ORIGINAL ARTICLE

Colonization and Transmission of *Ureaplasma urealyticum* and *Mycoplasma hominis* from Mothers to Full and Preterm Babies by Normal Vaginal Delivery

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Summary

A prospective study was carried out among pregnant women and their newborn babies in the University Hospital, Kuala Lumpur from January 1996 to June 1997. The maternal cervical colonization rates of *Ureaplasma urealyticum* (UU) and *Mycoplasma hominis* (MH) were found to be 57.5% and 15.8% respectively while the isolation rates from nasopharyngeal secretions of the newborns were 50.8% for UU and 6.6% for MH. The overall transmission rates were 88.4% for UU and 42.1% for MH. There was no significant difference in the transmission rates of either organism from mothers to their respective newborn babies by the maturity of pregnancy.

In preterm babies, the nasopharyngeal isolation rates of UU and MH were not influenced by the babies' gestational age and birth weight nor by the maternal history of abortion or parity. However, there was a tendency for UU to persist in the nasopharyngeal secretion of preterm babies especially those of birth weight below 2kg. None of the babies contaminated with mycoplasmas at birth developed respiratory symptoms during six to eight weeks of follow-up.

Key Words: *Ureaplasma urealyticum, Mycoplasma hominis,* Colonization, Transmission

Introduction

The lower genital tract of up to 60% of sexually active women is colonized by ureaplasma and/or mycoplasmas and this prevalence is known to increase with an increase in the number of sexual partners, sexual activity at a younger age and low socio-economic status[1-5]. These mycoplasmas can be transmitted from colonized mothers to their newborn infants mainly through delivery and less commonly transplacentally or via an ascending route, especially when there is a prolonged rupture of membranes[6-10]. Rates of perinatal transmission of *Ureaplasma urealyticum* (UU) had been reported to range from 18% to 55% among full term infants and 29% to 55% among preterm infants[10].

This study was designed to determine: 1) the colonization rates of UU and *Mycoplasma hominis* (MH) among pregnant women delivering full and preterm babies in an average socio-economic population, 2) the transmission frequency of UU and MH to newborns in this population and 3) any persistence of these microbes at postnatal follow-up.

Materials and Methods

Patient population:

The study group consisted of 60 sequential mothers who delivered term live-born babies and 60 sequential mothers who delivered preterm live-born babies at the University Hospital, Kuala Lumpur, Malaysia. The gestational age of the preterm babies at birth was assessed by the date of the maternal last menstrual period and physical examination of the newborns by Dubowitz score[11]. This is classified for the purpose of this study as "term" if the gestational age of the baby was 37 weeks or more but less than 42 weeks and "preterm" if 36 weeks or less. All preterm babies of any fetal or maternal cause of premature labour, such as fetal abnormality, multiple pregnancy, maternal diabetes, hypertension, eclampsia, abruptio placenta, etc were not included. This study was approved by the University Hospital Ethics Committee and verbal informed consent was obtained from all mothers.

Bacteriologic methods:

A commercial kit, the Mycofast All-in kit (International Mycoplasma, France)[12], was used for the isolation, identification and limited antibiotic susceptibility testing of UU and MH. Briefly, in the delivery room, cervical secretion was collected from the mother using a plain sterile cotton swab during the first obstetric examination. The cotton swab soaked with the secretion was immediately broken off into the Mycofast All-in Transport Medium and subsequently transported to the laboratory within 12 hours of collection. In the laboratory, the bottle containing the transport medium with the broken cotton swab tip was vortexed for 10 to 15 seconds. The transport medium was then transferred into the Mycofast All-in lyophilisat and mixed thoroughly. Three drops of the resultant lyophilisat were inoculated into respective wells of the Mycofast tray and 2 drops of the MH supplement were then added to the wells for MH detection and enumeration. Subsequently, 2 drops of sterile liquid paraffin were added to all wells in the tray to exclude atmospheric oxygen from the lyophilisat to achieve anaerobiosis and the tray was incubated at 37°C. The inoculated Mycofast All-in tray was read by naked eye twice a day for up to 24 hours for cervical secretion and 72 hours for nasopharyngeal secretion. A positive result was indicated by a colour change in the respective wells for the detection of UU and MH.

Nasopharyngeal secretion from the baby was collected into a sterile mucous extractor which was connected to a low suction pump as soon as the baby's head was delivered. Three drops of the secretion were transferred immediately into the Mycofast All-in Transport Medium using a sterile Pasteur pipette. The inoculated transport medium was transported to the laboratory within 12 hours and subsequently processed in the same manner as for the maternal cervical secretion.

On postnatal follow-up (6 to 8 weeks post-delivery), nasopharyngeal secretion was collected from the babies using a sterile per nasal cotton swab. Similarly, the cotton swab was then broken off into the Mycofast All-in Transport Medium and transported to the laboratory within 12 hours. The specimens were processed as for the maternal secretions described above.

The statistical tests applied in this study were the Chi-square test, t-test and Kruskal-Wallis H test. All significant results were based on the value of $p<0.05$.

