

# Neonatal omphalitis in Eastern Turkey

Hüseyin GÜVENÇ<sup>1</sup>, Müzehher GÜVENÇ<sup>2</sup>, Hikmet YENİOĞLU<sup>1</sup>,  
A.Denizmen AYGÜN<sup>1</sup>, Kenan KOCABAY<sup>1</sup>

Dept. of Pediatrics, Medical School of Firat University and  
Dept. of gynecology and Obstetrics, State Hospital, Elazığ, TURKEY

*Neonatal omphalitis is a common infection in developing countries. 130 newborns with omphalitis diagnosed at a university hospital in Eastern Turkey from January 1988 to December 1992 were studied. The yearly incidence was 7.1% in inpatient newborns. Two categories of omphalitis were recognized based on home (n:32) or hospital (n:98) deliveries. Gram-positive bacteria (n:87, 66.9%) predominated over gram-negative isolates (n:74, 56.9%). Staphylococcus aureus and Escherichia coli were the most frequent microorganisms. For the both categories prematurity-being small for gestational age (n:55, 41%) as an important risk factor and the results of bacteriologic analysis were similar. Overall mortality rate for the study was 14%. Significant differences (p<0.05) for the mean age for the rates of systemic findings and mortality suggest that home deliveries can be considered as a risk factor for neonatal omphalitis. [Turk J Med Res 1994; 12(2): 118-121]*

Key Words: Newborn, Omphalitis, Delivery

With aseptic delivery techniques and aseptic cord care, neonatal omphalitis has become an uncommon infection in industrialized countries. Mc Kenna and Johnson (1) estimated an incidence of omphalitis of 0.87 % in already hospitalized newborns, and Meberg and Schoyen (2) found umbilical infection rates of 0.2% in the nursery and 0.6 % outside hospital. Omphalitis continues to be a problem in developing countries because of the lack of aseptic delivery techniques (especially at home) and insufficient cord care. We previously demonstrated a predominance of Staphylococcus aureus from the infected umbilicus during the-neonatal period in 1982 (3), and additionally found a yearly incidence of neonatal omphalitis of 7.7% in inpatient newborns in 1991 in Turkey(4). In the current study, we offer new data on neonatal omphalitis from Turkey.

## PATIENTS AND METHODS

All charts coded with a discharge diagnosis of neonatal omphalitis (defined as a positive umbilical culture plus purulent discharge only and/or cellulitis of abdominal wall) at the Neonatal Unit of Firat University

Received: March 29, 1994

Accepted: April 21, 1994

Correspondence: Hüseyin GÜVENÇ

Research Hospital of Firat University  
23200 Elazığ, TURKEY

Elazığ between January 1988 and December 1992, were reviewed. Patients were evaluated for birth history, clinical findings, bacterial etiology, peripheral blood neutrophil count and mortality rate. Two categories of omphalitis were recognized based on (by a local midwife) and hospital (by an obstetrician) deliveries.

Home delivery babies did not have any other perinatal and neonatal problem at birth. Some of these newborns had a irregular umbilical antiseptic regimen including alcohol. For the umbilical cord care of the other born in our hospital with modern sanitary facilities, our routine antiseptic regimen with daily cleansing of the cord "stump with 0.5% chlorhexidine in 70% ethanol was used. All newborns with omphalitis, delivered at home or in hospital, were admitted to our neonatal unit. Each newborn was given a complete physical examination.

Specimens were obtained with a sterile cotton swab from the cord-cutaneous junction and/or purulent discharge from the umbilicus. All materials were sent in an anaerobic transport medium to the microbiology laboratory and cultured within 30 min. Aerobic culture media included plates of sheep's blood agar, chocolate agar and MacConkey agar. All plates were incubated at 35° - 37° C; the MacConkey plates aerobically and the other plates under 5-10 % CO<sub>2</sub>. Anaerobic media consisted of anaerobic blood agar plates, incubated at 35° - 37° C in Gas Pak jars. Plates incubated aerobically were examined at 24 h and 48 h, and anaerobic

**Table 1.** Incidence of omphalitis in inpatient newborns in 1988-1992.

Year	No. of inpatient newborns	Omphalitis	
		n	%
1988	168	13	7.7
1989	259	17	6.5
1990	231	21	9.1
1991	290	20	6.8
1992	360	22	6.1
Total	1308	93	7.1

P.S. Other 37 patients with omphalitis is from the outpatient unit.

plates were first inspected after 48 h of incubation and again at 72 h. All organisms isolated were identified using Gram stain morphology and standard biochemical testing. Susceptibility testing was performed by the standardized disc-agar method of Kirby and Bauer.

