Risk Factors for Carriage of Group B Streptococcus in Southern Israel

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Abstract

Background: In southern Israel, a discrepancy between a relatively high prevalence of Group B streptococcus maternal carriage (12.3%) and a very low incidence of neonatal disease (0.1/1,000 live births) has been found despite the fact that no preventive strategy has been implemented.

Objectives: To determine the risk factors for maternal carriage in order to clarify this discrepancy and further examine the different aspects of GBS in southern Israel.

Methods: Cultures for GBS were obtained from 681 healthy pregnant women, and relevant demographic and obstetric data were collected. The medical records of 86 neonates born to carrier women were retrospectively examined. Statistical analysis was performed using the Pearson chi-square test.

Results: Women who were not born in Israel, particularly immigrants from the former USSR, were significantly prone to carry the pathogen compared to native Israeli women (Bedouins and Jews) (P = 0.03).

Conclusions: A high GBS transmission rate is expected among immigrants who came from areas with a high prevalence of maternal carriage to one with a low incidence of neonatal disease environment and were not subject to any preventive strategy. Clinical attention should be directed to this issue throughout Israel.

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Group B streptococcus, or *Streptococcus agalactiae*, is a beta-hemolytic, aerobic, Gram-positive, polysaccharide-encapsulated streptococcus [1]. Today, it is the leading cause of early invasive infections in newborns worldwide [2,3] and can cause life-threatening infections in pregnant women, in immunocompromised adults, and apparently in the general population as a whole [2].

The publication of treatment and prevention guidelines by the U.S. Centers for Disease Control and Prevention in 1996 [2] led to a significant decline in the incidence of early-onset neonatal disease in institutions that adopted and followed these guidelines strictly, e.g., 86% in Sydney, Australia [4]. The CDC recommendations are to screen the entire maternal population proximal to labor (35–37 weeks gestation) and to administer intrapartum prophylactic antibiotics to all carriers. In addition, if the maternal carrier status is not known at labor, chemoprophylaxis should be administered to all patients with one or more major risk factors indicated by the CDC and others as being significantly related to higher rates of maternal transmitted neonatal disease [2,5,6].

GBS = Group B Streptococcus
CDC= Centers for Disease Control and Prevention

In Israel there is no uniform policy and many institutions do not adhere strictly to the CDC guidelines. While the prevalence of maternal carriage in developed countries (United States, Western Europe, and Australia) was 10–50%, and the incidence of early-onset neonatal disease averaged 1.8/1,000 live births before CDC recommendations were applied, the prevalence of carriage and the incidence of neonatal disease in Israel were constantly low [3,4,7,8]. In 1977–78 in the Sharon region of the country, the prevalence of maternal carriage was 11.8% (only high risk pregnancies were included), and the early-onset neonatal disease incidence was 0.5–0.6/1,000 live births [9]. During 1977–82 in Haifa, the prevalence of carriage was 2.6% and the incidence of early-onset neonatal disease 0.08/1,000 live births [10]. During 1982–87 in Jerusalem, the prevalence of carriage and the incidence of neonatal early-onset disease were 3.5% and 0.2/1,000 live births, respectively [7], and during 1988–91 the prevalence of carriage climbed to 11% and the incidence of neonatal disease to 0.95/1,000 live births in the same hospital [11]. The same study group from Jerusalem performed another study in 1991 and found a maternal carriage prevalence of 7.2% [12]. In 1993, the prevalence of carriage in the town of Rehovot was 7.5% (only high risk pregnancies were included) [13].

As we reported previously, a carriage prevalence of 12.3% among healthy pregnant women was documented in southern Israel, in conjunction with an early-onset neonatal disease incidence of 0.1/1,000 live births [14]. This prevalence of carriage was the highest reported so far from Israel, and the discrepancy between the relatively high prevalence of carriage and the very low incidence of neonatal disease necessitates further investigation [14]. During the study, no definite protocol for GBS intrapartum prophylaxis was routinely used. We concluded from our results that the recommendation to screen the entire maternal population should not be applied in southern Israel since the incidence of neonatal disease in this region remains constantly low [3,14]. By adopting this policy, we cannot predict if there are any subgroups left at risk of transmitting GBS to their offspring.

The objective of the present study was to determine the risk factors for carriage in the southern Israeli maternal population, which consists of approximately 75% Jews (representing 48% of all births) and 25% Bedouins (representing 52% of all births). Among the Jewish population, approximately 20% (representing 10% of all births) are immigrants. Some immigrants are non-Arab/non-Jewish residents (<1%).

Subjects and Methods

A prospective study was conducted from January to October 2000 at the Soroka University Hospital, after being approved by the local institutional review board (Helsinki Committee). All patients gave their informed consent.

The 681 healthy pregnant women who presented to the labor and delivery room were cultured for GBS, according to CDC recommendations (at ⩾ 35 weeks gestation or having preterm contractions) [2]. The same investigator took all the samples before conducting a pelvic examination and before using any disinfecting materials. The swab was first inserted into the distal third of the vagina (without using a speculum) and afterwards into the rectum as recommended by the CDC [2]. All samples were taken by the same investigator. The microbiologic processing has already been described in detail [14].

After labor and delivery, all women underwent a bedside postpartum interview using a specific uniform questionnaire. Maternal demographic status was assessed, including age, level of education, nationality, origin, and marital status. The socioeconomic status was assessed according to the family income in comparison to the average income in Israel, as subjectively reported by the patient. Maternal general health variables included fever in current or past labor, antibiotic treatment in current pregnancy, verified genitourinary tract infections in present and/or past gestations, gestational diabetes, and gestational hypertension. Obstetric status variables included the number of parities and gestations, past abortions, number of fetuses in the current pregnancy, gestational week of membrane rupture, mode of current labor, history of cesarean sections or premature deliveries, and known neonatal GBS disease in previous deliveries.

