

Effect of group B streptococcus infection, vaginal flora disorder and premature rupture of membranes on maternal and infant outcomes in middle and late pregnancy

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Abstract

Purpose: To investigate the effect of group B streptococcus infection, vaginal flora disorder and premature rupture of membranes on maternal and infant outcomes in middle and late pregnancy.

Methods: From May 2016 to February 2018, 145 pregnant women in middle and late pregnancy received group B streptococcus, vaginal flora and premature rupture of membranes respectively, and were divided into group B streptococcus positive detected group, group B streptococcus negative detected group, abnormal vaginal flora group, normal vaginal flora group, premature rupture of membranes group and unbroken foetal membranes group, and the effects on maternal and infant outcomes were analyzed.

Results: The incidence rates of premature birth, amniotic fluid pollution, postpartum hemorrhage, intrauterine infection, neonatal jaundice and neonatal pneumonia in group B streptococcus positive detected group and abnormal vaginal flora group were significantly higher in group B streptococcus negative detected group and normal vaginal flora group ($P < 0.05$), while there were no significant differences in the incidence of low birth weight ($P > 0.05$); The total incidence of adverse pregnancy outcomes was 94.00% and the total incidence of adverse neonatal outcomes was 64.00% in group B streptococcus positive detected group, which were significantly higher than 27.37% and 14.74% in group B streptococcus negative detected group ($P < 0.05$); the total incidence of adverse pregnancy outcomes was 95.34% and the total incidence of adverse neonatal outcomes was 67.44% in abnormal vaginal flora group, which were significantly higher than that in normal vaginal flora group (31.37% and 16.67%, respectively, $P < 0.05$); The incidence rates of premature birth, amniotic fluid pollution, postpartum hemorrhage, low birth weight, neonatal jaundice and neonatal pneumonia in premature rupture of membranes group were significantly higher than that in unbroken foetal membranes group ($P < 0.05$); the total incidence of adverse pregnancy outcomes (94.29%) and the total incidence of adverse neonatal outcomes (71.43%) were significantly higher than those in the unbroken foetal membranes group (36.36% and 19.09%, respectively, $P < 0.05$).

Conclusion: Group B streptococcus infection, vaginal flora disorder and premature rupture of membranes of pregnant women in middle and late pregnancy can increase the incidence of premature birth, amniotic fluid pollution, postpartum hemorrhage, neonatal jaundice, neonatal pneumonia and other adverse maternal and infant outcomes. Treatment should be taken as early as possible to ensure maternal and infant safety.

Keywords: Middle and late pregnancy; Group B streptococcus; Vaginal flora; Premature rupture of membranes; Maternal and infant outcomes

Pregnant women in the middle and late

pregnancy have lower immunity and are prone to a variety of adverse maternal and infant outcomes. It has been reported^[1] that group B streptococcus infection, vaginal flora disorder and premature rupture of membranes have different effects on maternal and infant outcomes. There are many

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microorganisms deposited in the vagina of women, forming a steady-state environment with lactobacillus as the dominant bacteria, but due to the decline of immunity of pregnant women, women are susceptible to infection by the bacteria, causing vaginal flora disorder, and at the same time, pregnant women's group B streptococcus will increase, group B streptococcus has a strong pathogenicity and will cause amniotic fluid pollution, intrauterine infection, premature delivery, neonatal pneumonia and other adverse maternal and infant outcomes. Studies have shown that [2], foetal membranes constitute a stable fetal development space, once premature rupture of membranes happens, it is prone to amniotic fluid loss, intrauterine infection, amniotic fluid pollution, and neonatal hypoplasia and other adverse outcomes. Therefore, the author discussed the effects of group B streptococcus infection, vaginal flora disorder and premature rupture of membranes on maternal and infant outcomes in middle and late pregnancy. The results were reported as follows.

1. Data and Method

1.1 General data

From May 2016 to February 2018, 145 pregnant women who were diagnosed as middle and late pregnancy in the Hospital were selected. There were 80 cases of first pregnancy, 65 cases of multiple pregnancy, with 1-3 times of pregnancy, average pregnancy (1.23±0.40) times, 20-40 years old, average age (27.32±3.21) years old, 28-42 weeks of pregnancy, and average (35.23±1.23) weeks of pregnancy. Inclusion criteria: (1) Diagnosed as middle and late pregnancy by B-ultrasonography; (2) Single pregnancy; (3) Antibiotics were not used in local vagina and the whole body in recent 4 weeks. Exclusion criteria: (1) Serious heart, brain, kidney, liver diseases; (2) Genital malformation; (3) Acute and chronic infectious diseases; (4) Coagulation disorders and immune disorders; (5) Pregnancy complications such as hypertension, diabetes and severe anemia.

