

Clinical features of the course of pregnancy and childbirth in women with pneumonia

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Abstract.

Background. Currently, there is insufficient data on the clinical, laboratory, and instrumental features of pneumonia in pregnant women that characterize hemodynamic disorders leading to the development of multiple organ failure, which makes difficult to target intensive treatment of this category of patients. Despite the available data on changes in laboratory parameters for influenza, their correlation relationships as predictors of the development of pneumonia remain insufficiently studied.

Aim. Analysis of the community-acquired pneumonia cases and their outcomes in pregnant women.

Materials and methods. A prospective observational study was conducted. The cases of community-acquired pneumonia and their outcomes in pregnant women was studied. Pregnant women were admitted to the City Perinatal Center No. 1 of Tashkent and the Regional Perinatal Center in Bukhara city from 2009 to 2014. The sample includes 180 pregnant women.

Results. 47.2% of pregnant women had severe community-acquired pneumonia. 14.4% of pregnant women with normal body temperature and without wheezing had pneumonia, the diagnosis of which was made on the basis of signs of intoxication, the presence of weakened breathing and radiological criteria - the presence of inflammation. With progression of severity of pneumonia decreased hematocrit, urine volume and total protein, increased leukocytosis and the process of intravascular thrombosis. In parallel with progress of intoxication pregnancy is complicated by the threat of spontaneous abortion, premature discharge of amniotic fluid. The frequency of perinatal complications of hypoxia increased in parallel with the progression of the severity of pneumonia. In pregnant women with severe pneumonia, significantly lower fetal weight and growth rates and Apgar scores of 4-5 points in the first minute and after 5 minutes were observed.

Keywords. Community-acquired pneumonia, pregnant women, pregnancy outcomes.

Introduction

Infectious diseases of the respiratory organs in pregnant women are an urgent problem, which is primarily determined by the frequency of pneumonia in pregnant women, the negative consequences for the development of the fetus and the newborn. Mistakes in the diagnosis of pneumonia, according to some researchers, are 20%, and among pregnant women the frequency of diagnostic mistakes reaches 30% (S.A. Racina and co-authors, 2010). Pneumonia is diagnosed in the first 3 days in 35% of cases. The late diagnosis of pneumonia in pregnant women is due to many reasons. The lack of a unified tactics and management strategy for pregnant women with pneumonia, an increase in the number of cesarean sections, high maternal and perinatal mortality and morbidity due to pneumonia, necessitate a thorough analysis. In connection with the foregoing, we made an attempt to study the features of the course of pneumonia in pregnant women, a range of complications of the gestational process.

The purpose of this study was to conduct a prospective analysis of the course and outcome of pregnancy in women with community-acquired pneumonia (CAP).

Materials and methods.

A prospective observational study was conducted. The course and outcome of pregnancy was studied in pregnant women with community-acquired pneumonia admitted to the City Perinatal Center No. 1 of Tashkent and the Regional Perinatal Center of Bukhara from 2009 to 2014. The sample includes 180 pregnant women with community-acquired pneumonia.

Research results and discussion.

In the vast majority of cases, pregnant women with pneumonia were admitted to the hospital in the period of 20-30 weeks - 52, (28.9%) and in the period of 32-36 weeks - 86 (47.8%), and 36

(20.0%) in gestational age 37-40 weeks. At the time of admission, pregnant women indicated a previous SARS for 4-5 days, an increase in temperature, weakness, and lack of appetite were noted. The results of the analysis of anamnestic data, complaints of patients upon admission showed that at the time of admission, fever in 54.4% of pregnant women averaged $38.8 \pm 1.20^{\circ}\text{C}$ in $39.4 \pm 1.70^{\circ}\text{C}$ and in 37 (20.6%) 37.5 ± 1.4 .

