ABSTRACT

Background: Ophthalmia neonatorum (ON) is the most common eye infection occurring in the first 28 days of life. Although most of these cases are benign, some may progress to systemic complications or blindness if left untreated. Objectives: The current study was conducted with the aim of revealing the bacteriological causes of conjunctivitis in neonates and the antibiotic sensitivity pattern of these bacteria. Materials and methods: The study included all neonates at the age of 1 to 28 days presenting at the neonatal nurseries with Neonatal Intensive Care Unit (NICU) and level II care beds in three hospitals; Authority of Al-Thawra General Hospital, Al-Kuwait University Hospital and Al-Sabeen Maternity & Child Hospital in Sana’a city, Yemen. A full history was taken from each nurse and mothers of the neonates included in the study in which the findings were recorded in a predesigned questionnaire including socio demographic, maternal clinical information and therapeutic interventions. To isolate the causative agent, the conjunctival swabs were inoculated on proper media and bacteria were identified by standard microbiological methods and antibiotic resistance was done for the isolates.

Results: 203 swabs were collected from newborns with eye discharge over a nine-month period. Positive growth rate was 51.7%, males were more affected (57.1%), 80% of affected neonates had low birth weight, 71.4% of preterm infants, and most affected infants were preterm (P < 0.01). There was a significant relationship between invasive and non-invasive mechanical ventilation with neonatal conjunctivitis (P < 0.05). Gentamicin showed good in vitro sensitivity to all bacteria isolated, Staphylococcus aureus (83%), Escherichia coli 84.6%, with P.aeruginosa it was 60%. Conclusion: The vast majority of cases of neonatal conjunctivitis were mild with a high level of occurrence, Staphylococcus aureus and Klebsiella pneumoniae were the major bacterial agents, neonatal conjunctivitis most likely to be a hospital-acquired infection. There was a significant association between phototherapy, non-invasive ventilation and incidence of neonatal conjunctivitis. Gentamicin had high activity against the bacteria isolated in this study.

Key words: antibiotic sensitivity, bacteriological causes, conjunctivitis, neonates, ophthalmia neonatorum (ON), Yemen

INTRODUCTION

Ophthalmia neonatorum (ON) also known as neonatal ophthalmia and/or neonatal conjunctivitis is the most common eye infection occurring in the first 28 days of life. Although most of these cases are benign, some may progress to systemic complications or blindness if left untreated. The conjunctiva of the newborn is sterile at birth but shortly becomes colonized by many microorganisms that may be either pathogenic or non-pathogenic. The conjunctiva of the newborn is susceptible to infection, not only because of low levels of antibacterial agents and proteins such as lysozyme and immunoglobulins A and G, but because the lacrimal membrane and outflow are just beginning to develop. Neonatal ophthalmia is characterized by purulent discharge of the eye and redness of the conjunctiva with or without swelling of the eyelid. However, clinical presentations of neonatal ophthalmia are not etiologically diagnostic and microbiological work with cytology, cultures and microbial sensitivities is obligatory. The choice of antimicrobial therapy is based on the findings of the laboratory. Neonatal conjunctivitis is a global problem with incidence ranging from 0.9% to 33% in different countries. Neonatal ophthalmia is usually acquired either from the maternal reproductive system or acquired after birth from a hospital or community setting. It can be caused by chemical inflammation, bacterial infections, and viral infections, but most cases of conjunctivitis in newborns are caused by bacterial factors.