1.2 Methods

145 pregnant women at 28-42 weeks of pregnancy underwent prenatal examination, and prenatal examination content included: (1) Group B streptococcus examination: ① The disinfection treatment was conducted after pregnant women emptied urine, and after drying, aseptic cotton swab was used to pick up cervical and vaginal secretions; ② Samples were placed in aseptic test tube at -20°C for preservation, and GBS detection

was conducted in 2d; ③ Group B streptococcus detection kit and real-time fluorescent quantitative analysis (QPCR) were used, and both positive and negative were detected; (2) Examination of vaginal flora: ① After vulvar disinfection, the cervical and vaginal secretions were taken out by sterile cotton swabs and used as samples; ② The concentrations of hydrogen peroxide (H₂O₂), leukocyte esterase (LE) and neuraminidase activity (SNA) were determined and used for the assessment of vaginal microecology. Among them, the microecology of vaginitis is H₂O₂+, LE-, SNA+ or H₂O₂-, LE+, SNA+ or H₂O₂+, LE+, SNA+ and SNA; the maladjusted microecological environment is H₂O₂-, LE+, SNA- or H₂O₂+, LE+ and SNA-; the simple microecology is H₂O₂+, LE- and SNA-; the normal microecology is H₂O₂-, LE- and SNA-. The microecology of vaginitis, the maladjusted microecology of SNA and the simple microecology were classified as abnormal microecology; ③ The presence of Candida and Trichomonas in the samples were examined by microscopic examination, and the bacteria, gonorrhoeae and chlamydia were detected by microbial culture method, and the result was positive diagnosis of vaginal flora disorder; (3) Diagnosis of premature rupture of membranes: ① Natural rupture of membranes with persistent fluid flow in the vagina with a PH of not less than 6.5; ② Examination of the uterine orifice with outflow of amniotic fluid from the orifice or accumulation of amniotic fluid at the posterior fornix. If it is consistent with the above two points, it will be premature rupture of membranes, in which if the maximum depth of amniotic fluid pool is less than 2cm and amniotic fluid index is less than 5cm, it will be judged as oligohydramnios.

1.3 Observation items

The maternal and infant outcomes of 145 pregnant women were observed, including pregnancy outcomes and neonatal outcomes, (1) Pregnancy outcomes: premature birth, amniotic fluid pollution, postpartum hemorrhage and intrauterine infection; (2) Neonatal outcomes: low birth weight, amniotic fluid pollution, neonatal jaundice and neonatal pneumonia.

1.4 Statistical method

SPSS21.0 was used to process the data, and the counting data were expressed as %, and χ^2 test was adopted. When $P < 0.05$, the difference was statistically significant.

2. Results

2.1 Effect of group B streptococcus infection on

maternal and infant outcomes

In the detection of group B streptococcus, there were 95 cases of negative detection and 50 cases of positive detection, and there were significant differences in the incidence of premature birth, amniotic fluid pollution, postpartum hemorrhage, intrauterine infection, neonatal jaundice and neonatal pneumonia in the positive detected group compared with the negative detected group ($P <$

0.05). Among them, there was no significant difference in the incidence of low birth weight compared with the negative detected group ($P > 0.05$). The total incidence of adverse pregnancy outcomes in group B streptococcus positive detected group was 94.00%, and the total incidence of adverse neonatal outcomes was 64.00%, which were significantly higher than that of negative detected group (27.37% and 14.74%, respectively; $P < 0.05$), as shown in Table 1 and Table 2.

Table 1. Effect of Group B Streptococcus Infection on Pregnancy Outcomes (n, %)

Group	Number of cases	Premature birth	Amniotic fluid pollution	Postpartum hemorrhage	Intrauterine infection	Adverse pregnancy outcomes
Negative detected	95	1 (1.05)	10 (10.53)	8 (8.42)	7 (7.37)	26 (27.37)
Positive detected	50	5 (10.00)	13 (26.00)	15 (30.00)	14 (28.00)	47 (94.00)
χ^2		6.611	5.877	11.430	11.259	58.179
P		0.010	0.015	0.001	0.001	0.000

Table 2. Effect of Group B Streptococcus Infection on Neonatal Outcomes (n, %)

Group	Number of cases	Low birth weight	Neonatal jaundice	Neonatal pneumonia	Adverse neonatal outcomes
Negative detected	95	4 (4.21)	3 (3.16)	7 (7.37)	14 (14.74)
Positive detected	50	5 (10.00)	12 (24.00)	15 (30.00)	32 (64.00)
χ^2		1.886	15.343	13.037	36.704
P		0.170	0.000	0.000	0.000