The chi square (with Yate's correction when appropriate) and unpaired t tests were used for statistical evaluation.

## RESULTS

One hundred and thirty patients were diagnosed as having neonatal omphalitis between 1988 and 1992. 93 were inpatient newborns and 37 were outpatients. Table 1 shows the yearly incidence of 7.1 % for omphalitis in inpatient newborns for the last five years.

Table 2 summarizes the organism found in each category and the overall total. Gram-positive isolates (n=87, 66.9%) predominated over gram-negative isolates (n=74, 56.9%). *Staphylococcus aureus*, coagulase-negative staphylococci and diphtheroids were the most commonly isolated gram-positive microorganisms whereas *Escherichia coli*, *Pseudomonas aeruginosa* and *Enterobacter* spp were the most fre-

quent gram-negative isolates. More than one microorganism was cultured from 26/130 (20%) patients whereas a single microorganism was observed 104/130 (80%).

The characteristics of the two categories are summarized in Table 3. The mean age of the infants born in hospital was significantly higher. There were 73 male patients and 57 female patients. Most families came from a low socioeconomic class. Of the risk factors associated with omphalitis, prematurity-being small for gestational age appeared to be more frequent (41%). The presence of systemic findings including abnormal temperature, poor sucking, and abdominal distension was significantly more common in the infants born at home. Mean total white blood cell and absolute neutrophil counts did not differ between two categories.

After susceptibility testing and appropriate antibiotic therapy 88 (8 %) of the 98 patients in the infants born in hospital died, compared with a mortality rate for the other infants of 34 % (11/32); the difference was statistically significant. The overall case fatality rate for the study was 14 % (19/130). These 16 patients had rapid progression of erythema of the umbilicus, and also developed lethargy (13 patients), convulsion (8 patients), umbilical necrosis (5 patients) and/or bleeding (2 patients).

## DISCUSSION

Although the advent of aseptic delivery techniques and prophylactic umbilical cord care has made it possible to reduce the occurrence of neonatal omphalitis, it is still encountered in developed countries, (1,5-7). However, there are few reports of umbilical infections in newborns from developing countries (3,4), which is surprising because of the lack of facilities for delivery and insufficient cord care encountered frequently in such countries.

Previous reports (3,8-11) have emphasized the importance of *Staphylococcus aureus*, *Staphylococcus*

**Table 2.** Bacteria isolated from umbilical cultures of 130 patients.

	Home delivery n=32	Hospital Delivery n=98	Total n=130
<b>AEROBIC BACTERIA</b>			
Gram-positive bacteria	43	118	161
<i>Staphylococcus aureus</i>	24	63	118
<i>Staphylococcus aureus</i>	13	35	48
Coagulase (-) staphylococci	5	15	20
Diphtheroids	3	4	20
Enterococci	2	nntüiv: 3	5
<i>Streptococcus pneumonia</i>	—	4	4
p-hemolytic streptococci	1	2	3
Gram-negative bacteria	19	55	74
<i>Escherichia coli</i>	11	38	49
<i>Pseudomonas aeruginosa</i>	5	10	15
<i>Enterobacter</i> spp.	2	5	7
<i>Proteus mirabilis</i>	1	2	3
<b>ANAEROBIC BACTERIA</b>			
<i>Clostridium</i> spp.	1		1

