Nigerian Journal of Paediatrics 1987; **14(3&4)**:79-82

Neonatal Respiratory Syncytial Virus Infection in Benin

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SUMMARY

Nwankwo MU, Dym A, Olomu IN, Okolo AA, Omene JA and Schuit KE. Neonatal. Respiratory Syncytial Virus Infection in Benin. *Nigerian Journal of Paediatrics,* **1987 14:0.** The occurrence of respiratory syncytial virus (RSV) infection in a Special Care Baby Unit was studied during a three-week period in July/August 1985, when RSV infection was known to be prevalent in the community. Nasopharyngeal washing were obtained weekly from all neonates in the Unit who were aged more than 5 days, until they were discharged. RSV antigen was detected by enzyme linked immunosorbent assay (ELISA). Five of 25 babies studied had RSV infection; these included 2 neonates infected on admission and 3 nosocomial infections among 10 contact infants. Babies in incubators were not infected. All infected infants, irrespective of age, had severe bronchopneumonia. This contrasts with previous reports indicating the mild nature of RSV infection in neonates less than 3 weeks of age.

Introduction

THE respiratory syncytial virus (RSV) is the most common respiratory pathogen in infants and young children.[1] However, it is said to be uncommon in the first 4 weeks of life.[2] Early reports of RSV infections in neonates have suggested that the illness was usually mild and non-specific in babies less than 3 weeks of age.[3, 4] More recent studies however, show that RSV infections in neonates may manifest as severe respiratory disease.[5, 6] There is very little known of the epidemiology of RSV disease in the tropics. We recently found that 55% of children aged 2 months to 3 years admitted for lower respiratory tract infection in our hospital were associated with RSV infection.[7] In view of this high incidence, we decided to examine the occurrence of neonatal infections with RSV and to identify the clinical and epidemiologic patterns in a tropical setting.

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Materials and Methods

The Special Care Baby Unit (SCBU) of the University of Benin Teaching Hospital (UBTH) has a capacity for 20 babies. It consists of 4 open wards adjoining the Labour Suite. Two of the

wards are reserved specifically for babies born in the maternity unit of the hospital, while the other two wards are essentially for referred cases from maternity homes and hospitals in Benin and neighbouring towns in Bendel State, of which Benin is the capital. Babies in the unit are nursed either in incubators or in cots. Each ward is provided with a wash-hand basin and tap water. Hand washing is usually required on entering the unit and between handling of babies. However, running water has from time to time, been in short supply. Staff are not strictly restricted to any of the open wards and they do not routinely wear mask and gowns. Mothers are allowed and encouraged to breast-feed their babies.

All babies admitted to the Special Care Baby Unit (SCBU) during a 3-week period in July/August 1985 who were aged more than 5 days, were included in the study.

A small (size 5 French gauge) feeding tube was attached to the distal tube of a disposable mucus extractor and suction was provided by a suction machine. The baby was placed on its side and 1–2ml of phosphate buffered saline was instilled into the nostril with the feeding tube inserted into the naso-pharynx via the nostril. The naso-pharyngeal washings trapped in the mucus trap was then transferred into sterile glass tubes and stored at −40°C till assayed. These washings were obtained from babies once weekly until discharge. Eighteen babies were sampled on two occasions, 8 on three occasions and 3 on four occasions. *Respiratory* Syncytial Virus (RSV) was detected by the Enzyme Linked Immunosorbent Assay (ELISA) method using the ORTHO-RSV Antigen ELISA Test kit (ORTHO Diagnostic Systems Inc. N Jersey); this kit employs murine antibody and a horse radish peroxidase catalysed conversion of O-phenylene diamine dihydrochloride. Positive and negative controls were used for every assay. The sensitivity and specificity of this technique have previously been established in comparison with HEp-2 cell culture.[8]

Results

A total of 25 babies, 9 males and 16 females were studied. Ten of the 25 were delivered in UBTH and admitted to the SCBU for various problems. The other 15 were referred to the unit at ages ranging from 2 hours to 28 days.

Respiratory syncytial virus was identified in 5 babies all of whom were referred cases. Two of these 5 cases were admitted with bronchopneumonia, and nasal washings obtained within 48 hours of admission were positive for RSV. They were thus considered infected before admission. Of the remaining 13 referred babies, three were never in the same room with an infected baby. The other 10 babies shared an open ward with at least, one RSV infected baby. Thus, three (30%) of 10 contact babies acquired a nosocomial RSV infection. Two of these babies had negative ELISA for RSV on two occasions (at one week intervals) before acquiring the infection (Table I).