Patients were admitted on average for 6.8 ± 2.7 days after the transfer of SARS. Upon admission to the hospital, pregnant women with community-acquired pneumonia showed an increase in body temperature from 37°C and more in all pregnant women (up to 37°C in 26 women -14.4%, up to 38°C in 23 women - 12.8%, $38-39^{\circ}\text{C}$ in 88 - 48.9%, and more than 39°C in 43 women - 26.9%). Of the total number of patients, 145 (80.6%) noted increasing weakness and rapid fatigue. The overwhelming majority of pregnant women 158 (87.8%) noted headaches for several days, while patients noted sharp headaches during the height of SARS, then, with the use of analgesics, the pain subsided. It was noteworthy that, against the background of satisfactory health, within 2-3 days after the “cold”, the headache progressed. Against the background of poor health, the patients noted joint pain 112 (62.2%) and a decrease in appetite 175 (97.2%). Periodic chills with severe sweating were noted 102 (56.7%), sore throat 87 (48.3%). Nausea was noted in 77 (42.8%), vomiting in 5 (2.8%), dry cough in 17 (9.4%) patients. During a physical examination, auscultation against the background of weakened, sometimes hard breathing, wheezing was heard in 17 (9.4%) cases. An x-ray study conducted in 2 projections confirmed the presence of an x-ray picture of bilateral pneumonia in all 180 pregnant women.

Table №1

Volume of pulmonary tissue lesions in pregnant women with CAP

R-characteristic of lung tissue	CAP of moderate severity	CAP severe severity
Unilateral lung lesions	49 (57,6%)	17 (32,1%)
- segmental	37(43,5%)	7 (9,1%)
- polysegmented	12(14,1%)	10 (13,0%)
Bilateral lung damage	36 (42,4%)	60 (78,0%)
- segmental	14(16,5%)	13(16,9%)
- polysegmented	22(25,9%)	47(61,0%)

Assessment of severity and condition at admission was based on the degree of respiratory insufficiency, severity of intoxication, volume of inflammatory infiltration. Bilateral lung injury occurred in 96 (53.3%) cases, which was more unfavourable in terms of severity and outcome of both pregnancy and disease. In 77 (42.5%) patients, pneumonia was severe and in 85 (47.2%) it was moderate.

26 (14.4%) pregnant women without fever deserved special attention. At the same time, the patients noted weakness, headaches, pain in joints and muscles, no appetite and bad sleep. It was found out from the anamnesis that during 8.5 ± 2.4 days on average they had undergone SARS with fever for 3 days, with chills, and then normalization of temperature was observed.

At the initial examination by the therapist of the perinatal center was noted auscultation weakened vesicular or hard breathing, lack of wheezing, no data for pneumonia. There were 7 cases of pharyngitis, 10 cases of tonsillitis and 9 cases of residual SARS.

The results of clinical observation and laboratory tests showed that 18 (69.2%) pregnant women had a dry cough with separation of small amounts of sputum, fever on average up to 37.8 ± 2.1 , chest pain, shortness of breath up to 26 ± 2 beats per minute. Auscultation was detected against the background of weakened vesicular breathing, presence of dry and small bubble wheezing. In 7 patients the temperature was within normal values, pulse rate averaged 98.4 ± 7.8 beats. Patients noted progressive weakness, coughing dry with separation of small amount of mucosa sputum, shortness of breath at low physical activity. All 26 patients underwent chest X-ray examination and pulmonary tissue infiltration in the lower lobes on both sides was detected.

The most pronounced respiratory insufficiency in the examined pregnant women with community-acquired pneumonia was observed in 85 women (47.2 per cent) with a respiratory rate (RR) of more than 30 per minute and in 77 women (42.8 per cent) with RR of 0-30, while the remaining 18 women (10 per cent) had RR up to 20 per minute.

Assessment of severity of the condition of patients with community-acquired pneumonia was based on the degree of respiratory insufficiency, severity of intoxication, state of function of vital organs. Of the total number of pregnant women with CAP, 85 (47.2%) had a severe condition on admission and 77 (42.8%) had a moderate condition on admission.

Analysis of peripheral blood parameters was differentiated depending on the severity of the patient's condition (Table 2).

