Preliminary assessment of the effects of Chorioamnionitis on the APGAR scores of newborns in the Lithuanian Health Sciences University Hospital.

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II. Abstract:

Background:
Chorioamnionitis is the infection of the amniotic fluid, membranes and placenta. It may be sub-grouped as clinical or subclinical infection. The signs may include maternal fever, maternal and fetal tachycardia, and leukocytosis. Adverse neonatal outcomes associated with chorioamnionitis include perinatal death, asphyxia, early onset neonatal sepsis and other. The accuracy of the diagnosis remains complicated, since depending on the hospital and literature, different protocols are established at each centre, and diagnosis is made hypothetically and sometimes with not enough criteria.

Aim: To establish a possible relationship between the chorioamnionitis and the possible effects on the newborn assessing their APGAR scores.

Objectives: 1. To analyze and assess diagnosis criteria based on the laboratory and clinical signs of chorioamnionitis. 2. To average the APGAR score of newborns possible affected of chorioamnionitis. 3. To establish a possible relationship for chorioamnionitis and diminished APGAR scores in the affected newborns.

Methods: Retrospective cohort study of 40 patients diagnosed with Chorioamnionitis and who delivered in the LUHS Kaunas Hospital Delivery department in the years 2013 and 2014. The data was obtained from LUHS Delivery department register and delivery case record. The data analyses included clinical and laboratory data that had confirmed the diagnosis of chorioamnionitis, APGAR scores of newborns. Statistical analysis was done with Aikake Information Criterion (AIC). APGAR Median values were calculated for the following groups: general (full sample), term deliveries (between 37+0 and 41+3 weeks of gestational age), Group B Streptococcus positive patients, Epidural receiving patients, medicated with metronidazole and also misoprostol.

Results: Half of the patients (55%) presented fever ≥38 degrees during labor, 80% of the patients presented leucocytosis, and 85% of cases presented elevated CRP. Third of the cases were with pathological CTG (32.5%) and unpleasant odor or colour of amniotic fluid (32.5%). The median value for APGAR 1 score was 5 and the median value for APGAR 5 score was 8 in the deliveries with gestational ages between 37+0 – 41+3 weeks. The median calculations for APGAR scores for Streptococcus Group B positive patients were: APGAR 1 - 4 and APGAR 5 - 7.

Conclusions:
1. Maternal fever, as the essential criterion for clinical diagnosis of chorioamnionitis was determined just for a half of patients (55%). 2. The median calculation for APGAR1 score was 5 and the APGAR 5 median score was 8 for the newborns delivered under the diagnosis of chorioamnionitis. 3. APGAR score was slightly diminished compared to normal healthy deliveries meaning that there could be a possible relationship between exposure and diminished APGAR scores.
III. Introduction:

Chorioamnionitis is a common complication in pregnancy caused by bacterial infection of the fetal amnion and chorion membranes. It is associated with significant maternal, perinatal, and long-term adverse outcomes. It can result on fetal and neonatal cardiopulmonary, cerebral, visual and renal systems dysfunction.

Recent studies regarding the diagnosis of chorioamnionitis in term deliveries have focused on the generality of the diagnostic criteria. The adverse maternal outcomes and neonatal risks have set a prophylactic protocol that is followed, without always being necessary. (1) Chorioamnionitis implies that a gravida has an “inflammatory or an infectious” disorder of the chorion, amnion, or both. Diagnosis often implies that mother and fetus may be at an increased risk for serious infectious complications, but does not indicate the severity of maternal or fetal illness, making it difficult to assess the consequences of this diagnosis for the mother or neonate. (2)

Therefore it is important to provide and assess accurate diagnosis criteria in order to improve the effectiveness treatment strategy and decrease the risk of multiple organ dysfunctions.

IV. Aim and objectives:

To establish a possible relationship between the chorioamnionitis and the possible effects on the newborn assessing their APGAR scores.

Objectives:

To analyze and assess diagnosis criteria based on the laboratory and clinical signs of choriamnionitis.
To average the APGAR score of newborns who were at risk of being affected by chorioamnionitis.
To establish a possible relationship for chorioamnionitis and diminished APGAR scores in the affected newborns.
V. Literature Review:

Etiology:

Early-onset bacterial infections in the newborn may appear when the mother has abnormal bacterial colonization which has reached the amniotic fluid, which may remain silent or manifest as symptomatic chorioamnionitis.

