

The incidence of *Streptococcus* Group B in 100 parturient women and the transmission of pathogens to the newborn

Częstość nosicielstwa paciorkowca grupy B u 100 rodzących kobiet i częstość transmisji patogenu do noworodka

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Abstract

Objectives: Perinatal infections are one of the fundamental causes of early puerperal complications in mothers and neonates. The aim of the study was to determine the incidence of *Streptococcus* group B (GBS) colonization in parturient women and the rate of pathogen transmission to the newborn.

Material and methods: The study group consisted of 100 consecutive parturient women and their newborns. Smear samples for GBS identification were taken from the parturient vagina and from the newborns' nasal cavity. In patients with positive smears, both the mother and the child, a more in-depth analysis was performed, including investigation of the mode of delivery and premature rupture of membranes incidence.

Results: GBS colonization was found in 19 parturient women and in 4 newborns in the first 24 hours of their lives. In case of 4 women who gave birth to 4 colonized newborns, two cases of premature rupture of membranes, two vaginal and two caesarean deliveries and one case of symptomatic infection in the mother were found. No symptoms of infection appeared among the four colonized newborns.

Conclusions:

1/ prevalence of GBS colonization appeared in one in five parturient women,

2/ in GBS positive women, the risk of transmission to newborns is about 21%,

3/ caesarean section and intact membranes do not prevent the transmission of GBS to a newborn.

Key words: ***Streptococcus* group B / pregnancy complications - infections / neonatal infection /**

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Streszczenie

Zakażenia okołoporodowe stanowią poważny problem kliniczny i są jedną z zasadniczych przyczyn powikłań wczesnopłodowych u matek i noworodków. Celem pracy było określenie częstości występowania kolonii paciorkowca grupy B (GBS) u kobiet rodzących i ich transferu do noworodka.

Materiał i metody: Badaniem objęto grupę 100 kolejno rodzących kobiet i ich noworodki. Wymaz do identyfikacji GBS pobrano z pochwy u kobiet i z przedsionka jamy nosowej u noworodków. W grupie czterech rodzących, które urodziły noworodki skolonizowane GBS przeanalizowano wybrane parametry dotyczące przebiegu porodu: sposób ukończenia ciąży i występowanie przedwczesnego pęknięcia błon płodowych.

Wyniki: Obecność nosicielstwa paciorkowców grupy B wykryto u 19 rodzących i 4 noworodków tych kobiet w pierwszej dobie życia. U czterech matek, które urodziły noworodki skolonizowane GBS wystąpiły: 1/ dwa przypadki przedwczesnego pęknięcia błon płodowych, 2/ dwa porody fizjologiczne i dwa ukończone cięciem cesarskim, 3/ jeden przypadek objawowej infekcji okołoporodowej u matki. U żadnego noworodka z pozytywnym wynikiem w kierunku GBS nie zaobserwowano objawów infekcji.

Wnioski:

- 1) Częstość kolonizacji GBS dotyczy co piątej kobiety rodzącej.
- 2) Wśród rodzących skolonizowanych GBS ryzyko transferu tego patogenu do noworodka wynosi około 21%, 3/ Wykonanie cięcia cesarskiego a także zachowany pęcherz płodowy do II okresu porodu u matki skolonizowanej GBS nie wyklucza możliwości transferu patogenu do noworodka.

Słowa kluczowe: paciorkowce grupy B / zakażenia w ciąży / zakażenia noworodków /

Introduction

Perinatal infections are not only a serious clinical problem and one of the primary causes of early puerperal complication in mothers, but they also influence the course of the neonatal period. The influence of the mother's infection on a foetus or neonate, besides such factors as germ kind, depends mostly on gestational age. Under specific conditions almost all known pathogens can cause an infection in a baby throughout the pregnancy period, during delivery and after birth. The most common etiological factors of bacterial infections in the perinatal period are those caused by Streptococcus group B (GBS) [1-6].

A GBS human reservoir is the digestive and urogenital system. Hypothetical ways of transmission to the foetus are placental and ascending infection, also through intact membranes. Neonatal infection happens in most cases during vaginal delivery or through contact with infected people (17-45%). About 10-20% of neonates of mothers with GBS undergo colonization [1, 3, 5, 6].

Maternal colonization by GBS may be connected with intrauterine foetal death, amniotic sac infection syndrome, premature delivery and recurring miscarriages [1, 3, 5-7].

