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The course of labor in term patients with concomitant acute intestinal infections

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BACKGROUND: Literature data on the course of labor in women with concomitant acute intestinal infections are very scarce. Individual works and articles are devoted to the coverage of this most important final stage of pregnancy. There are no developed specific tactics of labor management in patients with acute intestinal infections, therefore obstetricians and gynecologists have to use generally accepted standards of labor management in this group of patients, without having a clear idea of the frequency and nature of clinically relevant complications in childbirth.

AIM: The aim of this study was to evaluate the course of labor in women with concomitant AIs at full-term pregnancy.

MATERIALS AND METHODS: We examined 120 patients aged 19 to 39 years, delivered in Clinical Infectious Disease Hospital named after S.P. Botkin, St. Petersburg in 2017–2019. The main group consisted of 60 women with concomitant acute intestinal infections who gave birth, and the comparison group comprised 60 conditionally healthy women. The spectrum of acute intestinal infection pathogens in pregnant women, the course of labor, complications during labor and the condition of newborns were evaluated.

RESULTS: Women of the both study groups did not differ in the duration of labor and the anhydrous interval, the frequency of birth abnormalities, the volume of blood loss, and the frequency of maternal injury and complications in the postpartum period. The frequency of premature rupture of membranes, acute and chronic fetal hypoxia, and episiotomy was higher in patients of the main group. Asphyxia in the first minute after birth was also more common in newborns from women with concomitant acute intestinal infections.

CONCLUSIONS: Acute intestinal infections may complicate the course of labor. Labor management in women with concomitant acute intestinal infections requires continuous monitoring of the condition of the fetus during labor and the provision of timely medical care to the newborn.

Keywords: pregnancy; childbirth; acute intestinal infection; newborn; complications.

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Течение родов при доношенном сроке беременности у женщин с сопутствующими острыми кишечными инфекциями

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Обоснование. Данные о течение родов у женщин с острыми кишечными инфекциями в литературе встречаются крайне редко. Этому важнейшему завершающему этапу беременности посвящены единичные работы и статьи. Не разработаны конкретные тактики ведения родов у больных острыми кишечными инфекциями, в связи с чем врачам — акушерам-гинекологам приходится руководствоваться общепринятыми стандартами ведения родов без четкого представления о частоте и характере осложнений в родах, протекающих на фоне острой кишечной инфекции.

Цель — оценить течение родов у женщин с острыми кишечными инфекциями при доношенном сроке беременности.

Материалы и методы. Обследованы 120 пациенток в возрасте от 19 до 39 лет, родивших в СПбГБУЗ «КИБ имени С.П. Боткина» в 2017–2019 гг. Основную группу составили 60 родильниц, у которых выявлены острые кишечные инфекции. Группу сравнения составили 60 условно здоровых женщин. Оценены спектр возбудителей ОКИ у беременных, течение родов, осложнений во время родового акта и состояние новорожденных.

Результаты. Пациентки обеих групп не различались по продолжительности родов и безводного промежутка, частоте возникновения аномалий родовой деятельности, объему кровопотери, частоте возникновения материнского травматизма и осложнений в послеродовом периоде. Частота преждевременного излития околоплодных вод, острой и хронической гипоксии плода, эпизиотомии была выше у пациенток основной группы. Асфиксия на первой минуте после рождения также встречалась чаще у новорожденных от женщин с острыми кишечными инфекциями.

Заключение. Острые кишечные инфекции могут осложнять течение родов. У женщин с острыми кишечными инфекциями необходимо роды вести при непрерывном контроле за состоянием плода во время родового акта и обеспечить своевременную медицинскую помощь новорожденному.

Ключевые слова: беременность; роды; острая кишечная инфекция; новорожденный; осложнения.

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BACKGROUND

Complications in the course of pregnancy, childbirth, postpartum period, and newborn conditions in the presence of acute intestinal infections (All) in the mother represent an urgent but poorly investigated problem. Depending on the gestational age, Alls can cause spontaneous abortion, chorioamnionitis, and premature rupture of membranes, and, thus, preterm birth of a premature baby. Infectious processes in the body of a pregnant woman, affecting the fetus, can lead to antenatal death, neonatal sepsis, and meningitis [1–13].