GBS infections are no longer the major cause of early onset sepsis. Over the past 35 years, awareness of GBS-related neonatal morbidity and mortality has resulted in intrapartum chemoprophylaxis with antibiotics therefore reducing the risk of GBS disease. Currently Gram-negative bacteria are most predominant, more specifically *Escherichia coli*. (3)

Methicillin-resistant *Staphylococcus aureus* (MRSA), which is significant in nosocomial infection in maternity and neonatal units, is also considered as a possible source of early onset sepsis.

Pathogenesis:

The pathogenesis of chorioamnionitis is marked by the passage of infectious organisms to the chorioamnion and/or umbilical cord of the placenta. Different processes of infection have been established:

- Retrograde or ascending infection from the lower genital tract (cervix and vagina) is the most common way of infection.
- Hematogenous/transplacental passage and iatrogenic infection due to complication from amniocentesis or chorionic villous sampling are less common routes of infection.
- Anterograde infection from the peritoneum via the fallopian tubes has also been postulated. (4)

The presence of infectious agents in the chorioamnion engenders a maternal and fetal inflammatory response characterized by the release of a combination of proinflammatory and inhibitory cytokines and chemokines in the maternal and fetal compartments. The inflammatory response may produce clinical chorioamnionitis and/or lead to prostaglandin release, ripening of the cervix, membrane injury and labor at term or premature birth at earlier gestational ages. (5)

Host defense mechanisms preventing intraamniotic infection remain poorly understood, but specific physiological changes have been observed. (6) The cervical mucus plug as well as the placenta and membranes provide a barrier to infection of the amniotic fluid and fetus. Peroxide-producing
lactobacilli in the birth canal may induce variations in the vaginal flora impairing the virulence of pathogenic organisms.

**Diagnosis of chorioamnionitis**

Chorioamnionitis refers to group of conditions including inflammation as well as infections of varying degrees of severity and duration. The diagnosis of chorioamnionitis is made when any combination (or even one) of the following elements is noted:

1. Maternal Fever
2. Fetal tachycardia (greater than 160 beats per minute for 10 minutes or longer)
3. Maternal WBC count greater than 15,000 in the absence of corticosteroids
4. Purulent fluid from the cervical os (cloudy or yellowish thick discharge confirmed visually on speculum examination to be coming from the cervical canal).

However the presence of one (or even more) of these symptoms does not necessarily indicate uterine infection or actual chorioamnionitis being present. (5)

Maternal fever can occur as a result of intraterine or extra uterine causes. Infectious causes can include pyelonephritis, upper and lower respiratory tract infections such as influenza as well as infections in other organ systems. (1) Noninfectious causes of fever include use of epidural analgesia during labor, hyperthyroidism, dehydration, elevated ambient temperature, and the use of pyrogens such as prostaglandin E2 for the induction of labor. (6,7)

**Importance of C-Reactive Protein**

Symptom of chorioamnionitis a are difficult to be recognized before birth, diagnosis can be made in patients presenting two or more of the following criteria: High temperature, maternal tachycardia, fetal tachycardia, uterine tenderness, foul-smelling amniotic fluid, maternal leucocytosis with bands, and positive C reactive protein (CRP). (4)

It has been reported than the incidence of chorioamnionitis is related with the lower gestational age at PROM. In a retrospective study of 371 women diagnosed with PPROM. Patients diagnosed with chorioamnionitis had significant lower gestational ages at PPROM, 68% had PPROM diagnosed before 34 weeks of gestation (8).

In another study of 287 NICU admitted preterm infants, PPROM was a significant risk factors associated with chorioamnionitis (9).
CRP level has been shown to be an important measures in the detection of chorioamnionitis. In a study were included 146 consecutive women presenting with PPROM (20–33 weeks), a model based on non invasive clinical and laboratory parameters (gestational age and maternal CRP) was effective for predicting the developpement of chorioamnios in woman with PPROM (10).

Serum CRP level above 8mg/L represent a significant risk for chorioamnionits, the concentration of CRP at admission appears to be an accurate markers with a sensitivity > 90%. (8).

However, a recent literature review based on the use of CRP as a predictor factor of chorioamnioniis, CRP level could correlate or be associated with choriomanionits but there is no clear evidence to support the use of CRP as an early diagnostic test of chorioamnionitis following PPROM (11).

**APGAR Score**

APGAR score is used as a part of an early assessment of the condition of the newborn. The score is assessed at 1 and 5 minutes after birth (APGAR1 and APGAR5). The score is based on the 5 physical signs that are assessed: heart rate, respiration, muscle tone and movement, skin color/oxygenation and reflex irritability to tactile stimulation. Each physical sign receives a score between 0-2.