GBS is a common etiological factor of neonatal infection, where an important role is played by bacteriemia and pneumonia, where the death rate is as much as 40-80%, and meningitis. In colonized mothers GBS may be the cause of puerperal sepsis [1-3, 5-8].

With such risks, early detection and successful treatment of bacterial infection of the genital tract in pregnant women is essential. It is believed that the period when the identification of GBS infection proves the most effective occurs between the 35th and 37th week of gestation. Thus, the test is recommended to be done then [1-4, 6-19].

Routine screening of GBS colonization has led to a significant decrease of GBS transmission to neonates during delivery and provided for effective treatment methods with medically pronounced infections.

The use of antibiotics during delivery in GBS colonized mothers proves an effective prevention of neonatal infections [1, 4, 6, 7, 13, 17].

Detection of GBS infection is based on bacterial culture and identification of smear samples collected from the patient's vagina, anus or nasal cavity. [1,4,7,16]

In GBS positive pregnant women antibiotics (Penicillin, Ampicillin, Erythromycin, Clindamicin) should be administered until the delivery [1, 3, 4, 6, 7, 13, 17-19]. In Poland the incidence of GBS colonization among pregnant women is not fully assessed. In two reports the incidence of GBS colonization in two regions of Poland was examined [9, 16].

Aim of the study

The aim of the study was to determine the incidence of GBS colonization in parturient women and the rate of pathogen transmission to the newborn.

Material and methods

The prospective study examined 100 consecutive parturient women and their newborns hospitalized in the Clinical Department of Obstetrics and Gynaecology at the District Hospital in Rzeszów, from January 2008 to March 2008.

The project of the study was accepted by the Bioethical Committee of University of Rzeszów (No 6/01/2008). In each case an informed consent was obtained from the patient. The material for GBS testing was sampled from parturient vagina and from neonate nasal cavity. The material was sterile-collected and the swab obtained was transferred directly onto transportation or a dry medium. Additionally, the parturient urine was also tested for the presence of GBS. Smear tests from the vagina and nose were transferred onto Columbia agar medium and chromatogenic medium of selective differentiation towards GBS. The media with clinical inoculation material were placed in an incubator; incubation time was 18-24 hours. Having obtained bacterial growth, sensitivity towards antibiotics was determined.

Results

The age of women from the study group varied from 18-45 years. 55 patients are inhabitants of the rural and 45 of the urban areas.

Among 100 parturient women, 19 showed GBS colonization. Out of the neonates of the GBS-positive mothers, 4 showed the presence of GBS. The analysis of the material did not detect any occurrence of GBS in newborns delivered by the GBS-negative mothers.

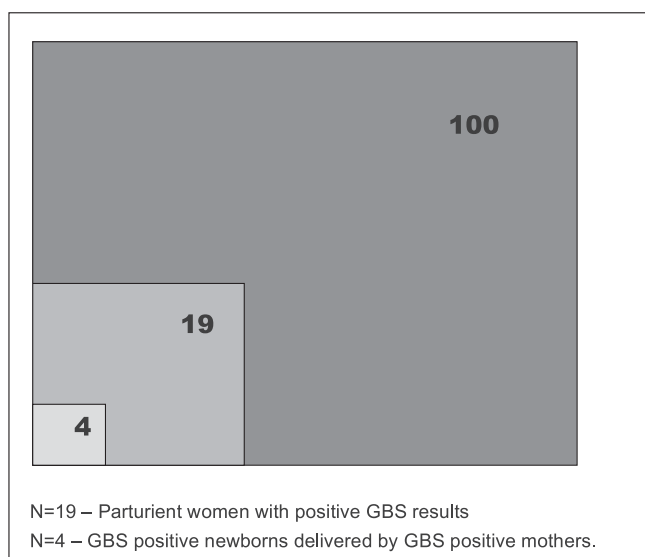


Figure 1. GBS colonization of parturient women and their newborns in a group of 100 patients.

Among the GBS colonized women, a similar group in terms of number were the primiparas (N=9, i.e. 47%) as well as multiparas (N=10, i.e. 53%). The majority of the pregnant women delivered on time, between 38 and 41 weeks of gestation. Only one woman gave birth before the due date, at the end of the 37th week of gestation. GBS carrier state was detected at the earliest in the 37th week of pregnancy, in the 41st week at the latest. Thirteen parturients (68%) had vaginal delivery and six (32%) had a caesarean section.

In one of the patients, mainly due to the premature rupture of the membranes, intranatal antibiotic therapy (Cefuroxim 1.5g) was administered. 11 hours 15 minutes passed between the moment of premature rupture of the membranes and the delivery.