Bacterial pathogens most frequently reported as causative pathogens are coagulase-negative Staphylococci, coliforms, pneumococci, Staphylococcus aureus and enterococci which tend to cause mild to moderate disease. Furthermore, viral pathogens that cause mild conjunctivitis in neonates such as rhinovirus, adenovirus and bocavirus. In addition, Pseudomonas aeruginosa, Chlamydia trachomatis, and Neisseria gonorrhoeae are associated with severe conjunctival infections. Predisposing factors, which can increase the chance of a newborn developing neonatal conjunctivitis include increased shedding of these organisms into the mother’s vaginal tract during the last trimester,
premature rupture of membranes, and prolonged labor. Neonatal conjunctivitis after cesarean delivery can be due to intrauterine *chlamydial* infection as a result of early rupture of membranes. Many studies have been conducted to study the health problems of infants and children in Yemen, including infectious diseases such as tetanus, protozoa, hepatitis viruses, and even eye problems such as trachoma and corneal ulcers, but there is no single study regarding Ophthalmia neonatorum prevalence, bacteriological causes, and antibiotic sensitivity pattern, in order to know the realistic recommendations for the routine prevention of the eye, which must be practiced immediately after birth, to prevent the occurrence of this dangerous infection for newborns. Therefore, the current study was conducted with the aim of revealing the bacteriological causes of conjunctivitis in neonates and the antibiotic sensitivity pattern of these bacteria.

**MATERIALS AND METHODS**

**Study design:** A prospective cross-sectional study.

**Study population and study area:** This study was conducted over a period of 9 months (February, 2021- October, 2021). This study included all neonates at the age of 1 to 28 days presenting at the neonatal nurseries with Neonatal Intensive Care Unit (NICU) and level II care beds in three hospitals; Authority of Al-Thawra General Hospital, Al-Kuwait University Hospital and Al-Sabeen Maternity & Child Hospital in Sana’a city, Yemen. There were no protocols for prophylaxis to neonatorum ophthalmia in the three hospitals during the period of the study.

**Inclusion criteria:** All babies at the age of 1 to 28 days presenting with purulent, mucoid or mucopurulent discharge either in one or both eyes.

**Exclusion criteria:** Hospitalized neonates under treatment.

**Sample size calculation:** This cross-sectional study was performed on 203 neonates (112 male and 91 female) aged 28 days. The sample size was calculated according to the following: The population of neonates attended to the tertiary hospitals in Sana’a city was 45,000 per year. With expected frequency of neonatal conjunctivitis as previous report (15.8%) Also, with acceptable margin of error equal to 5% at Confidence Level 95%.

**Data collection:** A full history was taken from each nurse and mothers of the neonates included in the study in which the findings were recorded in a predesigned questionnaire including socio demographic, maternal clinical information and therapeutic interventions.

**Specimen collection:** Physical examination was conducted on all study population and the severity of the conjunctivitis was detected. The specimens were taken by a trained health care personnel by using a sterile cotton swab which was moistened with sterile saline. Two conjunctival swabs were taken, one for each eye, even if the infection was only in one eye. The specimens were collected from the inferior conjunctival fornix with avoiding the eyelid border and eye lashes and were inoculated directly onto the beforehand prepared culture plates then transported in secure boxes to Al-kwaid University Hospital microbiological laboratory to be processed in the same day.

**Culturing of eye swabs:** To isolate the causative agent, the conjunctival swabs were inoculated on proper media and bacteria were identified by standard microbiological methods.

**Antibiotic susceptibility testing:** Antibiotic resistance was done using Kirby-Bauer disc diffusion methods and interpretation of antibiotic sensitivity results was done according to CLSI.

