ}\text{C}$ ), fast breathing ( $\geq 60$  breath per minute), severe chest indrawing, not feeding well, movement only when stimulated, convulsion, lethargic or unconscious] along with 2 of the hematological criteria; total leukocyte count ( $<4000$  or  $>12000$  cells/ $\text{m}^3$ , absolute neutrophil count ( $<1500$  cells/ $\text{mm}^3$  or  $>7500$  cells/ $\text{mm}^3$ ), erythrocyte sedimentation rate (ESR) ( $>15/1$  h) and platelet count ( $<150$  or  $>440$  cells/ $\text{m}^3$ ) and who were admitted to pediatric ward or neonatal ICU".

Data was collected using semi structured questionnaire and checklist prepared in English .

Finally, the data collectors collected the data through interviewing the mothers and reviewing neonates' medical records throughout the data collection period.

The data were checked for completeness, inconsistencies, 7 and cleaned and analyzed in SPSS version 20. Cross tabulation was done to see the distribution of cases and controls. The binary logistic regression model was used to test the association between dependent and independent variables. All variables with P value <0.05 in bivariate analysis were included in the multivariable analysis. Magnitude of association was

measured by using an odds ratio at 95% confidence interval. Statistical significance was declared at P<0.05. Finally, the data are presented with texts and tables.

#### **Epidemiological analysis:**

By measuring the Odds ratio which is a proxy measure to the relative risk.. Odds ratio had been estimated as:

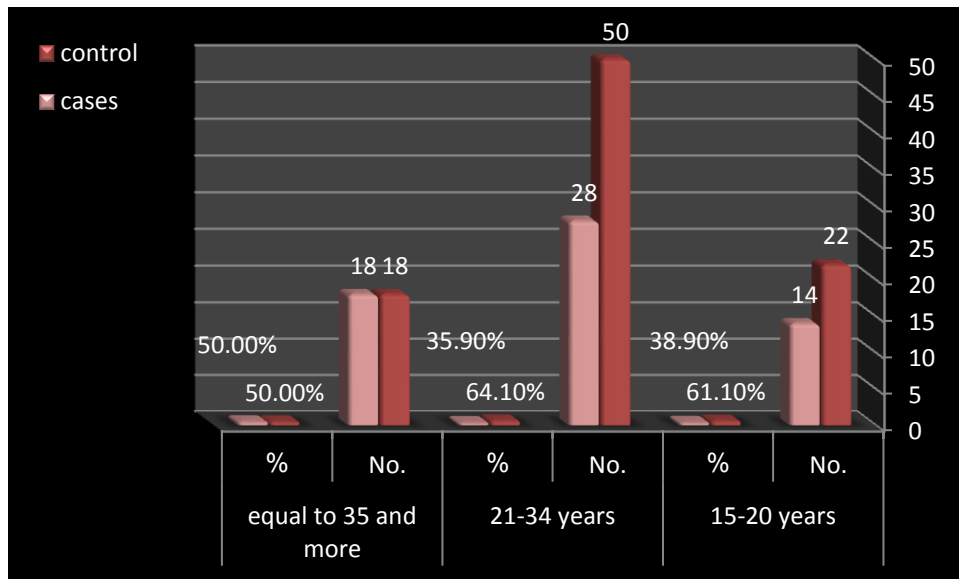
**Cases exposed X Controls not exposed**