There was a premature rupture of the membranes in 10 out of 19 parturient women (53%), in three cases (16%) the rupture happened in II stage of labour. Six women (31%) had intact membranes during the caesarean section. In majority of cases (78%) the amniotic fluid appeared to be unstained. Meconium was found in four cases (22%).

In 1 out of 19 colonized parturients the symptoms of infection (fever and tachycardia) 148 appeared. In this case premature rupture with meconium stained amniotic fluid was found. That delivery ended with a caesarean section. (Table I).

The material analyzed revealed that in 4 out of 19 neonates of the GBS colonized mothers, the presence of pathogenic microorganisms in nasal swabs occurred within the first 24 hours of their lives. No neonate showed development of the most dangerous clinical form of GBS infection i.e.: septicaemia, pneumonia and meningitis.

In the group of GBS colonized patients, over half (N=10) also proved positive for urine inoculation.

For the women and neonates classified as pathogenic flora carriers, the following parameters were analyzed retrospectively: the age of the mother, premature rupture of the membranes incidence (PROM), the method of the delivery, number of deliveries (primiparas or multiparas) and the presence of the symptomatic infection in the mother at birth.

The data accounting for these specific parameters is shown in table II.

Table II. Clinical characteristics of four GBS positive parturient women who gave birth of colonized newborns.

Age	PROM	The method of delivery	Primiparas / Multiparas	Infection symptomatic in mother at birth
29	No	VD	P	-
31	No	CS	M	-
25	Yes	VD	P	-
29	Yes	CS	P	Yes

VD – vaginal delivery
CS – caesarean section
P – primiparas
M – multiparas

Table I. Incidence of premature rupture of membranes (PROM), rate of caesarean section, incidence of temperature above 37°C at the labour in total group (N=100), GBS colonized parturient women (N=19), and GBS colonized parturient women and newborns group (N=4).

	Total group (N=100)	GBS colonized parturient women (N=19)	GBS colonized parturient women and newborns (N=4)
PROM	33% (N=33)	53% (N=10)	50% (N=2)
Caesarean section rate %	32% (N=32)	31% (N=6)	50% (N=2)
Temperature above 37,5 at labour	1% (N=1)	5% (N=1)	25% (N=1)

The Muller-Hinton medium was used with antibiotic discs of: Ampicillin, Erythromycin, Clindamicin (BioMerieux, France) to test their sensitivity to GBS. The antibiogram obtained was interpreted following the CLSI recommendations (Clinical and Laboratory Standards Institute). In all GBS colonized parturient women, antibiotic therapy was applied. Strains of GBS showed 100% sensitivity to ampicillin. In the remaining groups, sensitivity erythromycin and clindamicin proved to be the same (64%). (Figure 2).

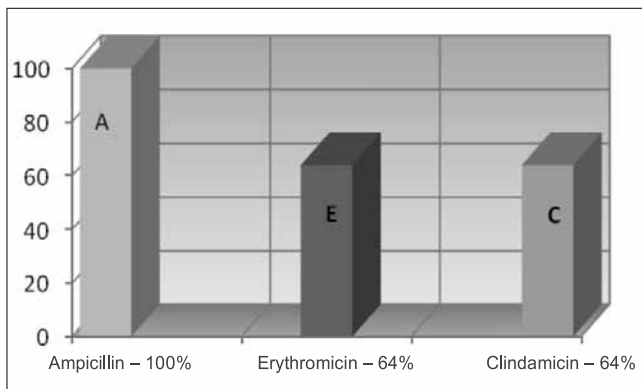


Figure 2. GBS sensitivity to antibiotics.

Discussion

Infections of genital organ constitute a serious problem in obstetrics [1-4, 6-9].

Colonization by pathogenic micro-organisms of the vagina and cervical canal is not always indicative of acute clinical symptoms in women. The presence of bacteria is more important, as it could probably be a reservoir for an increasing rate of infections. Such a situation poses a serious risk, not only for the pregnant woman but, more importantly, for the foetus and the newborn, who can be prone to various types of infection, often of an acute and complicated nature. In such cases, prognosis may be unfavourable, especially with premature delivery and preterm infant [1, 2, 7-12].

Based on epidemiological research run in several Polish centres, an increase in the number of cases where women and their newborns were colonized by GBS has been observed. Referring to the data given by the centres of the Masovia, Małopolska Poland and Silesia provinces, incidence of GBS colonization in pregnant women was 19.7%, 18% and 3.3% respectively. The GBS transfer to newborns appeared in 9,5-34,5% of cases [13].