Until now, no studies were conducted detailing the features of the delivery of female patients with All at full-term pregnancy. Some reports are presented, which mainly describe the effect of certain pathogens that cause All on the course of pregnancy, childbirth, and the postpartum period. In published studies, childbirth occurred at different gestational ages and in different ways.

A very small number of cases of All associated with *Campylobacter jejuni* and *Campylobacter fetus* in pregnant women are known to date; however, these pathogens are considered proven to cause septic abortion, preterm labor, and maternal sepsis [5–8]. No data was found on the effect of All caused by *Campylobacter jejuni* and *Campylobacter fetus* at full-term pregnancy on the course of labor and perinatal outcomes.

Salmonellosis in pregnant women can cause septic abortions, antenatal fetal death, chorioamnionitis, postpartum sepsis, neonatal sepsis, and meningitis [7, 11, 14]. A.R. Scialli, T.L. Rarick, L. Coughlin, and J. McGuigan described that the gestational age was 15 and 16 weeks in clinical cases of salmonellosis during pregnancy that ended in spontaneous abortions [7, 15]. M. Seoud et al. reported 14 cases of typhoid fever in pregnancy. This disease, diagnosed after 20 weeks, with adequate treatment, did not affect the pregnancy outcome and the condition of newborns. One of the two cases of typhoid fever, established before 20 weeks of gestation, ended in septic abortion at week 16, whereas the other case ended in full-term delivery. At birth, the child was diagnosed with neonatal sepsis caused by *K. pneumonia* [11]. S. Mohanty reported 5 pregnant women with salmonellosis caused by *S. typhi* and *S. paratyphi A* strains, who had a vaginal delivery. One case had preterm birth at 28 weeks of gestational age, whereas the other four cases were delivered at term. Two newborns were diagnosed with severe asphyxia at birth and three children were diagnosed with neonatal sepsis [16].

Evidence on the effect of shigellosis on pregnancy outcomes is inconsistent. According to some reports, pregnant women with dysentery caused by *Shigella flexneri* are characterized by the threat of pregnancy termination, but the incidence of preterm birth remains within the population

values [17]. N.S. Cherkasova obtained no data on the negative impact of dysentery on the course of pregnancy and childbirth [18]. Research by M. Makhmudova indicates that with dysentery, the frequency of not only spontaneous abortion but also abnormalities of uterine contractile activity increases, as well as the average labor duration and volume of blood loss [19].

Pregnancy with *Shigella sonnei* dysentery can be complicated by the threat of preterm delivery. Thus, a clinical case of surgical abdominal delivery of a patient with a gestational age of 25/26 weeks was presented. In presence of *Shigella sonnei*, a premature rupture of membranes stained with meconium occurred; the patient started labor, which was completed by cesarean section due to acute fetal hypoxia [12]. M. Parosot revealed that 28 pregnant women at different gestational stages had various pregnancy complications, and the course of labor was noted in the presence of dysentery caused by *Shigella sonnei*. In the third trimester of pregnancy, 15 out of 22 pregnant women registered the threat of preterm delivery, which was implemented in three cases. In addition, childbirth was typical in one case and ended with abdominal delivery due to acute fetal hypoxia in another. Woman 3 had an antenatal death of one fetus from twins, and the second fetus was born alive at 32/33 weeks of gestation [13].

Therefore, the literature best describes the effect of All on the course of pregnancy, but rarely at full-term. Practically, no data are available on the effect of All on the course of labor at full-term pregnancy.

This study aimed to evaluate the course of labor in patients with All in the third trimester of pregnancy.