If the woman could not be located in the hospital, an attempt was made to interview her by phone. If this attempt was unsuccessful, we completed the questionnaire using the available data from the patient's medical records.

The medical records of all neonates born to maternal carriers were examined as well. Variables included gender, neonatal GBS disease, neonatal hospitalizations, infant's weight at delivery, week of gestation in which the infant was born, Apgar scores (at 1 and 5 minutes), blood gas values at delivery, infant's temperature at delivery, and resuscitations at birth.

The Pearson chi-square test was used to evaluate associations between groups. A P value <0.05 was considered significant.

Results

Overall, 532 women were interviewed at the bedside, 37 were interviewed by phone, and 112 questionnaires were completed according to patients' medical records.

Women who had immigrated to Israel were significantly prone to GBS carriage (P = 0.03): 18 of 93 immigrants (19.3%) carried the pathogen compared to 66 of 571 (11.5%) native Israelis (Bedouins and Jews). Table 1 presents the distribution of GBS carriers according to their country of birth. USSR origin was associated with higher carriage prevalence (10 carriers out of 60, 16.6%, compared to 74 positives out of 604, 12.2%, in the general population) but it did not reach significance (P = 0.32). No statistical differences were found between new immigrants (in 1990–2000) and old immigrants (arriving before 1990). Among native Israeli Jews, the maternal ancestry (Sephardic, i.e., North African or Middle Eastern origin, or Ashkenazi, i.e., European origin) was not a risk factor for maternal GBS carriage.

Table 1. Origin of GBS carriers

	No. of carriers	No. of cases	(%)
Israel	66	571	11.5
Western USSR*	7	41	17
Eastern USSR**	3	19	15.8
Ethiopia	2	10	20
Argentine	2	4	50
Morocco	1	7	14.3
India	1	2	50
Yemen	1	1	100
Sweden	1	1	100
Other***	0	8	0
Missing data	0	17	0
Total	**84**	**681**	**12.3**

* Western USSR countries include Russia, Belarus, Ukraine, Latvia, Lithuania, and Moldova.

** Eastern USSR countries include Azerbaijan, Armenia, Tajikistan, Uzbekistan, Kazakhstan, and Turkmenistan.

*** Other countries include Tunis (n=3), Algeria (n=1), Uruguay (n=1), Chile (n=1), Ireland (n=1) and France (n=1), which are not included in the Table since no carriers were identified.

Table 2. Nationality of GBS carriers

	No. of carriers	No. of cases	(%)
Bedouins	37	345	10.7
Jews	44	309	14.2
Other*	3	14	21.4
Missing data	0	13	0
Total	**84**	**681**	**12.3**

* Other refers to non-Arab/non-Jewish nationality.

Table 2 illustrates the carrier status in relation to women's nationality. A higher prevalence of carriage was found among non-Arab/non-Jewish maternal residents, but it did not reach significance (P = 0.31). All three carriers in this group were immigrants from the former USSR countries.

Jewish women with low socioeconomic status (P = 0.07), four abortions or more (P = 0.07), twin pregnancy (P = 0.09), age older than 35 (P = 0.1), and primiparity (P = 0.11) were risk factors that did not reach significance.

Major risk factors, which according to CDC recommendations necessitate the administration of intrapartum chemoprophylaxis (preterm labor, premature rupture of membranes, prolonged rupture of membranes, maternal fever, GBS urinary tract infection during pregnancy, and previous delivery of an infant with GBS disease), were not more prevalent among the carrier population. In addition, GBS carriage was not related to the present mode of delivery or to cesarean section in the past.

Finally, no significant characteristics were found among neonates born to GBS carriers.

Discussion

The mechanism whereby GBS causes early neonatal disease in only a small part of newborns born to maternal carriers is still not fully understood. The fact that only 1–3% of neonates born to maternal carriers (who do not undergo any preventive strategy) develop symptomatic disease, although about 50% carry the pathogen [1], may imply that immunity capabilities of mother and/or fetus are involved in the pathogenesis of neonatal GBS disease [2]. In addition, the high incidence of disease among premature infants (25% of early-onset disease cases) [2,5,6] and among immunocompromised adults (states such as diabetes mellitus, congestive heart failure, liver cirrhosis, renal diseases, malignancies, etc.) [2,5,15], further implicate the importance of the host immune response in the development of invasive GBS disease. The discrepancy between a relatively high prevalence of maternal carriage (the highest prevalence reported so far from Israel) versus an extremely low incidence of neonatal disease in our region [14] suggests that maternal or neonatal immunity is amplified in the region, for reasons not yet understood. To broaden our understanding with regard to the demographic manifestations of our carrier population, we examined the risk factors for carriage but did not find any significant results. All the risk factors that we found (except the immigration issue) had already been reported in the past [2,3,6,16,17], and therefore could not explain the unusual low incidence of neonatal disease in southern Israel.

Immigrants, even after years of residency in their new country, still harbor infectious organisms acquired in their old environment. Since the low incidence of neonatal disease counter-indicates the need to adopt the CDC preventive guidelines in southern Israel, and since we found that the prevalence of carriage is significantly enhanced among immigrants (compared to native Israelis), this population warrants special clinical attention. The fact that the large population of immigrants settled in different parts of the country during the past 15 years may serve as a possible explanation for the elevated prevalence of GBS carriage found in our study. A prospective study to explore the origin of women whose neonates later developed early invasive GBS disease will determine whether global preventive measures should be specifically implemented for immigrant women in Israel as a whole.

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