The results of the differentiated analysis of peripheral blood parameters show that a relatively high erythrocyte index of $3.4 \pm 0.4 \cdot 10^{12}/l$ was observed in pregnant women from CAP admitted to the hospital in a relatively satisfactory condition, and a decrease in the number of erythrocytes, hemoglobin and color index was observed as the patient's condition progressed in severity: erythrocytes - $2.8 \pm 0.4 \cdot 10^{12}/l$, Hb - 95.6 ± 3.4 g/l and CI - 0.78 ± 0.02 . This dynamics indicates the development of anemia. Moderate leukocytosis was observed in all patients. In I group patients $9.7 \pm 1.8 \cdot 10^9/l$, in II group - $12.4 \pm 1.8 \cdot 10^9/l$ and in pregnant women with severe pneumonia leukocytosis was $14.4 \pm 1.6 \cdot 10^9/l$, with a shift of the leukocytic formula to the left and the development of lymphocytopenia and monocytopenia. The level of lymphocytes in patients of III group with severe course of CAP decreased to 16.4 ± 2.7 and monocytes to 2.8 ± 2.4 . It should be noted that the progressive reduction of hematocrit parameters in patients with severe course of CAP is $20.8 \pm 3.2\%$ against $38.6 \pm 3.2\%$ in practically healthy pregnant women ($P < 0.001$).

Table №2

Some indicators of peripheral blood, biochemistry in pregnant women with CAP

Learning Options	Surveyed groups of pregnant women			
	Control group n=30	I Satisfactory condition n=18	II Moderate condition n=77	III Severe condition n=85
Red blood cells, 10-12/l	3,8±0,6	3,4±0,4	3,0±0,6	2,8±0,4
Hemoglobin, g/l	110,8±4,8	109,7±3,7	100,8±3,2	95,6±3,4
White blood cells, 10 ⁹ /l	7,7±1,8	9,7±1,8	12,4±1,8	14,1±1,6
Color indicator	0,94±0,04	0,85±0,02	0,82±0,04	0,78±0,02
Neutrophils, % -immature -segmented	4,2±1,2 49,7±8,7	8,9±1,5 45,8±7,7	10,2±1,4 43,4±6,8	14,8±1,2 40,6±5,8
Lymphocytes,%	22,7±2,3	18,7±2,2	17,6±2,2	16,4±2,7
Monocytes, %	6,4±4,8	4,8±3,6	3,7±3,2	2,8±2,4
ESR, mm/h	15,6±1,8	25,4±1,6	27,6±1,8	30,4±1,7
Hematocrit%	38,6±3,2	32,4±3,7	28,6±2,8	20,8±3,2
Total protein, g/l	6,8±2,9	62,8±2,8	60,2±2,2	58,4±2,4
Albumin, mol/L	65,4±2,2	62,4±2,1	58,4±2,2	54,6±2,2
Glucose, mol/L	4,5±1,3	3,6±1,2	3,3±1,8	3,0±1,4
Bilirubin total, μmol/l	9,4±1,7	10,6±1,8	12,2±1,6	14,6±1,4
-ALT, mol/l	0,3±0,2	0,38±0,2	0,44±0,3	0,46±0,3
-AST, mol/l	0,4±0,3	0,42±0,3	0,48±0,3	0,52±0,4
Residual nitrogen, mol/l	28,4±3,4	26,4±3,2	28,9±3,4	29,4±3,2
The daily amount of urine, ml	1250,4±167,0	1150,4±175,0	990,7±136,4	820,6±127,6
The relative density of	1028,7±1,8	1022,6±1,7	1015,8±2,2	1010,4±2,8

urine				
Proteinuria, g/l	0,033±0,098	0,66±1,2	1,7±0,86	2,4±0,90
pH	6,8±1,2	6,6±1,4	6,4±1,2	6,2±1,4
Epithelium	5-6/1	8-10/1	10-12/1	12-16/1
White blood cells	4-5/1	6-8/1	12-16/1	16-18/1
Red blood cells	-	-	12-16/1	16-18/1
Cylinders	-	-	-	-
Fibrinogen, g/l	5,4±0,2	4,4±0,3	3,8±0,6	3,2±0,8
APR, s	56,4±3,8	62,2±3,2	68,4±2,8	70,6±2,6
APTT, s	34,2±2,4	36,2±2,7	38,8±2,2	40,8±2,4
PI%	98,6±4,8	96,4±4,2	94,8±3,8	88,6±2,8
Thromboelastogram				
R + K, mm	16,8±1,4	18,8±1,4	22,4±3,2	24,2±2,8
mA mm	50,5±2,3	48,8±2,2	46,4±2,6	38,6±2,4
ITP, conv. unit	19,4±1,6	18,2±1,4	16,4±1,2	12,8±2,1
TMA (%) platelet aggregation with stimulation of 10-3m				
ADP	44,2±7,8	42,4±6,4		
Adrenaline	42,3±4,2	40,8±3,8		
Collagen	38,4±5,8	40,4±6,2		
Platelets	264,8±18,6	248,4±16,8	202,8±14,4	180,4±12,8
FDP Mg/ml	4,1±1,8	4,6±1,6	4,8±1,2	5,2±1,8
SFMK				
Negative	n =30	n =18	n=65	n =58
Positive			n=12	n=27