In our study the presence of GBS was found in 19% parturient women, whereas the transfer of this pathogen to newborns occurred in 21% of cases.

Poland lacks an obligatory screening procedure for GBS colonization among pregnant women. Since 2008 Polish Gynaecological Society has issued recommendations concerning the detection of GBS carriers among pregnant women and prevention of the infection in neonates. According to that paper, it is recommended to performed GBS examination in material coming from a vagina and/or an anus in all pregnant women between 35-37th week of gestation [1, 3, 4,6, 7, 13].

According to the authors of the recommendations, antibiotics should be administered in case of patients:

- with a positive bacteriological result obtained in the 35th-37th week of pregnancy;
- with an obstetrical history of Streptococcus agalactiae perinatal infection during previous pregnancies/deliveries;
- who gave birth without a screening for GBS;
- with a positive result of GBS urine inoculation;
- in parturient women with PROM of duration above 18 hours, regardless of the bacteriological result;
- with body temperature above 38°C [4, 7, 13].

The efficiency of preventive treatment of GBS colonized patients and GBS colonized newborns depends on immediate diagnosis, proper choice of antibiotics and prompt treatment. In practice, target antibiotic therapy is used, i.e. consistent with the GBS positive result and the antibiogram of widest application range. The medicine used by choice is penicillin, demonstrating 100% sensitivity to strains of Streptococcus agalactiae [4-6, 13, 17-19].

Also, the time of antibiotic application before the delivery is of significance.

If the first dosage is given over four hours before the delivery, the risk of transmitting Streptococcus agalactiae to the foetus is only 1%. However, administering antibiotics less than four hours prior to the delivery increases the risk of passing the infection onto the foetus [4, 17].

Therefore, treatment of neonates depends on their general condition, and on how quickly the risk of transmission at delivery is detected. All neonates born by mothers who underwent a GBS perinatal preventive treatment should be included in the program of close monitoring during the first 24-48 hours after the delivery. If the presence of GBS and infection symptoms have been excluded, a neonate can be discharged home without the need of administering antibiotics. In the event of infection symptoms, neonates should undergo standard bacteriological diagnostics with suggested antibiotic therapy [4, 13, 19].

It is worth mentioning that the preparation and usage of vaccines would be another, besides screening tests, option of preventive procedures in case of GBS infections. Currently, advanced research is being carried out to devise a vaccine; however considerable amount of time will pass before the outcome is known [6].

Nowadays, the only way to control infections of GBS would be the introduction of a screening program across Poland among pregnant women between the 35th and 37th week of pregnancy and preventive perinatal treatment in cases when infection occurs.

Economic analysis in medicine is routinely carried out in order to examine potential benefits to society resulting from a particular health project. It helps to make decisions relating to clinical practice and the distribution of funds in the health service. Due to the fact that such analysis takes into account not only the consequences of a particular action but also expenditure, one can determine the final and realistic cost of the project.

Research on detecting carriers of GBS among pregnant women can also help experts decide what programme should

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be applied in Poland. One should consider whether to continue with the current practice or implement standards of prenatal care applied in other countries. The Centre for Disease Control and Prevention – CDC and American College of Obstetricians and Gynaecologists – COG [20] recommend screening of all pregnant women for GBS. From the pharmacoeconomic point of view, wide application of the universal screening programme among pregnant women in Poland may not be economically viable as the costs are likely to outweigh the real effects of the procedure. The opinion of clinicians about pharmacoeconomics playing the role of an “intruder” can be justified to some extent.

Nevertheless, thinking in economic terms in medicine is unavoidable and helps reach rational decisions applicable to the politics of health and their effect on the whole society. To the best of our knowledge, there are no pharmacoeconomic analysis carried out in Poland referring to a screening procedure for GBS colonization in pregnant women.

It is necessary to continue with studies similar to the one presented here in order to lay the foundation for preparing such analysis.

Conclusions

1. The incidence of GBS colonization in the group of randomly chosen parturient women has proven to be 19%, thus applicable to every fifth woman in labour.
2. The risk of transmission of the pathogen from a GBS positive mother to a neonate has been estimated at about 21%.
3. In every fifth neonate's swab (21%) of a GBS positive mother, GBS presence was diagnosed within the first 24 hours of life.
4. Caesarean section and the fact that the membranes remain unruptured until stage II of labour does not prevent GBS colonized mothers from transferring the pathogen to their neonates.

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