MATERIALS AND METHODS

The childbirth of 120 patients at S.P. Botkin Clinical Hospital for Infectious Diseases in 2017–2019 was retrospectively analyzed. The patients included in the study were distributed into two groups. The main group consisted of 60 patients who gave birth with the presence of All. Inclusion criteria were childbirth at a gestational age of 37–41 6/7 weeks and clinical manifestations of All upon admission. Exclusion criteria were multifetal pregnancy, fetal malformations, and severe preeclampsia. The comparison group consisted of 60 conditionally healthy women. The inclusion criterion was childbirth at a gestational age of 37–41 6/7 weeks. Exclusion criteria were signs of any infectious diseases upon admission, multifetal pregnancy, fetal malformations, and severe preeclampsia.

The average age of patients included in the main group was 27.4 ± 4.2 years and 30.4 ± 4.5 years in the comparison group ($F = 14.2$; $p < 0.001$). The gestational age at the time of delivery in the main group was 39.3 ± 1.1 weeks and 39.3 ± 1.1 weeks in the comparison group.

Table 1. Characteristics of patients in the studied groups

Параметры	Main group (n = 60)	Comparison group (n = 60)	Significance of differences, p
Primigravidae	26 (43.3 ± 6.4)	17 (28.3 ± 5.8)	N/S
History of abortion	18 (30.0 ± 5.9)	16 (26.7 ± 5.7)	N/S
History of childbirth	25 (41.7 ± 6.4)	38 (63.3 ± 6.2)	<0.05
History of cesarean section	3 (5.0 ± 2.8)	0	N/S

Note: N/S — not significant.

Table 1 presents the reproductive history of patients from the main and comparison groups.

Upon hospital admission, all patients underwent a clinical blood test, biochemical blood test, general urine test, and fecal bacteriological examination. In the case of the growth of microorganisms, automatic mass spectrometry was performed on a Vitek MS bacteriological analyzer. Automatic isolation of nucleic acids for the polymerase chain reaction (PCR) of feces for diagnostics of All pathogens was performed at the Neon-100 (Xiril) station. PCR diagnostics of viral and bacterial pathogens in feces was performed using the test systems of the company InterLabService "AmpliSens OKI screen-FL" on a Rotor-Gene Q device. All patients underwent fetal ultrasound examination, Doppler blood flow test in the mother-placenta-fetus system, and cardiotocography. For morphological examination of the placenta after delivery, its 1–2 cm³ fragment was fixed in 10% neutral buffered formalin (pH 7.2), dehydrated using the Sakura Tissue-Tek VIP 5 Jr automatic station, and embedded in paraffin according to the standard histological scheme. The material was stained with hematoxylin and eosin for microscopic examination.

The average age of patients was calculated using a one-way analysis of variance (ANOVA). The Pearson Chi-square test was used to analyze the characteristics of delivery and complications arising during childbirth. The multivariate

Table 2. Etiological structure of acute intestinal infections in pregnant women

Microorganisms causing All	Number of patients, n	Incidence, %
<i>Enterobacter</i> spp.	19	32
<i>Klebsiella</i> spp.	12	20
<i>Citrobacter</i> spp.	12	20
<i>Hafnia</i> spp.	5	8
<i>Proteus</i> spp.	4	7
<i>Norovirus</i>	4	7
<i>Enterococcus</i> spp.	2	3
<i>Shigella Sonne</i>	1	2
<i>Rotavirus</i>	1	2
Total	60	100

Note. All — acute intestinal infections.

ANOVA was used to compare the duration of the mothers' stay in the postpartum ward.

Statistical processing of the research results was performed using International Business Machines Corporation Statistical Package for the Social Sciences Statistics 24. The critical level of significance for all statistical tests was equal to 0.05.

RESULTS AND DISCUSSION

Analysis of the range of All pathogens in the main group showed that opportunistic flora prevailed in the etiological structure of All. Table 2 presents data on the range of microorganisms detected in the main group.

Table 3 presents data on the gestational age at which the disease started to develop and delivery occurred, depending on the identified pathogen.

Table 3 shows that childbirth occurred soon after the onset of All symptoms and hospitalization. No differences were found depending on the pathogen.

