

Omphalitis in Neonates Admitted to Al-Ramadi Maternity and Children Hospital

Sahar J. Al-Hiali , Saleem O. Al-Mawla , Wael W. Sa'eed , Ahmad M. Yousif

Abstract

Objective: The aim of the present study was to recognize the prevalence of omphalitis in Al-Ramadi maternity and children hospital, main bacterial agent causing omphalitis as well as its relation to neonatal sepsis.

Materials and Methods: All neonates admitted to neonatal care unit in Al-Ramadi maternity and children hospital during the study period are examined for omphalitis and data collected as follow: age, sex, gestational age, residency, maternal education, type and site of delivery, history of rupture membrane, way of cutting and clamping of umbilical cord. Umbilical swabs were taken for culture and blood were collected aseptically for culture.

Results: During the study, one hundred five (12%) hospitalized neonates had omphalitis with mean age 5.16 ± 4.27 days. Male to female ratio was 1:0.5 Preterm babies were 18.1%. Redness was present in 79%. Pus discharge presented in 21%. Common pathogenic organism revealed by umbilical swab culture was *Klebsiella spp.* While blood culture revealed *Staphylococcus aureus* as the common pathogenic organism.

No significant association between neonatal sepsis and omphalitis. Only pus discharge was significantly associated with positive blood culture.

Conclusions: High prevalence of omphalitis (12%) recorded in Al-Ramadi maternity and children hospital and majority of them presented with redness.

Neonatal sepsis recognized among 57% of them that was caused by other causes apart from omphalitis i.e. hospital acquired infection, so several community and hospital based studies are required to determine the prevalence of omphalitis and underlying risk factors.

Key Words : omphalitis , neonates , Ramadi

Introduction

The umbilical cord is a unique tissue consisting of two arteries and one vein covered by mucoid connective tissue called Wharton's jelly and a thin mucoid membrane.⁽¹⁾

Separation of the umbilical stump occurs by inflammation of the junction of the cord and the skin of the abdomen. During this process, small amounts of cloudy mucoid material may be collected at that junction; this may be misinterpreted as pus and the cord may be moist, sticky or smelly. The cord normally falls off between 5-15 days after birth. Factors that delay the process are the application of in proper antiseptic, infection and cesarean section.^(1,2) Omphalitis is an infection of the umbilical stump defined as

either pus discharge with erythema of the abdominal skin or severe redness (more than 2cm extension from the cord stump) with or without pus.^(2,3,4)

The most encountered risk factors for development of omphalitis in babies are protracted labour, non-sterile delivery, septic delivery as suggested by prolong rupture of membrane or maternal infection, umbilical catheterization, prematurity, low birth weight (<2500gm) and male sex.^(3,5,6)

Associated signs such as fever, lethargy, poor feeding and abdominal distension suggest a systemic complication.^(1,7)

It was found that omphalitis is a common cause of neonatal sepsis,⁽⁷⁾ as well as significant mortality rate varies according

to the gestational age and reach as high as 30% in low birth weight babies.^(8,9)

Omphalitis is most commonly caused by bacteria like *Staphylococcus aureus*, *Escherichia coli*, *Klebsiella pneumoniae* as well as *Streptococcus species*.^(10,11)

The estimated incidence of omphalitis in hospitalized newborns in the developed world is around 0.7%⁽¹²⁾; while it may be as high as 6.18% in developing countries.⁽³⁾

The main objectives of the present study is to recognize the prevalence of omphalitis in Al-Ramadi maternity and children hospital , the main bacterial agents causing omphalitis, as well as its association with neonatal sepsis.

Materials And Methods:

The study conducted in the neonatal care unit of Al-Ramadi Maternity and Children Hospital during the period from February 2007 to July 2007.

All neonates admitted to the neonatal care unit during the study period were examined for criteria of omphalitis (sever redness more than 2cm extension from the cord stump) with or without pus^(2,3,4).. Data collected including age, sex, gestational age, residency, maternal education, type and site of delivery, history of ruptured amniotic membrane, way of cutting and clamping of umbilical cord.