As follows from the data of table No. 2, with increasing intoxication, the concentration of total protein progressively decreases and in the III group of patients amounted to 58.4 ± 2.4 g/l against 62.8 ± 2.8 g/l in the group of pregnant women with pneumonia and in satisfactory condition ($P < 0.001$). Progressive hypoproteinemia was accompanied by hypoalbuminemia, which in the III group was $54.6 \pm 2.2\%$ versus 62.4 ± 2.1 in the 1st group of pregnant women. In the dynamics of glucose, a decrease in its concentration was noted, and in III group it was 3.0 ± 1.4 mmol/L against 4.5 ± 1.3 mmol/L in the control group. The dynamics of biochemical parameters reflecting the functional state of the liver, such as bilirubin, ALT and AST, remained within the standard values. The indices of residual nitrogen, urea, and creatinine did not significantly differ from those obtained in practically healthy pregnant women. We analyzed some indicators of renal function in pregnant women with CAP (table No. 2).

As follows from the data in Table No. 2, as pneumonia progressed, a decrease in diuresis was noted, which in the group of patients with severe course of the disease was 820.6 ± 127.6 ml versus 1250.4 ± 167.0 ml in the control group ($p < 0.001$).

As the intoxication progressed, there was a decrease in urine specific gravity and an increase in proteinuria, which in the group of patients with severe pneumonia course amounted to 2.4 ± 0.90 g/l against 0.033 ± 0.098 g/l in the control group ($p < 0.001$).

The number of leukocytes in the field of view also increased 16-18 in patients with severe disease.

We have analyzed some parameters of hemostasis in pregnant women with CAP depending on the period of gestation (Table 3).

Table №3

Hemostasis indices in pregnant women with pneumonia by gestation period

Learning Options	Examined pregnant					
	Control group			Main group		
	I trimester n=10	II trimester n =10	III trimester n =10	I trimester n =12	II trimester n =74	III trimester n =94
Fibrinogen, g/l	3,2±0,25	3,4±0,2	3,8±0,61	4,9±0,25	5,2±0,2	6,9±0,4
APTT, s	34,4±2,8	38,2±1,4	32,4±2,1	32,2±2,8	32,0±2,2	31,5±3,1
PI,%	82,4±3,9	82,6±4,8	86,4±3,7	88,4±3,9	99,8±3,8	100,4±2,9
Platelets	256,4±12,1	264,8±18,6	284,5±11,9	248,4±16,9	225,7±17,4	180,4±12,8

An analysis of the results of the study of hemostasis parameters indicates certain changes and patterns indicating an increase in the processes of intravascular thrombosis in pregnant women with pneumonia.

We conducted a study of the hemostatic system in pregnant women with CAP, depending on the severity of the patients' condition. It is known that with physiologically occurring pregnancy, hypercoagulation and inhibition of fibrinolysis are noted, which reflects the process of preparation for the postpartum period. In our opinion, it seems interesting to study the adaptive mechanisms in pregnant women with pneumonia, which will allow timely diagnosis of the onset of the failure of the adaptive mechanisms of hemostasis and the implementation of thrombotic and hemorrhagic complications and will serve as the basis for developing a method for the prevention of these complications. Given the above, the purpose of this section of hemostasis studies in uncomplicated pregnancy and in 180 pregnant women with pneumonia, depending on the gestational age and severity of the condition at admission.