Table 3. Characteristics of the patients

	Home delivery n=32	Hospital Delivery n=98		Total n=130
Age (day)	3.5+1.8 <sup>a</sup>	5.6+2.4	<0.05	-
Sex(M/F)	19/13	54/44		0aT**
Low socio-economic status <sup>b</sup>	30(94) <sup>c</sup>	88 (90)	NS <sup>d</sup>	118(91)
Risk factors				
1. Prematurity-being SGA	10(31)	45 (45)	NS	55(41)
2. Septic delivery <sup>e</sup>	5(15)	10(10)	NS	15(11)
3. Umbilical catheter	1 (3) <sup>f</sup>	5(5) <sup>f</sup>		6(4)
Systemic findings	22 (68)	25 (25)	<0.05	47(36)
1. Temperature (<36/>38°C)	17 (53)	20 (20)	<0.05	37(28)
2. Poor sucking	8(25)	11 (11)	NS	19(14)
3. Abdominal distension	7(21)	8(8)	NS	15(11)
Laboratory findings				
1. WBC (x10 <sup>9</sup> /mm <sup>3</sup> )	12.7+5.3	10.3+4.9	NS	-
2. Neutrophil (XKp/mm <sup>3</sup> )	6.8+3.4	5.4+3.2	NS	-
Mortality	11 (34)	8(8)	<0.05	19(14)

a. Mean+SD.

b. Socioeconomic status was determined on the basis of multiple criteria comprising family education level, family occupation, income and housing condition.

c. Numbers in paranthesis, percent.

d. NS: Non significant.

e. Septic delivery was defined as non-sterile delivery excluding home delivery, premature rupture of membranes or maternal infection.

f. Stastical analysis was not done because the number of patients was too small.

epidermidis and Streptococcus pyogenes in the etiology of omphalitis. Recent studies (4,7) suggest that gram-negative organisms have an important role. Gram-negative colonization, especially with Escherichia coli has increased because of the advent of prophylactic antistaphylococcal umbilical cord care with agents such as alcohol, chlorhexidine, hexachlorophene and triple-dye. However, no differences were seen between the two categories concerning distribution of the different strains isolated in this study.

The risk factors affecting morbidity and mortality of neonatal omphalitis previously cited by Davies (12) include low birth weight (<2500 g), prior umbilical catheterization and septic delivery as suggested by premature rupture of membranes, maternal infection or nonsterile delivery. Güvenç et al (4) have recently extended these risk factors by the addition of home delivery and prematurity-being small for gestational age, septic delivery and umbilical catheterization were similar in the twocategories. However, the significantly higher level of severe infection and mortality in the infants born at home is an important observation. The presence of home deliveries may be explained traditional and socio-cultural factors in Turkey, especially in low socio-economic class. It is probable that home delivery affects morbidity and mortality because of inadequate education about pregnancy and delivery poor nutrition and poor prenatal-perinatal care of pregnant women in a lower socio-economic class. We conclude that developing countries probably have much higher rates of home deliveries and neonatal omphalitis than developed countries. Neonatal omphalitis might be reduced by encouraging delivery under aseptic conditions in hospital and promoting

routine aseptic cord care with agents such as chlorhexidine, hexachlorophene, alcohol and/or triple-dye.

#### Doğj Anadolu Bölgesi'nde neonatal omfalit

Neonatal omfalit gelişmekte olan ülkelerde sık görülen bir enfeksiyondur. Doğu Anadolu bölgesinde bir üniversite hastanesinde Ocak 1989 ile Aralık 1992 tarihleri arasında omfalit tanısı konan 130 yenidoğan incelendi. Hastanede doğarlarda yıllık insidans % 7.1 idi. Omfalitler evde (n=32) ve hastanede (n=98) olan doğumlara göre iki gruba ayrıldı. Gram-pozitif bakteriler (n:87, % 66,9) gram-negatiflere (n: 74, %56,9) göre daha fazla idi. *Staph.aureus* ve *E. Coli* en sık izlenen mikroorganizmalardı. Her iki grupta prematürelilik (n:55, %41) ve bakteriyolojik incelemeler benzerdi. Çalışmadaki tüm mortalité % 14 idi. sistemik bulgular ve mortalité oranları için ortalama yaş yönünden iki grup arasındaki önemli fark (p<0.05) evdeki doğumların neonatal omfalit açısından bir risk faktörü olduğunu düşündürmektedir. [Turk J Med Res 1994; 12(3): 118-121]

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