APGAR scoring system is a comprehensive screening tool to evaluate a newborns condition at birth. Based on the score, the status of the newborn can be interpreted. (21) Scores between 7-10 have been considered as Normal status of the newborn, 4-6 is considered a moderately depressed status and between 0-3 it is considered as severely depressed status of newborns condition.

<table>
<thead>
<tr>
<th>Table 1</th>
<th>The Apgar Scoring System (from Apgar, V., 1966)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sign</td>
<td>Score</td>
</tr>
<tr>
<td>Color</td>
<td>Pale Blue</td>
</tr>
<tr>
<td>Reflex Irritability</td>
<td>None</td>
</tr>
<tr>
<td>Heart Rate</td>
<td>Absent</td>
</tr>
<tr>
<td>Respiratory Effort</td>
<td>Absent</td>
</tr>
<tr>
<td>Muscle Tone</td>
<td>Flaccid</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Score</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>7–10</td>
<td>Normal</td>
</tr>
<tr>
<td>4–6</td>
<td>Moderately Depressed</td>
</tr>
<tr>
<td>0–3</td>
<td>Severely Depressed</td>
</tr>
</tbody>
</table>
A low APGAR score less than seven points at five minutes is known to have implications for neonatal mortality, such as respiratory distress and neurological problems.

Studies have demonstrated a number of risk factors for low APGAR scores or asphyxia. These include socioeconomic, demographic and medical factors. Smoking, low socioeconomic status, single civil status of the mother, maternal short stature and maternal obesity have all been shown to increase the risk for a low APGAR score. (8) The delivery method, intrauterine meconium release and abnormalities in cardiotocography are also medical risk factors associated with a decreased APGAR score.

<table>
<thead>
<tr>
<th>Apgar Sign</th>
<th>2</th>
<th>1</th>
<th>0</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heart Rate (pulse)</td>
<td>Normal (above 100 beats per minute)</td>
<td>Below 100 beats per minute</td>
<td>Absent (no pulse)</td>
</tr>
<tr>
<td>Breathing (rate and effort)</td>
<td>Normal rate and effort, good cry</td>
<td>Slow or irregular breathing, weak cry</td>
<td>Absent (no breathing)</td>
</tr>
<tr>
<td>Grimace (responsiveness or &quot;reflex irritability&quot;)</td>
<td>Pulses away, sneezes, coughs, or cries with stimulation</td>
<td>Facial movement only (grimace) with stimulation</td>
<td>Absent (no response to stimulation)</td>
</tr>
<tr>
<td>Activity (muscle tone)</td>
<td>Active, spontaneous movement</td>
<td>Arms and legs flexed with little movement</td>
<td>No movement, &quot;floppy&quot; tone</td>
</tr>
<tr>
<td>Appearance (skin coloration)</td>
<td>Normal colour all over (hands and feet are pink)</td>
<td>Normal colour (but hands and feet are bluish)</td>
<td>Bluish-grey or pale all over</td>
</tr>
</tbody>
</table>


**EPIDURAL ANALGESIA AND MATERNAL FEVER**

The etiologies of intrapartum fever are various and between them infections and chorioamnionitis are included. Epidural analgesia is administered for pain relief during labor and has been known to be associated with a mild maternal temperature increase and over fever (14). The physiology behind the temperature elevation is characterized by sympathetic induced vasodilatation due to neuroblockade causing redistribution of body heat from the core to the periphery, where it is lost to the environment.(15)

Fusi et al. compared the vaginal temperatures of 18 parturient who received epidural analgesia with 15 women who received IM meperinide and metocllpramide.(12) The epidural group was found to have an average increase in temperature of approximately 1°C over 7 hours, while the temperature in the nonepidural group remained constant.

The fetus depends on the heat transfer from the mother to avoid hyperthermia, but maternal fever can induce fetal hyperthermia. (13) Some direct adverse effects of maternal fever have been documented in post partum period. A study performed by Morishima (14) demonstrated maternal deterioration and occasional death as well as increased uterine activity, late deceleration and fetal acidosis. A study performed b Lieberman (14) reviewed the records of 1218 nulliparous women who were febrile on admission. They found 10% developed fevers over 38.0°C and 5% over 38.3°C. Nearly all the febrile
women had received epidural analgesia. Moderate fever was found to be related to low fetal tone and 1 minute APGAR scores below 7.