A review of the 10 contact babies showed that 5 of them were nursed in incubators throughout the period of study. None of these incubator babies acquired a nosocomial RSV infection. The other 5 babies were nursed in cots and 3 acquired infection. Significantly, one of the 3 babies was admitted with neonatal tetanus and nursed in an incubator during the early part of the study. Unfortunately, he was weaned to a cot while an infected baby was in the room and became positive for RSV after 3 previous negative washings.

Table I shows the detection of virus antigen in relation to time of admission in the 5 RSV infected neonates.

All infected babies had a progressive respiratory illness. Cough, tachypnoea and retractions were constant features and congestive cardiac failure occurred in 3 infants. All 5 babies had bronchopneumonia confirmed on chest radiograph There were no deaths (Table II).

TABLE I

Virus antigen detection in 5 RSV infected Babies

Baby	*Date of Admission*	*Date of Discharge*	*Date of nasophyaryngeal Sample collection* 31/7	6/8	13/8	21/8
A	29/7	7/8	+	+	Nil	Nil
B	30/7	7/8	+	+	Nil	Nil
C	9/8	15/8	Nil	Nil	+	Nil
D	23/7	15/8	–	–	+	Nil
E*	16/7	25/8	–	–	–	+

\+ = Positive
— = Negative
Nil = Sample not taken
* = Out of incubator on 8/8

TABLE II

Clinical and Radiographic Features in 5 RSV infected Babies

	A	*B*	*C*	*D*	*E*
Age at presentation (days)	25	11	6	18	42
Sex	F	F	F	M	M
Cough	+	+	+	+	+
Fever	+	+	–	–	–
Coryza	–	+	–	+	–
Vomiting	–	–	–	+	+
Tachypnoea	+	+	+	+	+
Chest retractions	+	+	+	+	+
Crepitations	+	+	–	+	+
Rhonchi	+	–	–	–	–
Heart failure	+	+	–	+	–
Chest x-ray finding	RLL infiltrate	RUL consolidation	RLL atelectasis	RUL cysts RLL infiltrates	Diffuse alveolar infiltrates

\+ — Present
— = Absent
RLL = Right lower lobe
RUL = Right upper lobe

Discussion

Our data show that RSV infection can readily occur in the newborn nursery involving babies less than 4 weeks old. In contrast to some early reports,[4] all the 5 babies in this study had severe pneumonia and were critically ill. Similar findings in neonatal RSV infections have also been reported by other workes.[6] The clinical features in our neonates were not different from those associated with RSV infections in older children and were similar for both community acquired and nosocomial infections. Although culture corroboration of RSV infection and follow-up serology were not available in this study, the sensitivity and specificity of this ELISA technique has been established.[7, 8]

Nosocomial infection occurred in 3 of ten babies exposed to RSV infected neonates. This is in agreement with previous reports by Hall *et al.*[9] However, the spread of infection in our study was limited to rooms where infected babies were nursed even though neither nurses nor doctors were cohorted to rooms or patients. Transmission of RSV infections has been thought to occur either by direct inhalation of large viral particles and droplets or by inoculation of contaminated secretions to nasal mucosa or conjunctiva. Small particle aerosols are thought to be unstable and therefore not important in transmission. Previous reports on nosocomial RSV infection have implicated hospital personnel.[9 10] Spread by personnel would involve indirect inoculation by secretions on hands and fomites.[11] Since spread in our study was limited to one room, it is unlikely that medical staff were important in the transmission. Although it has been shown that RSV particles can survive in secretions on various surfaces for up to six hours,[11] it is not known whether such survival is possible under the hot humid weather of a tropical setting. A reduction in the survival time of viral particles in secretions and fomites could be the reason for limited spread of the infection observed in this study.

Baby to baby transmission could explain the spread of RSV infection among contact babies in this series. When the distance between cots is less than 2 metres, direct inhalation of large droplets could occur.[11] Our nursery is often crowded and the distance between cots and incubators is usually less than 2 metres. Thus, large droplet aerosols could be spread between babies whose cots are separated by a distance of less than 2 metres, resulting in nosocomial infection.

Another interesting finding in the present study is the observation that babies in incubators appeared to have been protected from nosocomial infection. None of the 5 contact babies nursed in incubators throughout the study period acquired infection whereas 3 of 5 babies nursed in cots acquired infection. Indeed, one of the nosocomial infections occurred in a baby who remained RSV negative for two weeks while in an incubator only to acquire infection upon transfer to a cot. Incubators would be expected to offer a physical barrier to heavy droplets and would also limit the free flow of air and so diminish contact with aerosols.

The findings in the present study indicate that RSV can readily infect newborn babies in our community. The clinical manifestations of community acquired neonatal RSV infection are similar to the nosocomial infections and do not differ from RSV infections in the older child The mode of spread of RSV appears to be by direct baby to baby contact, and incubators provide effective barriers to spread.

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Accepted 4 May 1987