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Carrier state of GBS in the aspect of perinatal antibiotic therapy in 2007–2011

Nosicielstwo GBS w aspekcie antybiotykoterapii okołoporodowej w latach 2007–2011

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ABSTRACT

Introduction: A significant decline in the proportion of the perinatal mortality of foetuses and newborns has been observed in recent years. The use of perinatal antibiotic therapy in order to reduce the risk of infection, including strains of group B *Streptococcus* (GBS) – *Streptococcus agalactiae* contracted during birth, is one of the reasons for this outcome.

Materials and methods: Material for the study was obtained from medical record data covering 1,328 live births of individual infants and their mothers. The analysed continuous parameters are described with appropriate numbers, arithmetic mean, standard deviation, and median, minimum and maximum values. Discrete parameters (qualitative) are expressed as percentages (fractions). The arithmetic means between groups were compared using Student's t-test. For analysis of fractions the χ^2 test was used with the Yates correction (for a small number of cells). The level of statistical significance was accepted at $p < 0.05$.

Results: The mean age of women giving birth was estimated at 27.5 ±5.1 years. The mean duration of pregnancy was 39.2 ±1.6 weeks. The mean time from the rupture of the amniotic sac to completion of birth was 352.2 ±925.2 minutes. The total time of the childbirth of an infected newborn was significantly longer then the birth of a healthy newborn (453.3 vs 383.8; $p < 0.0001$). The Apgar score was significantly higher in healthy newborns then in infected ones (9.3 vs 8.6; $p < 0.0001$). The percentage of treated pregnant women scored 26.81%, while those with a positive culture was 78.43% ($p < 0.0001$).

Conclusions: The use of perinatal antibiotic prophylaxis reduces the incidence of early GBS infections in newborns. The use of perinatal antibiotic therapy in the absence of GBS culture is not a common procedure. However, by comparing years 2007–2011, it is practiced more and more. The occurrence of the GBS carrier state is common.

Keywords: carriers of GBS; infection; childbirth; antibiotic.

ABSTRAKT

Wstęp: W ciągu ostatnich lat obserwowane jest wyraźne obniżanie się odsetka umieralności okołoporodowej płodów i noworodków. Jedną z przyczyn takiego stanu jest zastosowanie okołoporodowej antybiotykoterapii celem zmniejszania ryzyka zakażenia okołoporodowego m.in. szczepami paciorkowca grupy B (GBS) – *Streptococcus agalactiae.*

Materiały i metody: Materiał do badań stanowiły uzyskane z historii chorób dane 1328 żywo urodzonych, pojedynczych noworodków i ich matek. Badane parametry ciągłe opisano, podając odpowiednią liczebność, średnią arytmetyczną, odchylenie standardowe, medianę oraz najmniejszą i największą wartość. Parametry dyskretne (jakościowe) przedstawiono jako odpowiednie procenty (frakcje). Średnie arytmetyczne między grupami porównano testem t-Studenta. Do analizy frakcji użyto testu χ^2, także z poprawką Yatesa (dla małych liczebności komórek). Poziom istotności statystycznej przyjęto dla $p < 0,05$.

Wyniki: Średni wiek rodzących wyniósł 27,5 ±5,1 lat. Średni czas trwania ciąży wyniósł 39,2 ±1,6 tygodnia ciąży. Średni czas od pęknięcia pęcherza płodowego do zakończenia porodu wyniósł 352,2 ±925,2 min. Całkowity czas porodu noworodka zakażonego był istotnie dłuższy od czasu porodu noworodka zdrowego (453,3 vs 383,8; $p < 0,0001$). Stan urodzeniowy noworodka oceniany wg punktacji w skali Apgar był istotnie wyższy u noworodków zdrowych niż u noworodków zakażonych (9,3 vs 8,6; $p < 0,0001$). Odsetek leczonych ciężarnych wyniósł 26,81%, natomiast tych z dodatnim wynikiem posiewu tylko 78,43% ($p = 0,0001$).

Wnioski: Zastosowanie okołoporodowej profilaktyki antybiotykowej (IAP) ma wpływ na zmniejszenie częstości występowania wczesnych infekcji GBS u noworodków. Stosowanie IAP w razie braku posiewu w kierunku GBS nie jest powszechną procedurą, jednakże w zestawieniu lat 2007–2011 coraz częściej praktykowaną. Występowanie nosicielstwa GBS jest powszechne.