In the main group, 73.3% (44 patients) of pregnancies resulted in vaginal delivery, wherein 4.5% (2 patients) ended in vacuum extraction of the fetus due to acute hypoxia. Five patients of the main group resulted in a planned cesarean section, whereas an emergency cesarean section was performed in 11 puerperas with All. Cesarean section was performed in 62.5% of patients with Alls caused by *Enterobacter* spp., *Citrobacter* spp., and *Klebsiella* spp. All women of the comparison group had a vaginal delivery.

Table 4 presents the indications for surgical abdominal delivery in female patients with All. Half of all cesarean sections were performed due to acute fetal hypoxia.

Premature rupture of membranes was more common in patients with All ($\chi^2 = 14.594$; $p < 0.0001$), whereas timely rupture of membranes was more common in patients in the comparison group ($\chi^2 = 14.594$; $p = 0.01$). The frequency of early rupture of membranes was equal in women of both groups (Table 5).

Abnormalities of labor activity were registered in patients of both groups; they did not differ in frequency of occurrence and were represented by primary and secondary poor uterine contraction strength. Primary poor

Table 3. Terms of hospitalization and delivery, depending on the pathogens identified in the main group

Pathogens	n	Gestational age at the onset of the disease, weeks	Gestational age at delivery, weeks
		M ± m	M ± m
<i>Enterobacter</i> spp.	19	39.2 ± 1.04	39.3 ± 1.1
<i>Klebsiella</i> spp.	12	39.4 ± 0.9	39.5 ± 1.08
<i>Citrobacter</i> spp.	12	39.08 ± 1.08	39.1 ± 1.2
<i>Hafnia</i> spp.	5	37.6 ± 0.9	38.0 ± 1.4
<i>Proteus</i> spp.	4	39.6 ± 0.8	39.6 ± 0.8
<i>Norovirus</i>	4	39.2 ± 0.9	39.7 ± 1.2
<i>Enterococcus</i> spp.	2	40	40.5 ± 0.7
<i>Shigella Sonne</i>	1	40	40
<i>Rotavirus</i>	1	39	40

Table 4. Indications for surgical abdominal delivery in female patients with acute intestinal infections

Indications for surgical delivery	Number of patients, n	Incidence, %
Acute fetal hypoxia	8	50
Uterine scar inconsistency after cesarean section	2	13
Acute genital herpes	2	13
Drug-resistant primary poor uterine contraction strength	1	6
Foot presentation of the fetus	1	6
Threatening uterine rupture	1	6
Thrombosis of hemorrhoids	1	6

Table 5. Estimation of the time of discharge of amniotic fluid in the studied groups

Nature of the amniotic fluid discharge	Main group (n = 54)		Comparison group (n = 58)	
	number of patients, n	incidence, %	number of patients, n	incidence, %
Preterm discharge	21	38.9*	6	10.3
Early discharge	8	14.8	10	17.3
Timely discharge	25	46.3	42	72.4**

* $p < 0.0001$; ** $p = 0.01$.

uterine contraction strength in patients with All was revealed in 1 case of childbirth (1.9%), and in 2 cases in the comparison group (3.3%). Secondary poor uterine contraction strength was found in 2 patients of the main group (3.8%), whereas secondary poor uterine contraction strength was not noted in patients of the comparison group. In both groups, puerperas with secondary poor uterine contraction strength were given oxytocin stimulatory therapy with a positive effect. Labor induction with oxytocin in a puerpera of the main group with primary poor uterine contraction strength was ineffective. The patient had delivered by emergency cesarean section.

The duration of labor in patients of both groups did not significantly differ. Puerperas of the main group lasted for 7.1 ± 2.2 h, whereas 6.8 ± 2.4 h in the comparison group.

Acute and chronic fetal hypoxia was more common during labor in the main group ($\chi^2 = 15.393$; $p = 0.002$ and $\chi^2 = 15.393$; $p = 0.028$, respectively). Table 6 presents the incidence of acute and chronic fetal hypoxia in patients of both groups.