**The Odds Ratio =-----**

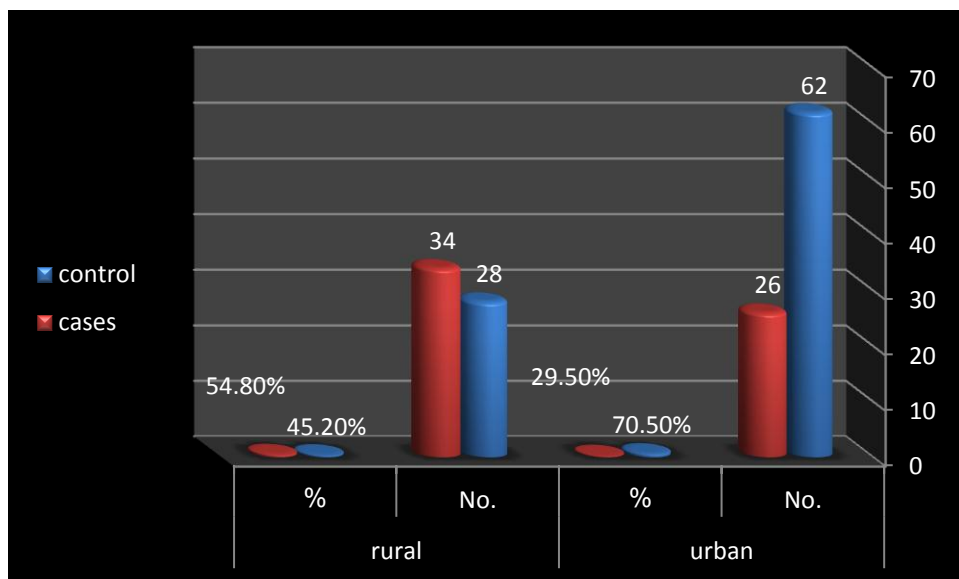
**Cases not exposed X Controls exposed**

#### **Results:**

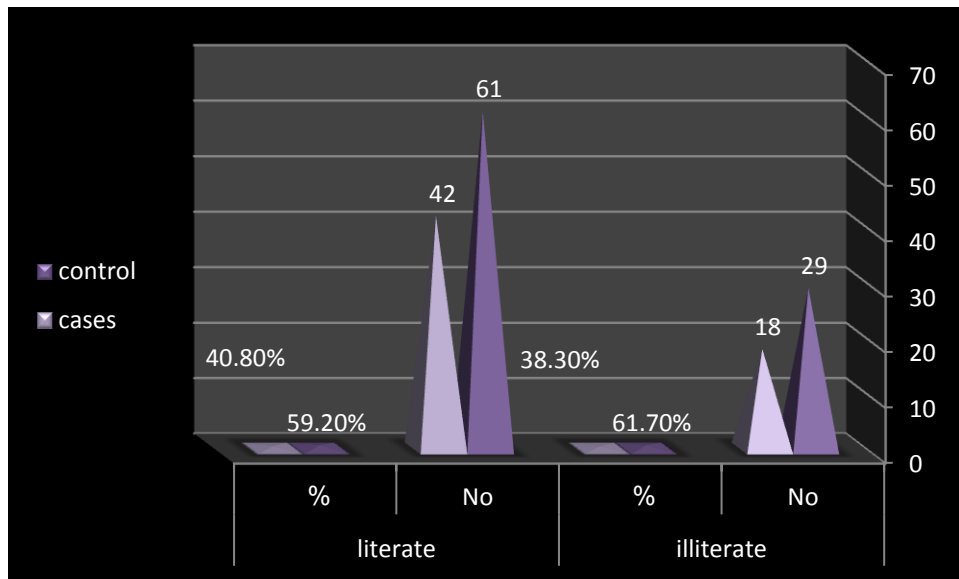
A total of 150 neonate had been studied allover 2017, sixty cases and ninety control, with mean gestational age ( $37.5467 \pm 2.36753$ ), . near three quarters(72%) of NS were with EOS(<7 days), while the remainder were with LOS, their statistical analysis had been shown bellow:



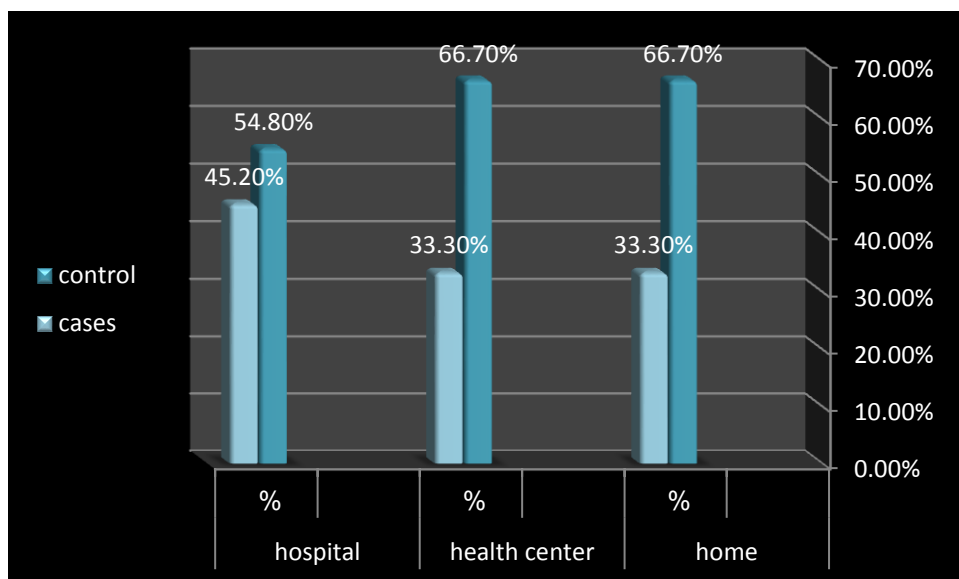
**Figure one: distribution of neonate according to the maternal age**  
 $\chi^2=2.066^a$  P value=0.370



**Figure two: distribution of neonate according to the maternal residence.**  
 $\chi^2=9.696^a$ ,  $p=0.002$



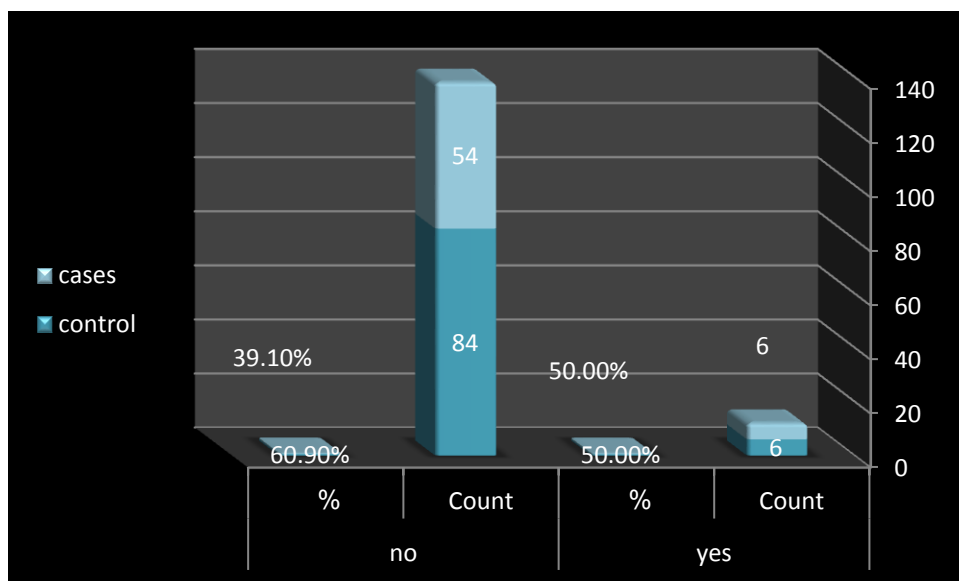
**Figure three: distribution of neonate according to the maternal education**  
 $\chi^2=0.083$ ,  $P=0.137$