Słowa kluczowe: nosicielstwo GBS; zakażenie; poród; antybiotykoterapia.

INTRODUCTION

A decline in the proportion in the perinatal mortality of foetuses and newborns has been observed in recent years. Despite enormous progress made in the field of perinatal care, there is still a risk of infection of the foetus during pregnancy or childbirth. One of the main etiological factors responsible for this is streptococci. An increased occurrence of such bacteria in both the urogenital tract and the gastrointestinal system of pregnant women has been observed. This applies in particular to group B of *Streptococcus* (GBS) – *Streptococcus agalactiae*. Infection of this type can have a very dramatic course. For this reason, it is valid to introduce perinatal antibiotic prophylaxis (IAP) [1, 2]. Therefore, nowadays intrapartum antibiotic prophylaxis has full medical justification. It was also confirmed that the costs associated with the prevention of GBS infections in newborns is much lower than the treatment of infected mothers or their children during labour. A growing number of perinatal infections, caused by group B streptococci, as well as the increasing incidence of bacterial strains with documented resistance mechanisms MLSB arouse anxiety among physicians. Thus, it is associated with an increased risk of serious infections in newborns. Therefore, in order to achieve full and reliable assessment, both benefits and risks arising from the widely used antibiotic prophylaxis, it is reasonable to conduct further research in this area.

MATERIALS AND METHODS

Material consisted of data obtained from the medical records of 1,328 newborn infants and their mothers. Deliveries took place at the Regional Hospital in Kołobrzeg in 2011 (the year of the introduction to the daily practice of PTG therapeutic guidelines for the prevention of GBS infections in newborns) and in 2007 (in the absence of widespread prevention of GBS infections in newborns). Statistical analysis was carried out using Statistica PL v. 10.0 StatSoft, USA. Parameters measured continuously were described with the appropriate numbers, arithmetic mean, standard deviation, and median and minimum and maximum values. Discrete parameters (qualitative) were expressed as percentages (fractions). Arithmetic means were compared between groups with the t-test.

RESULTS

The first table contains general information about women in labour.

The mean age of women giving birth was estimated at 27.5 ±5.1 years. The youngest woman was 16 years of age, while the oldest was 43 years old. The mean parity score reached 1.6 ±0.9. Pregnancies were in most cases mature. The mean duration of pregnancy was 39.2 ±1.6 weeks. The shortest pregnancy lasted 27 weeks, the longest 43 weeks. The total mean time of birth was 387.9 ±193.5 minutes. The mean time from rupture of the amniotic sac to completion of birth was 352.2 ±925.2 minutes.

The second table contains general information about the newborn.

The mean Apgar score assessed in a newborn in the first minute was 9.2 ±1.2 points. Newborn babies weighed on average 3381 ±523 g. The lightest weighed 990 g, the heaviest 5050 g. The mean duration of hospitalization of a newborn after vaginal delivery was 3.9 ±2.7 days, compared to 5.8 ±2.2 days after birth through caesarean section.

Table 3 shows the correlation between the general parameters of the women in labour, childbirth and newborns in terms of early-symptomatic infections in the newborns.

The parity of the mothers of infected newborns was significantly lower than the parity of mothers of healthy ones

TABLE 1. General information related to women giving birth

Parameters	n	Median	Mean ±SD	Min.	Max.
Age (years)	1328	28	27.5 ±5.1	16	43
Parity	1328	1	1.6 ±0.9	1	8
Duration of gestation (weeks)	1328	39	39.2 ±1.6	27	43
Total duration of labour (minutes)*	1061	360	387.9 ±193.5	34	1320
Total time from rupture of foetal membrane to delivery (minutes)**	1174	120	352.2 ±925.2	1	24000

n – size of studied population; SD – standard deviation; Min. – minimum value; Max. – maximum value
* refers to vaginal deliveries; ** refers to all deliveries

TABLE 2. General data concerning newborns

Parameters	n	Median	Mean ±SD	Min.	Max.
Evaluation of the newborn with the Apgar score	1328	10	9.2 ±1.2	1	10
Newborns' birthweight (g)	1328	3400	3381 ±523	990	5050
Hospitalization of newborns after vaginal delivery (in days)	1064	3	3.9 ±2.7	1	30
Hospitalization of newborns after caesarean section (in days)	264	5	5.8 ±2.2	3	23

n – size of studied population; SD – standard deviation; Min. – minimum value; Max. – maximum value