Results

During the one and a half year period from January 1996 to June 1997, 120 mother-infant pairs (60 term and 60 preterm) were enrolled in the study. The overall maternal cervical colonization rate at the time of delivery was 57.5% for UU and 15.8% for MH (Table I). The overall isolation rate of mycoplasmas from the nasopharyngeal secretions of newborn babies was 50.8% for UU and 6.7% for MH (Table II). Similarly, UU was isolated more frequently than MH from the nasopharyngeal secretions of both term and preterm babies irrespective of gender (Table III).

The overall transmission from mothers to their respective babies was 88.4%(61/69) for UU and 42.1% (8/19) for MH. There was no significant difference in the rate of transmission to term and preterm babies and the outcome of pregnancy was not significantly influenced by the presence of either organism in the cervix (Table I and II).

Table I
Cervical colonization rates of *Ureaplasma urealyticum* and *Mycoplasma hominis* of pregnant women at delivery

	Ureaplasma urealyticum			*Mycoplasma hominis*		
Pregnancy	Positive (n)	Negative (n)	Positive (%)	Positive (n)	Negative (n)	Positive (%)
Term	34	26	56.7	10	50	16.7
Preterm	35	25	58.3	9	51	15.0
Total	69	51	57.5	19	101	15.8

Table II
Isolation rate of *Ureaplasma urealyticum* and *Mycoplasma hominis* from the nasopharyngeal secretions of newborn babies at delivery

	Ureaplasma urealyticum			*Mycoplasma hominis*		
Maturity	Positive (n)	Negative (n)	Positive (%)	Positive (n)	Negative (n)	Positive (%)
Term	30	30	50.0	3	57	5.0
Preterm	31	29	51.7	5	55	8.3
Total	61	59	50.8	8	112	6.7

Table III
Isolation rate of *Ureaplasma urealyticum* and *Mycoplasma hominis* from the nasopharyngeal secretions of newborn babies by gender

	Ureaplasma urealyticum			*Mycoplasma hominis*		
Sex	Positive (n)	Negative (n)	Positive (%)	Positive (n)	Negative (n)	Positive (%)
Male	37	30	55.2	6	61	9.0
Female	24	29	45.3	2	51	3.8
Total	61	59	50.8	8	112	6.7

In the preterm babies the isolation of UU and MH was further stratified according to gestational age at birth and birth weight (Table IV). The mean gestational age was not significantly different in babies with and without UU ($t=1.67$, $p=2.79$) and MH ($t=1.66$, $p=0.25$). The mean birth weight was also not significantly different in babies with and without UU ($t=0.51$, $p=0.62$) and MH ($t=0.3$, $p=0.77$). In addition, UU isolation was not affected by a maternal history of abortion ($x^2=1.98$, $p=0.16$) or parity of pregnancy ($x^2=1.69$, $p=0.19$).

Of the 30 term and 31 preterm babies with positive nasopharyngeal secretions at the time of delivery, only 18 term babies and 14 preterm babies returned for the collection of second nasopharyngeal specimens during the postnatal period. UU was not isolated again from any of the 18 term babies but was recultured from 6 of the preterm babies, none of whom had any respiratory symptoms from discharge till the time of follow-up. This difference in the persistence of UU in the preterm and term babies is statistically significant (Fisher, $p=0.003$). UU persistence also appears to be related to

Table IV
Mycoplasmas isolation in preterm babies by gestational age and birth weight

		U. urealyticum		*M. homonis*	
		positive	negative	positive	negative
Gestational age (week)	Mean	33.0	34.0	32.6	33.7
	Range	28 - 36	29 - 36	30 - 35	28 - 36
	*SD	2.17	1.87	2.30	2.00
Birth weight (gram)	Mean	2121	2191	2223	2148
	Range	715 - 2860	1200 - 3000	1515 - 2640	715 - 3020
	*SD	589	478	462	544

*SD = Standard Deviation.

low birth weight as five of the six follow-up culture positive infants had birth weights below 2 kilogram (Kruskal-Wallis H=10.0, p=0.007). MH was not isolated from any of the babies at postnatal follow-up.

Discussion

This study shows that Malaysian pregnant women, like their counterparts in other parts of the world[1-5], are frequently colonised by mycoplasmas in the lower genital tract and these organisms are regularly transmitted to babies delivered by the normal vaginal route. In this study, transmission was not affected by gestational age or birth weight, but UU persisted longer in the upper respiratory tract of babies weighing less than 2kg at birth. This persistence could be due to the relative immaturity of the immune system in low birth weight babies.

None of the colonised babies in this study developed symptoms of respiratory disease within six to eight weeks of follow-up. In healthy, term babies, most mycoplasmal colonisations appear to be transient and of no sequelae[13], but in preterm infants, both UU and MH are established causes of perinatal morbidity and mortality[14,15]. Pneumonia is one of the commonest presentations of neonatal ureaplasma disease but diagnosis is complicated by the high rate of colonisation in the respiratory tract. Isolation from nasopharyngeal secretions, by itself, is not indicative of invasive lung disease even in symptomatic babies. A positive culture has to be interpreted along with other evidence of disease like chest X-ray findings, raised neutrophil counts and a specific IgM response[16]. Endotracheal secretions are more reliable specimens for culture. Although routine screening for UU is not necessary, it has been recommended that endotracheal secretions should be cultured in preterm babies weighing less than 1250gm, with signs of respiratory distress, soon after birth or when they are not responding to beta-lactam therapy. A therapeutic trial with erythromycin is often used when the diagnosis of UU infection is in doubt.

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