Umbilical swabs were taken by using a disposable wooden swab and cultured in the following media (blood, chocolate and Maconkey agars). Tow ml of blood were collected aseptically by cleaning the area by povidine iodine then after dryness for one minute, again cleaned by alcohol solution (90%) then after dryness, aspirate venous blood and mixed with 10 ml of Brain Heart solution for blood culture. Specimens were transferred to the hospital laboratory to be processed and cultured under supervision of a senior microbiologist.

Student's test was applied to study the difference between means. Chi-square was done to study the association between

variables, P value less than 0.05 was considered significant

Results

Out of 875 neonates admitted to the neonatal care unit during the study period, 105 (12%) neonates had omphalitis .The majority of cases were found among the age group(1-7) days (81.9%) ,table I. Seventy one (67.6%) were males and 34 (32.4%) were females, giving a male to female ratio of 2.09:1. Eighty six (81.9%) were full term, eighty tow (78.1) were delivered at hospital, and 70 (66.7%) neonates were delivered normally (normal vaginal delivery). The majority (79%) of the neonates were presented with redness, and 22 (21%) had pus discharge. Surgical blade, scissor and other domestic tools were used for cutting the umbilical cord in 78 (74.2 %), 26 (24.8%) and 1 (1.0%) respectively. Plastic sterile clasper, Silk, and non hygienic materials were used to clamp the umbilical cord in 75 (71.5%), 18 (17.1%) and 12 (11.4 %) respectively, Table II.

Fifty six (53.3%) of studied cases had positive swab culture while forty nine(46.7%)cases had negative swab culture .The common pathogenic organisms isolated were *Klebsiella spp.* 25 (44.5%), *Staphylococcus aureus* 24 (42.9%), *Escherichia coli* and *Proteus* 3 (5.4% for each) Fungi 1 (1%), Table III .

Fifty seven (54.3%) of neonates with omphalitis had positive blood culture while forty eight (45.7%) had negative blood culture. The main pathogenic organism isolated was *Staphylococcus aureus* 35 (61.4%). *Klebsiella spp.* 18 (31.5%), *Escherichia coli* 2 (3.5%), *proteus* and *pseudomonas* (1.8%for each), Table IV.

Table V shows that both negative culture was (22.9%) while both positive culture was

(30.4%), only swab culture positive was (22.9%) and only blood culture positive was (23.8%).

Table VI shows the description of both the umbilical swab culture and blood culture in relation to the organisms that cause it and it revealed that there is no significant association between the umbilical swab culture and blood culture.

Table VII shows that only pus discharge was significantly associated with positive blood culture while redness was not, and both umbilical swab(positive ,negative) and blood culture(only negative) not significantly

associated with presentation of omphalitis (redness or pus discharge), Table VIII shows both positive blood and swab cultures were not significantly associated with sign and symptoms that associated with omphalitis.

Table IX shows that the redness was found at earlier age while discharge lately, redness was significantly associated with means of clamping umbilical cord; while it was not significantly associated with type of delivery , place of delivery, and means of cutting the umbilical cord. Pus discharge was not significantly associated with means of cutting, clamping the umbilical cord, type and place of delivery.

Table I: Prevalence of omphalitis in relation to age

Age (days)	No.	%
1-7	86	81.9
8-14	14	13.3
15-30	5	4.8
Total	105	100

* Mean age \pm SD = 5.16 \pm 4.27

Table II: Characteristics of omphalitis cases.

Character	No	%
Gestational age	Full term	86 81.9
	Preterm	19 18.1
Clamping of umbilical cord	Clamper	75 71.5
	Silk	18 17.1
	Non hygienic materials	12 11.4
Signs of omphalitis	Redness	83 79
	Pus discharge	22 21
Site of delivery	Hospital	82 78.1
	Home	23 21.9
Means of cutting umbilical cord	Surgical blade	78 74.2
	Scissor	26 24.8
	Domestic tool	1 1.0
Sex	Male	71 67.6
	Female	34 32.4
Type of delivery	NVD	70 66.7
	C/S	35 33.3

Total		105	100
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Table III: Distribution of microorganisms isolated by swab culture.