**Figure four: distribution of neonate according to the place of delivery**  
 $\chi^2=2.183^a$   $P=0.109$

Table one: Maternal determinants of neonatal sepsis					
				Total	X <sup>2</sup> ,P value
		Control	Cases		
Mode of Delivery	SVD	60 63.8%	34 36.2%	94	1.556, .175
	CS	25 <sub>a</sub> 53.2%	22 <sub>a</sub> 46.8%	47	
	Instrument	5 <sub>a</sub> 55.6%	4 <sub>a</sub> 44.4%	9	
HTN	Yes	12 41.4%	17 58.6%	29	5.194 <sup>a</sup> , 0.013
	No	78 64.5%	43 35.5%	121	
Bleeding	Yes	1 5.0%	19 95.0%	20	29.087 <sup>a</sup> .0001
	No	89 68.5%	41 31.5%	130	
UTI	Yes	22 38.6%	35 61.4%	57	17.549 <sup>a</sup> .0001
	No	68 73.1%	25 26.9%	93	
PROM	Yes	5 17.2%	24 82.8%	29	27.387 <sup>a</sup> .0001
	No	85 70.2%	36 29.8%	121	
Fever	Yes	7 31.8%	15 68.2%	22	8.532 <sup>a</sup> .004
	No	83 64.8%	45 35.2%	128	
Foul smell liquor	Yes	6 22.2%	21 77.8%	27	19.580 0.0001
	No	84 68.3%	39 31.7%	123	1.844,0.317
parity	Primi	25 56.8%	19 43.2%	44	
	Multi	65 61.9%	41 38.1%	106	
Total		90 60.0%	60 40.0%	150	
				100.0%	





**Figure 5: distribution according to APH**  
 $X^2 = 0.542$ . p value= 0.181

Table two: Neonatal determinants and predictors of sepsis						
					Total	X <sup>2</sup>
			Control	Cases		P value
GA	Equal or less 37 week	38	30	68	.879, .086	
		55.9%	44.1%			
	Equal or more 37 Week	52	30	82		
		63.4%	36.6%			
Sex	Male	40	37	77	4.274 <sup>a</sup> .018	
		51.9%	48.1%			
	Female	50	23	73		
		68.5%	31.5%			
1 minute APGAR	<7	19	43	62	37.944 <sup>a</sup> .000	
		30.6%	69.4%			
	>7	71	17	88		
		80.7%	19.3%			
5 minute APGAR	<7	2	7	9	5.693 <sup>a</sup> .019	
		22.2%	77.8%			
	>7	88	53	141		
		62.4%	37.6%			
Cry immediately after birth	Yes	86	43	129	17.063 <sup>a</sup> .000	
		66.7%	33.3%			
	No	4	17	21		
		19.0%	81.0%			
resuscitation	Yes	8	26	34	24.366 <sup>a</sup> 0.0001	
		23.5%	76.5%			
	No	82	34	116		
		70.7%	29.3%			
MSAF	Yes	0	6	6	9.2730.004	
		0.0%	100.0%			
	No	89	54	143		
		62.2%	37.8%			
B.WT	<2.5kg	8	15	23	7.198 <sup>a</sup> ,0.006	
		34.8%	65.2%			
	>2.5kg	82	45	127		
		64.6%	35.4%			
Total		90	60	150		

	60.0%	40.0%	100.0%	
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**Table: three: logistic regression analysis for studying the association of independents variables for the sepsis**

Significant variables	B	Sig.	Exponential (B){odds ratio}
maternal Age(2)	- 1.426-	.04 4	.240
Mode of Delivery(2)	1.994	.09 1	7.347
bleeding(1)	3.850	.00 6	46.992
PROM(1)	3.431	.00 0	30.901
fever(1)	1.944	.01 4	6.988
APGAR1(1)	2.199	.00 2	9.020
Cry immediately .after birth(1)	- 2.338-	.00 5	.097
MSAF(1)	39.85 7	.99 8	204033200329036992.000
PIH(1)	- 21.77 4-	.99 9	.000
B.WT(1)	1.834	.02 7	6.260
Constant	-.829-	.56 7	.436