**Chorioamnionitis effects on neonatal outcome.**

As maternal symptom presentation doesn’t always correlate with a systemic inflammation condition, the condition could be present without being detected and for an unknown period of time. Fetal inflammatory response syndrome is a frequent consequence of ascending maternal infections. Antenatal exposure to inflammation puts the neonates at a higher risk for disfavored developments for pulmonary, neurological and organ development. Many studies have associated chorioamnionitis with adverse neonatal outcome in newborn infants and the most pronounced effects were often present in infants with signs of FIRS. In term and preterm newborns in particular, perinatal brain damage is a fundamental cause of developmental delay and lifelong neurological disabilities. (20)

A relationship between chorioamnionitis exposed infants and a higher risk of bronchopulmonary dysplasia has been established, where the early gestational ages are more affected. Evidence has been found for a reduced surfactant efficacy in infants with severe chorioamnionitis associated with increased bronchopulmonary susceptibility. Preterm lungs are much more susceptible to injury, which would lead to chronic lung conditions such as respiratory distress syndrome and bronchopulmonary dysplasia.

Early onset sepsis has been found in infants that were in contact with intramnotic infections, maternal administration of antibiotics previous to the delivery significantly reduces the relationship between chorioamnionitis and fetal involvement and early onset sepsis.
Multivariable models for prediction of early onset sepsis (20).

VI. Methods:

Retrospective cohort study of 40 patients with diagnosed Chorioamnionitis and who delivered in the LUHS Kaunas Hospital Delivery department in the years 2013 and 2014. The data was obtained from LUHS Delivery department register and delivery case records. The data analyses included clinical and laboratory data that had confirmed the diagnosis of chorioamnionitis, APGAR scores of newborns. Statistical analysis was performed by AIC (Aikake Information Criterion). Statistical analysis was performed by median calculations of neonatal APGAR values.

Inclusion criteria were patients diagnosed with chorioamnionitis, nulliparous and multiparous women were included, preterm and term deliveries, with a range between 24 and 42 gestational weeks. Clinical and laboratory data was selected from the patient’s case histories.

Exclusion criteria: patients who delivered within the years 2013-2014 and presented no suspicion of infection or diagnosis of chorioamnionitis. Patients who’s clinical or laboratory data were within normal values.

APGAR Median values were calculated for the following groups: general (full sample), term deliveries (between 37+0 and 41+3 weeks of gestational age) , Group B Streptococcus positive patients, Epidural receiving patients, medicated with metronidazole and misprostol medicated.
The data was obtained by analyzing the patient’s partograms and delivery transcripts searching for clinical and laboratory data that had confirmed the diagnosis of chorioamnionitis. APGAR scores were used to evaluate the instant outcomes of the possible chorioamnionitis diagnosis.

APGAR score was used for a primary assessment of neonatal condition taking into account the possible adverse outcomes of chorioamnionitis on fetal development. APGAR 1 and 5 were divided based on their scores (those with APGARS above 7 were placed in the HIGH group, and those lower than 7 in the LOW group). Considering that the sample of cases included different gestational ages and these could affect the results, the group of term deliveries was separately analyzed in order to see the direct effect of the newborns being exposed to the infection at full term moments. Allowing us to differentiate between the neonatal conditions based on this classification and to assess the severity of the condition, and the possible accuracy of the diagnosis established during the delivery period.
VII. Results:

Diagnostic Criteria that was selected from the 40 cases:
It was found that between the overall of 40 patients, 55% of those presented with fever over 38°C, pathological CTGs were noticed in 32.5% of the cases. (0% of the patients presented an elevated white blood cell count, C-reactive protein was elevated in 85% of the cases, and finally unpleasant odor or color of the amniotic fluid was noticed in 32.5%.

Group B streptococcus infection:
Infection was present in 10% of the cases

External Factors present in the 40 cases:
27.5% of patients had metronidazole administered during the delivery, Misoprostol was given to 22.5% of patients and 27.5% of patients had an epidural during the delivery

APGAR score analysis
APGAR was used to analyze the adverse outcomes of the diagnosis. APGAR 1 and 5 were divided based on their scores (those with APGARS above 7 were placed in the HIGH group, and those lower than 7 in the LOW group). Where 5% of the APGAR 1 where in the HIGH category and 32.5% of APGAR 5 where placed in the LOW group (< 7)

Epidural group analysis:
Epidural administration is known to have many benefits during childbirth, but some side effects have also been discovered. This is the reason why we selected the patients that had an epidural administered, and analyzed their symptoms as well as the APGAR scores of the newborns. The aim was to try to understand if the clinical presentation could be a side effect of the analgesia received. APGAR 5 was over 7 in 90% of the cases.