Culture result		No	%
Positive	<i>Klebsiella sp.</i>	25	44.5
	<i>S. aureus</i>	24	42.9
	<i>E. coli</i>	3	5.4
	<i>Proteus sp.</i>	3	5.4
	<i>Fungi</i>	1	1.8
Total		56	100

Table IV: Distribution of microorganisms isolated by blood culture.

Culture result		No	%
Positive	<i>S. aureus</i>	35	61.4
	<i>Klebsiella spp.</i>	18	31.5
	<i>E. coli</i>	2	3.5
	<i>Proteus</i>	1	1.8
	<i>Pseudomonas</i>	1	1.8
Total		57	100

Table V: The relation of swab culture with blood culture.

	No.	%
Only swab culture	24	22.9
Only blood culture	25	23.8
Both positive	32	30.4
Both negative	24	22.9
Total	105	100

Table VI: Description of both swab & blood culture.

			<i>Klebsiella sp.</i>	<i>S. aureus</i>	<i>E. coli</i>	<i>Proteus</i>	<i>Total</i>
swab culture only			11	9	2	2	24
blood culture only			11	13	1	0	25
Both positive	Same organism		4	13	0	0	32
	Different organism	Swab culture	10	2	1	1	
		blood culture	3	9	1	0	
P value			0.5	0.32	0.13	0.67	

Table VII: Distribution of umbilical status according to result of culture

Character	No.	Swab culture				P value	Blood culture				P value
		+ve	%	-ve	%		+ve	%	-ve	%	
Redness	83	45	54.2	38	45.8	0.56	42	50.6	41	49.4	0.42
Pus discharge	22	11	50	11	50	0.62	15	68.2	7	31.8	0.006
Total	105	56		49			57		48		

Table VIII: Associated signs and symptoms with results of culture.

Variables	Swab culture(positive) 56 case.			Blood culture (positive) 57 case.		
	No.	%	P	No.	%	P
Fever	20	35.5	0.39	20	35.1	0.3
Pallor	3	5.3	0.09	4	7	0.27
Cyanosis	13	23.2	0.18	16	28.1	0.9
Dyspnoea	14	25	0.5	12	21.5	0.6
Apnoea	6	10.5	0.4	10	17.5	0.1

Table IX: The relation of signs of omphalitis with studied variables .

Character		No.	redness	%	P value	Discharge	%	P value
Place of delivery	Hospital	82	65	61.9	0.6	17	16.2	0.12
	Home	23	18	17.1	0.4	5	4.8	0.22
Clamping of umbilical cord	Clamper	75	68	69.5	0.014	7	1.9	0.53
	Non hygienic material	12	7	6.7	0.5	5	4.8	0.12
	Silk	18	8	2.9	0.1	10	14.2	0.36
Means of cutting umbilical cord	Surgical blade	78	57	54.3	0.8	16	15.2	0.5
	scissor	26	25	23.8	0.16	7	6.7	0.4
	Domestic tool	1	1	1	0.3	0	0	
Type of delivery	NVD	70	54	51.5	0.71	16	15.3	0.3
	Cesarean section	35	26	24.7	0.35	9	8.5	0.32
Total		105	83			22		

Discussion

The diagnosis of omphalitis depends considerably on clinical features, and in some cases it requires a positive swab culture. Diagnosis in our community, however, must be based solely on clinical signs of infection. Mullany et al stressed that two signs for defining omphalitis are recommended for use in the community, redness and the presence of pus.⁽¹²⁾

Our results showed that 79% of neonates with omphalitis presented with redness while pus discharge showed 21%. The predominance of redness is probably due to that most of cases presented early and majority of the cases were on antibiotics at the time of examination.