2.2 Effect of vaginal flora disorder on maternal and infant outcomes

In the detection of vaginal flora, there were 102 cases of normal vaginal flora, 43 cases of abnormal vaginal flora, and there were significant differences in the incidence of premature birth, amniotic fluid pollution, postpartum hemorrhage, intrauterine infection, neonatal jaundice and neonatal pneumonia between abnormal vaginal flora group and normal vaginal flora group ($P < 0.05$), among which, there was no significant difference in the

incidence of low birth weight compared with normal vaginal flora group ($P > 0.05$). The total incidence of adverse pregnancy outcomes was 95.34% and the total incidence of adverse neonatal outcomes was 67.44% in abnormal vaginal flora group, which were significantly higher than the total incidence of adverse pregnancy outcomes being 31.37% and the total incidence of adverse neonatal outcomes being 16.67% in normal vaginal flora group ($P < 0.05$), as shown in Table 3 and Table 4.

Table 3. Effect of Vaginal Flora Disorder on Pregnancy Outcomes (n, %)

Group	Number of cases	Premature birth	Amniotic fluid pollution	Postpartum hemorrhage	Intrauterine infection	Adverse pregnancy outcomes
Normal flora	102	0 (0.00)	10 (9.80)	12 (11.76)	10 (9.80)	32 (31.37)
Flora disorder	43	6 (13.95)	13 (30.23)	11 (25.58)	11 (25.58)	41 (95.34)
χ^2		14.847	9.459	4.327	6.080	49.524
P		0.000	0.002	0.038	0.014	0.000

Table 4. Effect of Vaginal Flora Disorder on Neonatal Outcomes (n, %)

Group	Number of cases	Low birth weight	Neonatal jaundice	Neonatal pneumonia	Adverse neonatal outcomes
Normal flora	102	4 (3.92)	4 (3.92)	9 (8.82)	17 (16.67)
Flora disorder	43	5 (11.63)	11 (25.58)	13 (30.23)	29 (67.44)
χ^2		3.086	15.301	10.772	36.004
<i>P</i>		0.079	0.000	0.001	0.000

2.3 Effect of premature rupture of membranes on maternal and infant outcomes

In the detection of premature rupture of membranes, there were 110 cases of unbroken foetal membranes and 35 cases of premature rupture of membranes. There were significant differences in the premature birth, amniotic fluid pollution, postpartum hemorrhage, low birth weight, neonatal jaundice and neonatal pneumonia

between premature rupture of membranes group and unbroken foetal membranes group ($P < 0.05$). The total incidence of adverse pregnancy outcomes was 94.29% and the total incidence of adverse neonatal outcomes was 71.43% in premature rupture of membranes group, which were significantly higher than that of unbroken foetal membranes group (36.36% and 19.09% respectively, $P < 0.05$), as shown in Table 5 and Table 6.

Table 5. Effect of Premature Rupture of Membranes on Pregnancy Outcomes (n, %)

Group	Number of cases	Premature birth	Amniotic fluid pollution	Postpartum hemorrhage	Intrauterine infection	Adverse pregnancy outcomes
Unbroken foetal membranes	110	2 (1.82)	12 (10.91)	13 (11.82)	13 (11.82)	40 (36.36)
Premature rupture of membranes	35	4 (11.43)	11 (31.43)	10 (28.57)	8 (22.86)	33 (94.29)
χ^2		6.182	8.377	5.584	2.612	35.634
<i>P</i>		0.013	0.004	0.018	0.106	0.000

Table 6. Effect of Premature Rupture of Membranes on Neonatal Outcomes (n, %)

Group	Number of cases	Low birth weight	Neonatal jaundice	Neonatal pneumonia	Adverse neonatal outcomes
Unbroken foetal membranes	110	3 (2.73)	8 (7.27)	10 (9.09)	21 (19.09)
Premature rupture of membranes	35	6 (17.14)	7 (20.00)	12 (34.29)	25 (71.43)
χ^2		9.478	4.637	13.096	33.579
<i>P</i>		0.002	0.031	0.000	0.000

3. Discussion

Pregnant women have low immunity and are susceptible to many factors. GBS infection during pregnancy results in poor maternal and infant outcomes. Group B streptococcus is a very dangerous vaginal pathogen, belongs to streptococcus agalactiae and can make pregnant women and infants sick^[3]. Epidemiology shows^[4] that the infection rate of group B streptococcus vaginalis in pregnant women can be as high as 30%, which seriously threatens the health of pregnant women and infants and leads to an increase in the incidence of adverse maternal and infant outcomes.