**RESULTS**

A total of 203 swabs were collected from neonates with eye discharge over nine months. The general characteristics of all neonates in this study are shown in Table (1). Table (2) shows that the most common bacteria implicated in ophthalmia neonatorum in order of decreasing frequency were *Staphylococcus aureus*, *Klebsiella pneumoniae*, *Escherichia coli* and *Pseudomonas aeruginosa*. Table (3) shows that among 105 samples (51.7%) yielded growth and no growth was detected in 98 samples (48.3%). Among this study, the affected males were 60 (57.1%) and the affected females were 45 (42.9%). The difference between the proportions of affected males and females was not statistically significant (*P* = 0.56). Eighty percent of affected neonates were low birth weight (The mean ±SD weight of the neonates was 2.6 ± 0.5 kg). Out of the total number of 105 bacterial conjunctival neonates, 30 (28.6%) babies were term (gestational age greater than 37 completed weeks), while 75 (71.4%) were preterm (gestational age < 37 weeks). None of the babies was post-term (gestational age greater than 42
weeks). Most of the affected neonates were premature which was statistically significant \((P < 0.01)\). The mean age of onset was 8.8±6.7 days Most cases of neonatal conjunctivitis \(78\) (74.3\%) occurred in the first week of life while \(21\) (20\%) presented within the second week of life. The rest of cases \(5\) (4.8\%) and \(1\) (0.95\%) developed in the third and the fourth week of life, respectively. Bilateral conjunctivitis was present in \(117\) (57.6\%) of all neonates, while unilateral involvement was seen in \(86\) (42.4\%) of the patients. Table \(4\) shows that among \(105\) neonates with conjunctivitis, \(70\) (66.7\%) neonates were delivered vaginally and \(35\) (33.3\%) were delivered by cesarean section. There was no relation between the delivery mode with neonatal bacterial conjunctivitis \((P = 0.46)\). A positive history of prolonged rupture of fetal membranes \((> 18\) hours\) was documented in \(9\) (8.6\%) neonates with conjunctivitis, however, it was not statistically significant \((p = 0.69)\). Moreover, no relation between the history of maternal infections of the lower genital tract with neonatal bacterial conjunctivitis \((p = 0.099)\). Table \(5\) showed that there was a statistically significant between invasive and non-invasive mechanical ventilation with neonatal conjunctivitis \((P < 0.05)\). Among \(105\) neonatal conjunctivitis cases, \(3\) cases (2.9\%) needed invasive mechanical ventilation and \(26\) cases (24.8\%) needed noninvasive mechanical ventilation mainly nCPAP (nasal continuous positive airway pressure) during their stay in NICU. There was a statistically significant association between NNPT and conjunctivitis \((P < 0.01)\). Neonates who underwent phototherapy presented an incidence rate of conjunctivitis of \(59\) (56.2\%) notably higher than among those without phototherapy criteria \(46\) (43.8\%). There was not a statistically significant association between application of Alcohol and the occurrence of conjunctivitis \((P = 0.845)\). Among \(105\) neonatal conjunctivitis, \(71\) (67.6\%) cases were applied Alcohol and \(34\) (32.4\%) were not applied Alcohol. Table \(6\) shows that gentamycin showed a good sensitivity in vitro to all isolated bacteria. S. aureus was found to be sensitive to gentamycin (83\%), followed by Chloramphenicol (77.9\%), ofloxacin (64.4\%), erythromycin (55.9\%) and tetracycline (45.2\%). While, Klebsiella pneumoniae was resistant to erythromycin and sensitive to gentamycin, ofloxacin, tetracycline and chloramphenicol as following (56.6\%, 43.3\%,40\% and 33.3\%, respectively). E.coli showed sensitivity to gentamycin, ofloxacin and chloramphenicol (84.6\%, 46.1\%,40\% and 38.4\%, respectively). Also, P.aeruginosa showed sensitivity only to gentamycin (60%) and ofloxacin (30%).

**DISCUSSION**

In this study, bacteria cultures were positive in 51.7\% of the neonates and 48.3\% of the neonates were free of demonstrable pathogenic bacteria despite the presence of conjunctivitis. Similar prevalence rates were reported from Saudi Arabia (60\%)22,23 and Iraq (69\%) 24. However, higher prevalence rates (81.5\% and 80.5\%), from UAE and Iran, respectively were reported 24,25. This wide variation may be attributed to differences in the geographic distribution of pathogens and standards of obstetric and perinatal care. In this study, 98 samples (48.3\%) did not reveal any growth that might be due to other organisms that had not been researched such as Candida albicans or viruses. This negative percentage is higher than Saudi Arabia (40\%) and Iraq (31\%)22,23.