No previous study on the prevalence of omphalitis was reported in Iraq, up to our knowledge. High rate of omphalitis is reported in this study (12%) while in developing countries 6.18%⁽³⁾ and in the developed world is around 0.7%⁽¹²⁾. The prevalence of neonatal infection varies with considerable fluctuation over time and geographical location and even from hospital to hospital. These variations may be related to conduct of labour and environment conditions⁽³⁾. Our results showed that most of cases of omphalitis were born in hospital (78.1%) and sterile plastic clasper (71.5%) was used in majority of them, yet the rate of omphalitis is high, this may be due to that the setting up and aseptic technique in the hospital was very poor. In Tanzania, Mosha et al demonstrated that clean hands, clean perineum, clean delivery surface, clean cord, cutting and tying instruments (six cleans) had a positive effect on reducing cord infection.⁽¹⁶⁾, this rule not perfectly used in our hospital. In a trial to determine the effectiveness of six cleans with use of a clean delivery kit in preventing cord infection, Winani et al reported that newborns whose mothers used the delivery kit were 13.1 times less likely to develop cord infection than infants whose mothers did not use the kit (six cleans).⁽¹⁷⁾ Our study revealed a male predominant,

which is in agreement with that reported in other studies.^(3,6)

The isolation rates of *Klebsiella spp.* and *Staphylococcus aureus* from the umbilical cord swabs were almost similar (44.5% and 42.9%, respectively). In eastern Turkey, *Staphylococcus aureus* (69%) was more commonly isolated from umbilical cord⁽¹³⁾. While in Nigeria, *Staphylococcus aureus* constituted (55%) from other bacterial agents⁽¹⁴⁾. The high isolation rate of *Klebsiella spp.* in our study is most likely hospital acquired, as the routine swabs taken from incubators, labour ward usually show *Klebsiella*.

Our laboratory findings had confirmed the importance of *Staphylococcus aureus* (61.4%), *Klebsiella spp.* (31.5%) and *Escherichia coli* (3.5%) in septicemia. These findings are consistent with that reported in the neonatal unit at Baghdad teaching hospital in Iraq.⁽¹⁵⁾

No significant association of positive swab cultures and positive blood cultures was observed. Our study revealed the majority of cases showed that umbilical swab and blood culture have different organism in the same patient. This finding may indicate that the route of infection in septicemia may be other than infected umbilical cord and could be hospital acquired infections (nosocomial infection). Al-Shawii et al found that neonatal sepsis was significantly associated with management procedures (cannula, IV. set, nasogastric tube, suction and O₂ therapy).⁽¹⁵⁾

Our study showed only the pus discharge was significantly associated with positive blood culture while redness was not, and both swab and blood culture (only negative) not significantly associated with presentation of omphalitis (redness or pus discharge).

Our research revealed that fever, pallor, cyanosis, dyspnoea and apnea were not significantly associated with positive swab or blood cultures. These findings do not agree with that of other workers. ^(3,18)

Our study proved that one sign of omphalitis (redness) was significantly associated with means of clamping umbilical cord (only clasper). This fact is not available in other studies up to my knowledge. The plastic clasper may cause physical irritation to the skin leading to redness.

Conclusions

From results of the present study, we concluded the following:

- 1- High prevalence of omphalitis (12%) recorded among studied group, the majority of them accompanied by redness.
- 2- Both umbilical cord swab and blood cultures were positive in 53.3% and 54.3% respectively.
- 3- No significant association between positive umbilical swab culture and positive blood culture.
- 4- Only redness was significantly associated with the clamping of umbilical cord.

Recommendations

Further studies are required in the future to cover the following subjects:

1. To carry out several community and hospital based studies to determine the prevalence of omphalitis, and underlying risk factors.
2. To identify the practices of delivery and neonatal care that are associated with omphalitis.
3. To identify the role of birth attendants in developing omphalitis.
4. To carry out the rule of six cleans which include clean hands, clean perineum, clean delivery surface, clean cord, cutting and tying instruments.

To carry out regular collection of haphazard swabs in our hospital to avoid high incidence of bacterial infections

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