Variable(s) entered on step 1: maternal age, residence, Education, place of delivery, mode of Delivery, HTN, bleeding, UTI, PROM, fever, foul smell .liquor, Neonate sex, APGAR1, APGAR5, cry. Immediately after birth, resuscitation, parity, MSAF, PIH, APH, B.WT, RGA., **the only**

**Maternal age (21-35), CS as a mode of deliver, presence of( bleeding, PROM, maternal fever), and low birth weight of the neonate were of significant statistical and epidemiological association, APGAR, MSAFA and crying immediately might be consider as neonatal sepsis predictors**

#### **Discussion:**

Neonatal and maternal risk factors for NS, had been assessed by this study this was the main aim, in-order to solve this problem, that contributing one of

the main causes of increasing neonatal mortality all over the world contribute to tackle the burden of the disease and its associated problems. By this attempt we might contribute in reducing the burden of this problem, So

probable risk factors had been counted in order to sorting them as a determinants or predictors for NS. near three quarters(72%) of NS were with EOS(<7 days), while the remainder were with LOS. which is more or less comparable with the studies conducted earlier in our country in Gonder (2012) and Bishoftu (2014) which was 81.8% and 81.4% respectively(14,15).

this study show that both maternal and neonatal factor had a significant effect on the risk of NS, these factors did not show similar effects for other studies .

This study showed that a 2/3 of neonates born at home and health center developed sepsis with 2 times higher odds of developing sepsis compared to neonates born in hospitals. A previous study conducted in Bishoftu, Oromia (2014) also suggested that the proportion of neonates who were born at health center had higher risk compared to home delivery(15). This might be due to the reason that neonates who were delivered at health center had less likely to be cared based as in the hospital for a risk approach screening (10).

In this study, nearby 2/3 (63%) of the cases were born to mothers who had a history of STI/ UTI, with four times higher odds of developing sepsis compared to neonates born to mothers who did not have a UTI / STI diagnosis. This finding is more or less comparable with the findings of studies conducted previously in Ghana (2014) (OR = 3. 01) ,India (2005) (OR = 14. 3 ), and Bishoftu, Ethiopia (2014) which revealed that maternal UTI/ STI (OR = 12. 9;) was a significant factor for the development of neonatal sepsis(13,15,16). This study indicated that 63% of those neonates who were born to mothers who had UTI/STI and developed sepsis are EOS. This finding

Might be support for the reason that maternal

UTI is often associated with EOS, especially if untreated during, and it may be associated with NS following the birth canal colonization by the infectious agent(15,17).

Prolonged rupture of membrane ( \_ 18 hours) had shown a significant effect on risk of neonatal sepsis with the likelihood of sepsis was 30 times higher among neonates born to mothers who had PROM \_ 18 hours compared to those neonates born before 18 hours of rupture of membrane. One fifth (20%) of cases were born to those mothers who had PROM. Similar findings were also observed in earlier studies conducted in different parts of the world(14,17-22). Early rupture and prolonged labor increases the chance of ascending microorganisms from the birth canal into the amniotic sac and fetal compromise as well as asphyxia which frequently leads to sepsis(13,17).

fever had been show a significant effect on the development of NS in

the present study. Neonates who were born to mothers who had fever during labor had 6 times

higher odds of developing sepsis compared to neonates born to mothers who did not have. This is consistent with the study conducted previously in Pakistan (2014) and Bangladesh (2011) which revealed Fever was an independent predictor of neonatal sepsis(17,21). fever is indication of maternal infections that are might transmitted to the baby during passage through the canal or in utero which usually causes EOS(17,23).

This study showed that APGAR score at 1<sup>ST</sup> minute had a strong significant effect on the

development of neonatal sepsis. Where Odds ratio is 9 time, Similar observations are also shown in the studies conducted

in India (1997), Saudi Arabia (1997), Bangladesh (2011) and Washington (1985) which

indicated that APGAR score but at 5th minute had a strong effect on risk of neonatal sepsis (17,18,23,24)

Immediate crying at birth currently showed a significant association with neonatal sepsis.