The present study shows a high percentage of S. aureus as the most common causative agent (56.2\%) followed by Klebsiella pneumoniae (28.6\%), Escherichia coli (12.4\%) and less commonly by pseudomonas auroginosa (2.9\%). Similarly, several studies reported that Staphylococcus aureus is the main bacterial cause of neonatal conjunctivitis from different parts of the world, including the United Arab Emirates, Iran (53.9\%), Nigeria (57.1\%) and Pakistan (65\%)24-27. In contrast, Enterobacter cloaceae (26.3\%), Klebsiella pneumoniae (25.36\%) and Escherichia coli (35\%) were the primary isolates from Saudi Arabia, Iraq and India, respectively 22,23,25. However, the role of Staphylococcus aureus in neonatal conjunctivitis is controversial because it is often isolated from the eyes of asymptomatic neonates 29. However, in this study only newborns with signs and symptoms of conjunctivitis were evaluated. Although prophylaxis for neonatal Neisseria, gonorrhoea and Chlamydia trachomatis was not used in these three hospitals; Neisseria gonorrhoeae and Chlamydia trachomatis, which are usually causes of ophthalmia neonatorum, have not been diagnosed. A similar finding of zero or minimal cases of gonococcus and chlamydial conjunctivitis has been reported elsewhere26,27. This finding may indicate a rare occurrence of gonorrhoea and chlamydia in the community.

In the current study, 57.1\% of ON patients were males and 42.9\% were females, this is similar to that reported from Iran, Nigeria and Saudi Arabia with slightly increased in male patients (54.4\%)25, (66.3\%) 26 and (51\%) 22. It was also observed in this study that the majority of positive cases of bacterial cultures occurred between the lowest birth weight (80\%) and premature neonates (71.4\%), because these groups of neonates are more at risk as confirmed by the results of Dias et al. 30. This study showed a statistical significance between gestational period and the occurrence of conjunctivitis.
Neonates with a positive bacterial culture were 71.4% preterm vs. 28.6% full term. This finding is in agreement with a study by Dias et al. in Portugal. This can be attributed to the fact that conjunctivitis may develop more frequently in premature babies where they spend a long time with their eyes closed or covered, allowing bacteria to multiply, and due to the immature lacrimal system. A functional lacrimal system produces tear components, opening and closing of the eyelids act as a pump to facilitate tear distribution across the surface of the eye and the lacrimal ducts act as a drainage system, which carries away tears, epithelial debris and bacteria. It was also noted in the current study that the vast majority of 78 cases (74.3%) occurred during the end of the first week of life. This finding is in agreement with studies from Nigeria and Iran where the majority of cases occurred within the first week of life and between 1 and 12 days of age, respectively. The result indicates that the first week of life is the most susceptible period for conjunctivitis in infants. Also, the mean age of onset in the current study is 8.8 days indicating that ON is postnatally acquired. This study showed that there was no statistical significance between ON and the conjunctivitis wither it is unilateral or bilateral ($P = 0.883$). Bilateral conjunctivitis was present in 57.1% of patients, and unilateral involvement was seen in 42.9% of the patients. This result is similar to that reported by Afjeiee et al.

In our study, many risk factors for bacterial neonatal conjunctivitis were evaluated. Some of them are maternal risk factors and the others related to the medical intervention during the stay at hospitals wither in NICU or in the nurseries. We found that there was no statistical significance between bacterial conjunctivitis and the maternal risk factors like the mode of delivery, PROM and the history of vaginal discharge ($P > 0.005$). These results are similar to results from India, Iran and Pakistan. This result might be due to the fact that the conjunctivitis is acquired from the hospitals as a result of contamination not from mothers.