The Apgar score of newborns from patients with All 1 min after delivery was 7.6 ± 0.4 points and 7.9 ± 0.1 points in the comparison group. The Apgar score of newborns from patients of the main group was 8.7 ± 0.4 points and 8.9 ± 0.2 points in the comparison group 5 min after delivery. Moderate asphyxia at birth (7 points on the Apgar scale 1 min after birth) was diagnosed in 31.6% (19 children) of newborns from mothers with All and in 3.3% (2 children) in the comparison group ($\chi^2 = 36.109$; $p < 0.0001$). No difference was found in the condition of children on the Apgar scale 5 min after childbirth.

Table 6. Incidence and structure of fetal hypoxia in the studied groups

Type of hypoxia	Main group		Comparison group	
	number of patients, <i>n</i>	incidence, %	number of patients, <i>n</i>	incidence, %
Острая гипоксия плода	11	20*	1	1.6
Хроническая гипоксия плода	7	12.7*	1	1.6

* $p = 0.002$; ** $p = 0.028$.

Table 7. Maternal injuries in the studied groups

Type of maternal injury	Main group		Comparison group	
	number of patients, <i>n</i>	incidence, %	number of patients, <i>n</i>	incidence, %
Hysteroecvorrhesis grade I	7	15.9	6	10
Hysteroecvorrhesis grade II	1	2.2	1	1.6
Rupture of the mucous membrane of the vaginal walls	2	4.4	0	0
Perineal rupture grade I	1	2.2	4	6.6
Perineal rupture grade II	1	2.2	3	5
Perineal rupture grade III	1	2.2	0	0

The volume of blood loss in puerperas with All during vaginal delivery was 272.7 ± 65.9 ml, 656.2 ± 89.2 ml in cesarean section, and 272.5 ± 85 ml in the comparison group.

Episiotomy in female patients of the main group was performed in 56.8% of cases (25 patients), whereas 28.3% of cases (17 patients) in the comparison group ($\chi^2 = 9.233$; $p = 0.01$). The main indication for episiotomy was the incipient perineal rupture.

No differences were found in the incidence of maternal injuries in both groups (Table 7).

In the postpartum period, the duration of stay in the ward was 5.1 ± 1.2 days for postpartum women with All and 4.0 ± 1.0 days for patients in the comparison group ($F = 25.634$; $p < 0.0001$).

No differences were found in the incidence of complications in the postpartum period between the postpartum women of both groups. Complications in the postpartum period were represented by hypotonic bleeding in the early postpartum period, placenta segment retention in the uterus, and uterine subinvolution. Hypotonic bleeding in the early postpartum period was noted in only 1 (1.6%) patient with All, due to which a manual examination of the uterine cavity was performed. The placenta segment retention in the uterus was registered only in patients of the comparison group and in 1 case of childbirth. This patient underwent a manual examination of the uterine cavity, and the retained segment of the placenta was removed. Uterine subinvolution was diagnosed in both groups, wherein 3.3% (2 patients) of patients in the main group and 5% (3 patients) in the comparison group. These patients underwent vacuum aspiration of the contents of the uterine cavity.

CONCLUSION

Study results revealed that at present, the etiological structure of patients with All with full-term pregnancy is represented mainly by opportunistic flora. Female patients with All at full-term pregnancy more often had a complicated course of labor. In this group, preterm discharge of amniotic fluid was noted more often than in the comparison group. The frequency of acute and chronic fetal hypoxia was significantly higher in patients with All, as well as the presence of moderate asphyxia 1 min after delivery. The data obtained confirm the study results by K.B. Markham, G. Mor, and M. Makhmudova on the risk of acute fetal hypoxia in puerperas with All [12, 13, 19]. No differences were found in the incidence of labor anomalies, labor duration, and volume of blood loss in patients with All, which was confirmed by the data of T.V. Belyaeva and N.S. Cherkasova [17, 18]. However, patients with All have an increased incidence of episiotomy during labor and a longer stay in the postpartum unit.

Therefore, childbirth must be performed in patients with All with continuous monitoring of the condition of the fetus during labor, and timely medical care to the newborn is necessary.

ADDITIONAL INFORMATION

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