The present study indicated that neonates cried at birth had 99% less likely to be suffering from sepsis compared to those who did not cry at birth. This finding is in line with the previous finding, reported in Ghana which showed that neonates cried at birth had 92% less likely to develop sepsis than neonates who did not cry at birth(13). This difference might be due to the nature

of crying as the physiologic events and changes associated with it. Prematurity and low birth weight are the well established neonatal risk factors in industrialized and developing countries(13,16,18-21,23) as other studies, this study observe an association between preterm or low birth weight and risk of neonatal sepsis. These other studies, conducted in Bangladesh (2011) and Bishoftu (2014) also observed that

low birth weight had an insignificant effect on the risk of neonatal sepsis(15,17).

mode of deliver had an important role in NS , this similar to other studies(13-25)

Parity, Residence, n, and foul smelling liquor were not found to be predictors of neonatal sepsis in this study. This is in contrary to the findings of studies on risk factors of neonatal sepsis in different parts of the world indicated that these factors had an influence on neonatal sepsis [13–25]. The reasons for these differences

may range from the background of the participants, access to health facilities and health professionals.

But this type having the following **limitations** and disadvantages:

1-they are subject to selection bias.

2-They are inefficient for rare exposures.

3-Information on exposure is subject to observation bias.

4-They generally do not allow calculation of incidence (absolute risk).

## CONCLUSION:

The only Maternal age (21-35), CS as a mode of deliver, presence of(bleeding, PROM, maternal fever), and low birth weight of the of the neonate were strong risk factors for neonatal sepsis , APGAR <7, MSAFA<7 and Not crying immediately might be consider as neonatal sepsis predictors that might give hint for early initiation proper antibiotic.

Both neonatal and maternal factors had contributed to the risk of NS. The crucial things are improvement of institutional delivery practices as well as Strengthening of the existing risk based prevention strategies.

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## دراسة حول (الانتان الوليدي) للأطفال حديثي الولادة في مدينة الناصرية – مستشفى بنت الهدى التعليمية لعام ٢٠١٧

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د. فاضل حسين عناية – اختصاص امراض الاطفال

### ملخص البحث

يعتبر الانتان الوليدي احد الامراض المهمة عند الاطفال حديثي الولادة والذي تؤدي الى كثير من المراضه وحالات الوفيات خصوصا في بلدان العالم الثالث ومن ضمنها العراق لذلك التشخيص المبكر ومعالجة عوامل الخطورة والعلاج الملائم مهم جدا للتقليل من الوفيات

**اهداف الدراسة :-** توضيح عوامل الخطورة الرئيسة بالنسبة للأطفال والامهات وتأثيرها على الانتان الوليدي عند الرضع في مدينة الناصرية – مستشفى بنت الهدى التعليمي لعام ٢٠١٧

**الطرق :-** فحص حالات مريضة عدد ٦٠ حالة مقارنة بحالات سليمة غير مصابة عدد ٩٠ حالة باستخدام العلامات الطبية السريرية و الفحص المختبري لجميع الحالات

**النتائج :-** العدد الكلي ١٥٠ طفل تم دراستهم خلال عام ٢٠١٧ منها ٦٠ حالة مصابة و ٩٠ حالة غير مصابة للمقارنة ولأعمار اقل من سنة و العديد من عوامل الخطورة التي تخص الامهات والاطفال

**الاستنتاج :-** عوامل الخطورة تخص كل من الاطفال والامهات التي تعتبر العوامل الرئيسية للإصابة بالمرض خصوصا عند الاطفال بعمر اقل من سبعة ايام وهي النسبة الاكثر اصابة بالمرض لذلك تصحيح هذه العوامل خصوصا اثناء فترة الحمل والولادة و ما بعدها يحسن كثيرا من النتائج وتقلل الإصابة بالمرض .