In regarding to other risk factors which result from clinical intervention, we found that there was statistical significance in applying the invasive or noninvasive mechanical ventilation ($P < 0.05$). This result is similar to that reported by Borer et al. and Dias et al. in which ventilation was a risk factor. The association between ON and respiratory support including nCPAP and invasive mechanical ventilation was interpreted as infants needing ventilator assistance may allow respiratory secretions to be transferred from the nasopharynx to the eyes, particularly during suctioning. Another interpretation is that the mechanical ventilation as nCPAP usually need more manipulations and operating with hands that lead contamination with skin normal or potential pathogenic bacteria.

In this present study, there was statistical significance between applying of neonatal phototherapy and the occurrence of bacterial conjunctivitis ($P < 0.01$). This result is similar to the results reported by Faulhaber et al. and Bayatmokhtari et al. This association is attributed to the using the eye protection devices during applying of the phototherapy. Also, the eye shield reduces the blinking which has protective effects from bacterial colonization in the conjunctival sac and lead to conjunctivitis. In our study, there was no statistical significance in application of antimony ($P = 0.845$). Pure kohl contains antimony sulfide and trisulfide as its main constituents. It is a traditional eyeliner and is taken from dark stone known in Arabic as “ithmed” stone. Al-kohl is used in our community to darken the eyelids and serve as cosmetics. This result comes in agreement with a study conducted in Nigeria by Isa et al.

The sensitivity patterns in this study revealed that the highest sensitivity of S. aureus was to gentamicin 83% which is similar to the result reported by Dias et al. In contrast, in another study in Iraq, Staphylococcus aureus was more sensitive to ciprofloxacin followed by chloramphenicol. Klebsiella pneumoniae in this study had an average sensitivity of gentamicin 56.6%, however, in another study in Nigeria, Klebsiella pneumoniae was resistant to gentamicin but sensitive to ceftazidime. Finally came Escherichia coli, which showed a high sensitivity to gentamicin (84.6%) and moderate sensitivity of Pseudomonas aeruginosa to gentamicin (60%).

**CONCLUSION AND RECOMMENDATION**

The vast majority of cases of neonatal conjunctivitis were mild with a high level of occurrence, Staphylococcus aureus and Klebsiella pneumoniae were the major bacterial agents, neonatal conjunctivitis most likely to be a hospital-acquired infection. There was no statistically significant association between maternal risk factors (prelabour rupture of membranes, presence of vaginal discharge and mode of delivery) and neonatal conjunctivitis, but there was a significant association between phototherapy, non-invasive ventilation and incidence of neonatal conjunctivitis. Gentamicin had high activity against the bacteria isolated in this study. Microbiological examinations are needed
prior to treatment for cases of NO, routine eye prophylaxis as soon as possible after delivery, regardless of whether it was delivered vaginally or by caesarean section, and health workers in neonatal units should pay attention to infection control practices in order to reduce the level of pollution.

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CONFLICT OF INTEREST

No conflict of interest associated with this work.

AUTHOR’S CONTRIBUTIONS

The first author is a master’s student who did the field and lab work and wrote the thesis. All other authors participated in writing the article, reviewing the results and supervising the master’s thesis, especially Prof. Ahmed Al-Joufi and Prof. Essam Al-Shamahi.

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## Results

Table 1: General characteristics of the study population.

| Variable                          | Frequency | percentage |
|-----------------------------------|-----------|------------|
| **Gender**                        |           |            |
| Male                              | 112       | 55.2 %     |
| Female                            | 91        | 44.8 %     |
| **Weight**                        |           |            |
| Normal weight                     | 141       | 69.5 %     |
| LBW                               | 62        | 30.5 %     |
| **Gestational category**          |           |            |
| Preterm                           | 88        | 43.4 %     |
| Term                              | 115       | 56.7 %     |
| Post-term                         | 0         | 0 %        |
| **Onset of conjunctivitis**       |           |            |
| First week                        | 112       | 55.2 %     |
| Second week                       | 55        | 27.1 %     |
| Third week                        | 21        | 10.3 %     |
| Fourth week                       | 15        | 7.4 %      |
| **Mode of delivery**              |           |            |
| Spontaneous Vaginal delivery      | 140       | 69 %       |
| Cesarean section                  | 63        | 31 %       |
| **Mechanical Ventilation**        |           |            |
| Invasive                          | 48        | 23.6 %     |
| Noninvasive                       | 37        | 18.2 %     |
| Without                           | 118       | 58.1 %     |