TABLE 3. General specifications for the women in labour, delivery and newborns with the occurrence of early-symptomatic infections in the newborns. Comparison of means

Parameters	Newborn						p*
	uninfected			infected			
	mean	SD	n	mean	SD	n	
Maternal age (years)	27.6	5.2	1240	27	4.9	88	NS
Parity	1.6	0.9	1240	1.4	0.9	88	<0.02
Duration of pregnancy (weeks)	39.2	1.6	1240	39.4	1.8	88	NS
Hospitalization of newborn after vaginal delivery (in days)	3.5	2	1000	10.8	3.4	64	<0.0001
Hospitalization of newborn after caesarean section (in days)	5.4	1.6	240	9.6	3.4	24	<0.0001
Total duration of labour (minutes)**	383.8	192.9	1059	453.3	193	64	<0.005
Total time from rupture of foetal membrane to delivery (minutes)***	347.3	769.2	1163	629.4	2806	73	<0.02
Evaluation of the newborn with the Apgar score	9.3	1.2	1240	8.6	1.4	88	<0.0001
Newborns' birthweight (g)	3376	521	1240	3445	553	88	NS

SD – standard deviation; n – size of studied population; NS – not significant; * t-student test; ** refers to vaginal deliveries; *** refers to all deliveries

(1.4 vs 1.6). The duration of hospitalization of an infected infant who was born vaginally was significantly longer than the duration of the hospitalization of a healthy one (10.8 vs 3.5). The length of the hospital stay of an infected infant who was born by caesarean section was significantly longer than the duration of the hospitalization of a healthy newborn (9.6 vs 5.4). The total time of childbirth of an infected infant was significantly longer than the time of birth of a healthy child (453.3 vs 383.8). The total time of a childbirth of an infected infant was significantly longer than the time of birth of a healthy newborn (453.3 vs 383.8). The health status of an infant evaluated by the Apgar score was significantly higher in healthy newborns when compared to infected infants (9.3 vs 8.6). Comparisons of other parameters did not show statistical differences.

Table 4 shows the frequency of GBS strains detected in women who had a vaginal and anal swab for these bacteria prior to the delivery.

In 484 patients a smear was performed to detect GBS between 35–37 weeks of pregnancy. 331 pregnant women (68.39%) were GBS negative, while 153 (31.61%) were GBS positive.

Table 5 presents the frequency of perinatally used antibiotics in relation to GBS carriers.

Among all pregnant women participating in the study, 73.19% did not receive perinatal antibiotic therapy, while 26.81% were treated. Among pregnant women without a smear for GBS, 77.01% were not treated with an antibiotic perinatally, while in 22.99% an antibiotic was introduced. Pregnant women with a negative GBS smear in 87.31% cases did not receive such treatment, but 12.69% were treated with an antibiotic perinatally. Whereas, 78.43% of pregnant women with a positive Pap GBS received antibiotics in the perinatal period, and 21.57% did not. Among all pregnant women treated perinatally with antibiotics, in 66.87% of cases GBS swabs were taken during pregnancy (29.73% had negative results and 3.40% positive). The differences were statistically significant ($p < 0.0001$).

TABLE 4. Carriers of group B of Streptococcus (GBS) in pregnant women, in whom a swab from the vagina and the anus was taken between 35–37 weeks of pregnancy

Score of GBS in pregnant women	n	%
Positive	153	31.61
Negative	331	68.39
Total	484	100

n – size of studied population

Table 6 shows the incidence of perinatal antibiotic use in the studied years.

Women giving birth in 2007, in most cases did not receive antibiotics perinatally (90.15%), while 9.85% were treated. In 2011, when the recommendations of the Polish Gynaecological

TABLE 5. Use of antibiotics and perinatal group B of *Streptococcus* (GBS) carrier status

Treatment of pregnant women	Total		The result of GBS smear among pregnant women						% from the row (the N)
			no smear		negative		positive		
	n	%	n	%	n	%	n	%	
Untreated	972	73.2	650	77.01	289	87.31	33	21.57	66.87/29.73/3.40
Treated	356	26.8	194	22.99	42	12.69	120	78.43	54.49/11.80/33.71
Total	1328	100	844	100	331	100	153	100	63.55/24.92/11.52
$p^* < 0.0001$									

n – size of studied population; * χ^2 square test

TABLE 6. The use of perinatal antibiotic therapy in pregnant women in the individual years