The severity of changes in the parameters of the hemostatic system depends on the duration and severity of the clinical manifestations of the inflammatory process in the lungs. In pregnant women received in satisfactory condition, the concentration of fibrinogen was 4.4 ± 0.3 g/l, which is significantly lower compared to the control values of 5.4 ± 0.2 g/l ($P < 0.01$).

As the inflammatory process progresses in the lungs, an increase in recalcification time is noted. A significant decrease in the concentration of fibrinogen in the group of pregnant women with severe pneumonia was noted and amounted to 3.2 ± 0.8 g/l against the control values of 5.4 ± 0.8 g/l. As for platelet concentration, thrombocytopenia was observed compared with the control group. So, as the severity of the patient's condition progresses, a progressive decrease in the number of platelets was noted, which in the III group of pregnant women was $180.4 \pm 12.8 * 10^9$, which is significantly lower than the indicators obtained in the I group ($248.4 \pm 16.9 * 10^9$) ($P < 0.01$).

Induction of the vascular-platelet link of hemostasis in pregnant women leads to the consumption of functionally active platelets. An increase in plasma products of degradation of fibrinogen and fibrin indicates the progression of intravascular coagulation in pregnant women with an inflammatory lesion in the lungs. Thus, the concentration of FDP increased from 4.1 ± 1.8 mg/ml in pregnant women with a physiological course of the gestational process to 5.2 ± 1.8 mg/ml in pregnant women with severe pneumonia. The concentration of soluble complexes of fibrin monomers (SCFM) was significantly increased in pregnant women with CAP and satisfactory condition upon receipt of significant changes in general assessment tests; no aggregation-adhesive properties were noted.

Most parameters of blood coagulation and platelet activity reflected a high coagulation potential with no signs of activation: the level of FDP and the concentration of SCFM did not significantly differ from the control values. Changes in coagulation and aggregation activity were more pronounced in the II and III group of pregnant women. Aggregate curves in pregnant women with severe pneumonia are represented by hyperaggregation types. Most of the parameters of the plasma link of hemostasis ART, APTT, PI in pregnant women in 1 group did not significantly differ from control values. At the same time, as the severity of the patient's condition progresses, platelet

hyperactivity was noted in the form of an acceleration of their reaction to the action of aggregation inducers.

In pregnant women with CAP and a severe inflammatory process, along with a maximum increase in platelet activity, an increase in the total activity of blood coagulation factors was observed in terms of ART, APTT, and PI. Total blood coagulation was characterized by chronometric (r+k) and structural (ITP) hypercoagulation, increased signs of consumption coagulopathy. The obtained indicators reflect hypercoagulation in pregnant women with pneumonia and the progression of CAD.

Analysis of the course and outcomes of pregnancy, childbirth, the state of the fetus and newborn was carried out differentially, depending on the severity of the condition of women with CAP.

Table №4

Results of the analysis of the course of pregnancy and childbirth in pregnant women with CAP

	Learning Options	Surveyed groups of pregnant women		
		Control n =120	CAP of moderate severity n=77	CAP severe severity n =85
1.	Threat of spontaneous interruption of pregnancy	6(5,0%)	12(15,6%)	18(21,2%)
2.	Oligohydramnios	4(3,5%)	8(10,4%)	15(17,6%)
3.	Polyhydramnios	5(4,2%)	6(7,8%)	9(10,6%)
4.	Premature birth	3(2,5%)	9(11,7%)	11(12,9%)
5.	Premature discharge of amniotic fluid	10(8,3%)	10(13,0%)	15(17,6%)
6.	Preeclampsia	4(3,5%)	7(9,1%)	8(9,4%)
7.	Fetal developmental delay syndrome	3(2,5%)	6(7,8%)	9(10,6%)
8.	PDNLP	3(2,5%)	5(6,5%)	7(8,2%)
9.	Cesarean section	8(6,7%)	7(9,1%)	9(10,6%)

The obtained results show (Table 4) that as intoxication progressed, the course of pregnancy was more often complicated by the threat of spontaneous miscarriage, the frequency of which in the group with moderate severity pneumonia was 15.6%, and in the group with severe pneumonia - 21.2% ($P<0.01$). Oligohydramnios was recorded in pregnant women with severe CAP in 17.6%, compared to 10.4% in the group with medium current severity. A significant difference in the frequency of premature outflow of amniotic fluid was recorded in pregnant women with severe pneumonia, amounting to 17.6% against 8.3% in the control group ($P<0.01$). As for operative births, the indications for pregnant women with CAP were PDNLP and fetal distress. In no case was a C-section performed for pneumonia (Table 5).