| Variable                          | Frequency | percentage |
|-----------------------------------|-----------|------------|
| Neonatal phototherapy (NNPT)      |           |            |
| Yes                               | 86        | 42.4 %     |
| No                                | 117       | 57.6 %     |
| Antimony (Kohl) applied           |           |            |
| Yes                               | 136       | 67 %       |
| No                                | 67        | 33 %       |
| Eye involvement                   |           |            |
| Unilateral                        | 86        | 42.4 %     |
| Bilateral                         | 117       | 57.6 %     |

Table 2: The Frequency of isolated bacteria causing neonatal conjunctivitis.
| The bacteria                | Number of isolates | Percentage |
|----------------------------|--------------------|------------|
| *Staphylococcus aureus*    | 59                 | 56.2%      |
| *Klebsiella species*       | 30                 | 28.6%      |
| *Escherichia coli*         | 13                 | 12.4%      |
| *Pseudomonas aeruginosa*   | 3                  | 2.9%       |
| **Total**                  | **105**            | **100%**   |

Table 3: Demographic data and clinical manifestations among neonates with bacterial conjunctivitis (n=105).

| Variable                  | Bacterial conjunctival neonates=105 | Non-bacterial conjunctival neonates=98 | OR  | 95% CI       | X²    | p-value |
|---------------------------|------------------------------------|---------------------------------------|-----|---------------|-------|---------|
| Gender                    |                                    |                                       |     |               |       |         |
| Male                      | 60 (57.1%)                         | 52 (53.1%)                           | 1.2 | 0.7-1.2       | 0.34  | 0.55    |
| Female                    | 45(42.9%)                          | 46 (46.9%)                           |     |               |       |         |
| Weight                    |                                    |                                       |     |               |       |         |
| LBW                       | 84(80.0%)                          | 57(58.2%)                            | 2.9 | 1.5-5.4       | 11.3  | 0.00    |
| Normal weight             | 21(20.0%)                          | 41(41.8%)                            |     |               |       |         |
| Gestational period        |                                    |                                       |     |               |       |         |
| Preterm                   | 75 (71.4%)                         | 13 (13.3%)                           | 0.1 | 0.03-0.13     | 69.8  | < 0.01  |
| Term                      | 30 (28.6%)                         | 85 (86.7%)                           |     |               |       |         |
| Onset of conjunctivitis   |                                    |                                       |     |               |       |         |
| First week                | 78(74.3%)                          | 34(34.7%)                            | 2.7 | 1.7-4         | 4.1   | 0.04    |
| Second week               | 21(20.0%)                          | 34(34.7%)                            |     |               |       |         |
| Third week                | 5(4.8%)                            | 16(16.3%)                            |     |               |       |         |
| Fourth week               | 1(1.0%)                            | 14(14.3%)                            |     |               |       |         |
| Eye involvement           |                                    |                                       |     |               |       |         |
| Unilateral                | 45(42.9%)                          | 41(41.8%)                            | 1.04| 0.6-1.9       | 0.02  | 0.88    |
| Bilateral                 | 60(57.1%)                          | 57(58.2%)                            |     |               |       |         |

OR (Odd ratio) >1 (at risk)  
X² (Chi square) ≥ 3.7  
CI: Confidence Intervals  
P (Probability value) < 0.05 (significant)
Table 4: The maternal risk factors correlation with ophthalmia neonatorum.