Year of delivery	Untreated pregnant		Treated pregnant		Total		% from the row (the N)
	n	%	n	%	n	%	
2007	651	66.94	71	19.94	722	54.33	90.15/9.85
2011	321	33.06	285	80.06	606	45.67	52.97/47.03
Total	972	100	356	100	1328	100	73.17/26.83
p* = 0.0001							

n – size of studied population; * χ^2 square test

Association were in force, 52.97% of women in labour were covered by it, and 47.03% were not. Out of all pregnant women who did not receive antibiotic perinatally, 66.94% delivered babies in 2007 and 33.06% in 2011. From all pregnant women treated perinatally with antibiotics 19.94% of them had babies in 2007 and 80.06% in 2011. It has been observed that a perinatal antibiotic was used significantly more often in 2011 than in 2007 (47.03% vs 9.85%).

DISCUSSION

Falciglia et al. observed in their study that the incidence of early-symptomatic infections among newborn babies is 10 times higher in infants born prematurely [3]. Kraśnianin et al. noted that not only premature labour, but also a longer period from the moment of an interruption to the continuity of the membrane to completion of childbirth are associated with a higher risk of perinatal infection in the newborn. Moreover, they observed a higher incidence of early-symptomatic infections in infants born to younger mothers [4].

In our study we observed that the duration of pregnancy and the mean age of giving birth, both among healthy and infected infants, did not differ significantly. It was noted, however, that significantly more births of mothers of infected newborns were characterized by longer time elapsing from the start of rupture of the membrane to completion of delivery.

According to global epidemiological data, carriers of GBS in pregnant women is rated at 3–35% of respondents [5, 6, 7, 8, 9, 10]. In Europe, the colonization of pregnant women by the streptococcus group B is around 6.6% in Greece, 7% in Spain and 16% in Germany [1]. According to Kraśnianin et al., every fifth woman in labour is a carrier of GBS strains [4].

On the basis of data published by several Polish centres, it can be said that in recent years there has been a clear upward trend in the number of women colonized by group B *Streptococcus*. Therefore, the increased numbers of neonates colonized by this bacterium has been recorded [1]. Kociszewska-Najman et al. evaluated the incidence of group B streptococcal colonization among Polish pregnant at 11.4% [11]. However, in the study by Dobrowolska-Redo et al. the colonization of GBS was detected in as many as 40.9% of pregnant women [12].

In our research we found that among all women with vaginal and rectal swab testing for GBS taken between 35 and 37 weeks of pregnancy, 31.61% of them were colonized by *Streptococcus* group B.

In a Glasgow et al. study, the group consisted of 130,447 full-term single newborns and their mothers. Women gave birth in 19 hospitals in Utah, USA between 1998–2002. There was then a gradual increase in the frequency of the use of antibiotics perinatally among GBS carriers, from 75% in 1998 to 91% in 2002, and an increase of detection of GBS carriers during pregnancy from 1.9% in 1998 to 13.8% in 2002 [13].

In a retrospective analysis by Kociszewska-Najman et al., which covered 2,212 cases of birth in 2007 and 2008 in the Department of Obstetrics and Gynaecology, Medical University of Warsaw, antibiotics were used in 79.6% of GBS-positive women during labour. In the remaining 20.4% of GBS-positive pregnant women, for various reasons (hospital admissions in the second stage of labour, scheduled Caesarean section by preserved foetal membranes) perinatal antibiotics were not used [11].

In our study 78.43% of birth-giving carriers of GBS received perinatal antibiotic prophylaxis, and the percentage of treated carriers of GBS was significantly higher ($p < 0.0001$) than the proportion of pregnant women treated perinatally with GBS negative or with an unknown GBS status. We observed that the increase in the frequency of perinatal antibiotic use in pregnant had a significant impact on a positive GBS result in swabs tests ($p < 0.0001$). We also noted a clear increase in the frequency of perinatal antibiotic prophylaxis in 2011 (introduction of the daily practice of therapeutic guidelines for the prevention of GBS infections in newborn infants) compared to 2007 (no use; $p = 0.0001$).

CONCLUSIONS

1. Use of a perinatal antibiotic prophylaxis reduces the incidence of early-onset GBS infections in newborns.
2. Use of the above mentioned prophylaxis in the absence of GBS culture is not a common procedure, but in years 2007 and 2011 it was increasingly practiced.
3. The occurrence of the GBS carrier state is common.

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