Studies have shown that^[5] pregnant women with diabetes and hypertension have high group B streptococcus infection rate. After group B streptococcus infected membranes, it secretes a large number of phagocytes, produces part of the proteolytic enzyme to invade the amniotic membrane, resulting in reduced membrane tension, and at the same time, it can promote the release of interleukin and other inflammatory factors, and lead to fetal membrane edema and premature rupture of membranes^[6]. Studies have reported^[7] that group B streptococcus promotes the release of inflammatory factors that can

contract the uterus and lead to premature birth in pregnant women. Group B streptococcus can also lead to amniotic fluid pollution, and the clinical symptoms of amniotic fluid pollution are that amniotic fluid turned green and can even appear dung. Amniotic fluid pollution is mainly caused by oligohydramnios, hypertension and umbilical cord, but some studies showed that^[8] the incidence of amniotic fluid pollution is high in patients with group B streptococcus. On the other hand, group B streptococcus can be transmitted vertically through the birth canal and parasitic in the respiratory tract and intestinal mucosa of the fetus, resulting in adverse neonatal outcomes such as pneumonia and jaundice, which seriously harm the growth and development of the fetus.

There are many microorganisms in female vagina, among which lactobacillus is the main one and constitutes a relatively balanced microecological environment of vagina^[9]. Pregnant women are prone to vaginal flora disorder, on the one hand, it is due to pregnant women's immune decline, vaginal mucosal edema and hyperemia, leading to declined mucosal barrier function and causing a variety of bacterial infections; on the other hand, it is due to pregnant women's internal estrogen level increased, leading to glycogen easy accumulation, so that the vagina breeds a variety of bacteria, causing flora disorder^[10]. Epidemiology shows that^[11] about 30% of pregnant women's vaginas are prone to parasitic candida. Once pregnant women's immunity is too low, candida will rapidly propagate into the vaginal dominant flora, because candida's flora has a strong toxicity, it will lead to a variety of adverse maternal and infant outcomes^[12]. Studied reported^[13] that vaginal flora disorder can lead to postpartum hemorrhage, intrauterine infection, amniotic fluid pollution, as well as neonatal jaundice, pneumonia, premature birth and other adverse maternal and infant outcomes, which is consistent with the results of this study.

This study shows that premature rupture of membranes is associated with poor maternal and infant outcomes such as premature birth, amniotic fluid pollution, postpartum hemorrhage, intrauterine infection, low birth weight, premature birth, neonatal jaundice and pneumonia, which can increase the incidence of adverse maternal and infant outcomes. Pregnant women's immunity decreased, resulting in susceptibility to pathogens and forming reproductive tract infection, thus leading to premature rupture of membranes^[14]. The formation mechanism of premature rupture of membranes includes the following aspects: (1) The

increase of leukocytes caused by the pathogen infection and the increase of uterine contractility induced by the release of prostaglandins^[15]; (2) The destruction of lysosomes by leukocytes, and the susceptibility of membranes to cytotoxicity^[16]; (3) The increase of inflammatory cells induced by infection with pathogens in pregnant women, and the membrane proteins and extracellular matrix are degraded by hydrolases secreted by inflammatory cells, causing premature rupture of membranes^[17]. When pregnant women have premature rupture of membranes, resulting in oligohydramnios, the protective effect of membranes will disappear, causing a variety of microbial invading the reproductive tract, and increasing the incidence rate of intrauterine infection and amniotic fluid pollution^[18]. Studies have shown that^[19] intrauterine infection will lead to increased inflammatory cells and endotoxin secretion, resulting in intrauterine inflammation and increasing the incidence of abortion and premature birth in pregnant women, and at the same time, increasing the incidence of pneumonia and jaundice in fetuses. Oligohydramnios caused by premature rupture of membranes affects the fetus mainly in the following two aspects: On the one hand, oligohydramnios causes serious uterine contraction, affects the blood circulation of umbilical cord, causes fetal respiratory dysfunction and affects the development of fetal lung; on the other hand, amniotic fluid is an important component of placenta, and it is a necessary environment for fetal growth and development, oligohydramnios can cause placental insufficiency, affect fetal growth space and form adverse neonatal outcomes of low birth weight, which is consistent with the results of Jiang Bailing's study^[20].

From the above analysis results, we can see that group B streptococcus infection, vaginal flora disorder, premature rupture of membranes and adverse maternal and infant outcomes have a strong correlation, this study can also further explore the relationship between group B streptococcus infection, vaginal flora disorder and premature rupture, so as to provide the relevant theoretical basis for clinical medical treatment. To sum up, group B streptococcus infection, vaginal flora disorder and premature rupture of membranes of pregnant women in middle and late pregnancy can increase the incidence of premature birth, amniotic fluid pollution, postpartum hemorrhage, intrauterine infection, premature birth, neonatal jaundice, neonatal pneumonia and other adverse maternal and infant outcomes. Treatment should be taken as early as possible to

ensure maternal and infant safety.

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