| Parameter                                      | Bacterial conjunctival neonates=105 | Non-bacterial conjunctivital neonates=98 | OR  | 95% CI      | X2   | P-value |
|-----------------------------------------------|-------------------------------------|-----------------------------------------|-----|-------------|------|---------|
| Mode of delivery                              |                                     |                                         |     |             |      |         |
| o Vaginal delivery                            | 70(66.7%)                           | 70(71.4%)                               | 0.8 | 0.44-1.4    | 0.54 | 0.46    |
| o Cesarean section                            | 35(33.3%)                           | 28(28.6%)                               |     |             |      |         |
| PROM*                                         |                                     |                                         |     |             |      |         |
| o Present                                     | 9(8.6%)                             | 10(10.2%)                               | 0.82| 0.32-2.1    | 0.16 | 0.69    |
| o Absent                                      | 96(91.4%)                           | 88(89.8%)                               |     |             |      |         |
| History of maternal infections of the lower genital tract |                                     |                                         |     |             |      |         |
| o Infected                                    | 50(47.6%)                           | 58(59.2%)                               | 0.63| 0.36-1.1    | 2.7  | 0.099   |
| o Non-infected                                | 55(52.4%)                           | 40(40.8%)                               |     |             |      |         |

OR (Odd ratio) >1 (at risk)                     X2 (Chi square) ≥ 3.7
CI: Confidence Intervals                        P (Probability value) < 0.05 (significant)

*PROM: Prolonged rupture of membranes

Table 5: Clinical intervention and Alkohl application as risk factors among newborns with bacterial conjunctivitis (n=105).

| Parameter                                      | Bacterial conjunctival neonates=105 | Non-bacterial conjunctivital neonates=98 | OR  | 95% CI      | X2   | P-value |
|-----------------------------------------------|-------------------------------------|-----------------------------------------|-----|-------------|------|---------|
| Mechanical Ventilation                        |                                     |                                         |     |             |      |         |
| o Invasive                                    | 3(2.9%)                             | 45(45.9%)                               | 0.04| 0.01-0.12   | 52   | < 0.01  |
| o Noninvasive                                 | 26(24.8%)                           | 11(11.2%)                               | 2.6 | 1.2- 5.6    | 6.2  | 0.013   |
| o None                                        | 76(72.3%)                           | 42(42.9%)                               |     |             |      |         |
| NNPT                                          |                                     |                                         |     |             |      |         |
| - Exposed                                     | 59(56.2%)                           | 27(27.6%)                               | 3.4 | 1.9-6.1     | 17   | < 0.01  |
| - Non-exposed                                 | 46(43.8%)                           | 71(72.4%)                               |     |             |      |         |
| Alkohl (antimony)                             |                                     |                                         |     |             |      |         |
| - Applied                                     | 71(67.6%)                           | 65(66.3%)                               | 1.0 | 0.59-1.9    | 0.038| 0.845   |
| - Not applied                                 | 34(32.4%)                           | 33(33.7%)                               |     |             |      |         |

OR (Odd ratio) >1 (at risk)                     X2 (Chi square) ≥ 3.7
CI: Confidence Intervals                        P (Probability value) < 0.05 (significant)

NNPT: Neonatal phototherapy
Table 6: Antibiotics susceptibility to isolated bacteria.

| Antibiotic      | S.aureus Sensitivity (%) | K. pneumoniae Sensitivity (%) | E. coli Sensitivity (%) | P.aeruginosa Sensitivity (%) |
|-----------------|--------------------------|-------------------------------|-------------------------|-------------------------------|
| Chloramphenicol | 46 (77.9 %)              | 10(33.3%)                     | 5(38.4%)                | -                             |
| Erythromycin    | 33 (55.9%)               | -                             | -                       | -                             |
| Gentamycin      | 49 (83%)                 | 17(56.6%)                     | 11(84.6%)               | 2(60%)                       |
| Ofloxacin       | 38 (64.4%)               | 13(43.3%)                     | 6(46.1%)                | 1(30%)                       |
| Tetracycline    | 32 (54.2%)               | 12(40%)                       | -                       | -                             |