Table № 5

The results of the study of the fetus

Learning Options	Surveyed Groups		
	Control n =120	CAP of moderate severity n=77	CAP severe severity n =85
Age years	24,4±4,7	25,6±3,6	27,6±2,7
Pregnancy, weeks	35,7±2,7	36,6±4,2	36,8±2,5
Dopplerographic study data in pregnant women with CAP			

CDA ma	1,8±0,22	2,5±0,34	2,8±0,42
CDA ap	2,9±0,68	3,1±0,54	3,5±0,47
Assessment of fetal status according to CTG in pregnant women with CAP			
Basal heart rate bumps/min	-	158,8±2,8	164,7±1,3
Variability / Acceleration bumps/min	-	18,9±1,4 2,4 за 60'	27,4±2,5 2,5 за 60'
Decelerations	-	Variable duration 30,4±2,2	Variable uncomplicated 40,4±1,2

The results of the conducted studies show that as the intoxication progresses, there is a violation of blood flow in the uterine arteries and, corresponding to the violation of IA, and in the arteries of the IB umbilical cord. The fetal heart rate ranged from 140 to 170 beats in 1 and averaged 158.8±4.2 beats in a group of women with an average degree, and with severe pneumonia 164.7±4.5 beats in 1 minute. As for the variability of acceleration, they were recorded at an average of 2-3 per 60', variability of uncomplicated deceleration with a duration of 30-60 seconds.

Table №6

The status of newborns in women with CAP

Studied parameters in newborns	Группы обследованных		
	Control n=120	CAP of moderate severity n=77	CAP severe severity n =85
Body weight in g	3124,7±19,5	3009,7±16,8	2724,5±14,5
Height, cm	50,2±3,2	47,9±2,2	46,8±2,3
Apgar score in the first minute, points			
8-10	67 (55,8%)	30 (39,0%)	28(32,9%)
6-7	45(37,5%)	34 (44,2%)	40 (47,1%)
4-5	8 (6,7%)	13 (16,9%)	17 (20,0%)
In the fifth minute, points			
8-10	86 (71,7%)	50 (64,9%)	48 (56,5%)
6-7	30 (25,0%)	26 (31,2%)	30 (35,3%)
4-5	4 (3,3%)	3 (3,9%)	7 (8,2%)

As can be seen from the data in Table 6, in women with severe pneumonia the average weight of newborns was 2704.5±14.5 g, which is significantly lower than in the control group and in patients with CAP the average degree of severity. The assessment of newborns on the Apgar scale at the first minute showed that the largest number of children with a score of 4-5 was registered in women with severe pneumonia and amounted to 20.0% compared to 16.9% in the group with average severe pneumonia ($p < 0.05$). Assessment of children's condition after 5 minutes showed that the number of children with a score of 4-5 in the pregnant women with severe pneumonia remained significantly higher than 8.2% against 3.3% in the control group.

Conclusions

1. Of the total number of examined pregnant women with CAP in 10%, the condition was rated as satisfactory in 42.5% of moderate severity and in 47.2%, a severe course was noted.
2. In 14.4% of pregnant women, despite the normal temperature and the absence of wheezing, the diagnosis of pneumonia was made on the basis of signs of intoxication, the presence of weakened breathing and radiological criteria for the presence of a focus of inflammation.
3. As the severity of the course of CAP progressed, hematocrit decreased, diuresis decreased, leukocytosis progressed, and total protein concentration decreased.

4. As the severity of the course of CAP progressed, an increase in the processes of intravascular thrombosis was observed.
5. As intoxication progressed, the course of pregnancy was more often complicated by the threat of spontaneous abortion and premature leaking of amniotic fluid.
6. The frequency of perinatal complications of hypoxic genesis increased with progression of CAP severity. Pregnant women with severe pneumonia had significantly lower fetal weight and growth rates and scores on the Apgar scale of 4-5 in the first minute and 5 minutes later.

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