Symptoms were also considered separately for this group, showing that: CRP was elevated in all patients that received an epidural, WBC was elevated in 60% of patients who received epidurals, Maternal fever was present in 20% of the epidural patients, CTG was affected in 54% of the epidural patients.
Although the sample contained 40 patients that were diagnosed with chorioamnionitis, 2 were excluded since the APGAR data was missing. Since APGAR 1 and APGAR 5 were strongly correlated ($r = 0.962$) only APGAR 5 was used as the dependent variable. For the first model, the following independent variables were first used to select the best model using a backward selection process comparing AIC: Maternal Fever, Pathologic CTG, Positive GBS, Elevated WBC, Elevated CRP, and unpleasant odor/color. The process was then repeated for the second model including Metronidazole, Epidural, and Misoprostol.

Table 1 represents the 5 top sets for the first model. The best model only included elevated white blood count. However adding unpleasant odor/color had a Delta AIC very close to zero, so both these variables were chosen to represent the best model. This statistical summary of this regression is included below. Based on the model, APGAR5 would decrease if by 0.61 if there was unpleasant odor/color and would increase by 0.53 if white blood cell count was elevated.

<table>
<thead>
<tr>
<th>Variables</th>
<th>AIC</th>
<th>DeltaAIC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Elevated.WBC</td>
<td>13.33</td>
<td>0</td>
</tr>
<tr>
<td>Elevated.WBC. + Unpleasent.odor.color</td>
<td>13.46</td>
<td>0.13</td>
</tr>
<tr>
<td>Elevated.WBC. + Unpleasent odor color + GBS positive</td>
<td>14.98</td>
<td>1.65</td>
</tr>
<tr>
<td>Elevated.WBC. + Unpleasent.odor.color + GBS.positive+ Pathologic.CTG</td>
<td>16.96</td>
<td>3.63</td>
</tr>
<tr>
<td>Elevated.WBC. + Unpleasent.odor.color + GBS.positive+ Pathologic.CTG. + Maternal.Fever</td>
<td>18.94</td>
<td>5.61</td>
</tr>
</tbody>
</table>

Table 1. Top 5 sets with Maternal Fever, Pathologic CTG, Positive GBS, Elevated WBC, Elevated CRP, and Unpleasant odor/color covariates modelling APGAR 5 scores using Akaike’s Information Criterion
Table 2 shows the best model when including Metronidazole, Epidural, and Misoprostol. The best model predicting APGAR 5 was Elevated CRP, GBS.positive, and Epidural. However, adding Maternal fever gave a delta AIC close to zero so this was included in the best model. The statistical summary of this regression is included below. Based on the model, APGAR5 is predicted to increase by 0.58 if maternal fever is present, decrease by -1.1948 if CRP was elevated, decrease by -1.419 if GBS was positive, and increase by 1.53 if there was an epidural. This best model selected did not include unpleasant odor/colour or elevated WBC, however, the R-square increased from 0.10 to 0.24 indicated, a better fit model compared to the first model.

Table 2. Top 5 sets adding Metronidazole, Epidural, and Misoprostol covariates modelling APGAR 5 scores using Akaike’s Information Criterion.

<table>
<thead>
<tr>
<th>Variables</th>
<th>AIC</th>
<th>DeltaAIC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Elevated.CRP + Epidural</td>
<td>11.05</td>
<td>0</td>
</tr>
<tr>
<td>Maternal.Fever + Elevated.CRP + Epidural</td>
<td>11.3</td>
<td>0.25</td>
</tr>
<tr>
<td>Maternal.Fever + Elevated.WBC + Elevated.CRP + Epidural</td>
<td>12.96</td>
<td>1.91</td>
</tr>
<tr>
<td>Maternal.Fever + Elevated.WBC + Elevated.CRP + Metronidazole + Epidural</td>
<td>14.81</td>
<td>3.76</td>
</tr>
<tr>
<td>Maternal.Fever + Elevated.WBC + Elevated.CRP + Unpleasent.odor.color + Metronidazole + Epidural</td>
<td>16.77</td>
<td>5.72</td>
</tr>
</tbody>
</table>
VIII. Discussion:
The whole sample was analyzed searching for the most predominant symptoms that where present, which had lead to a diagnosis of chorioamnionitis. From the whole sample, the next symptoms were selected, according to diagnostic criteria:

- Fever over 38 degrees Celsius
- Pathological CTG readings
- Elevated white blood cells over 13000
- Elevated CRP readings
- Unpleasant odor or color of amniotic fluid

We can observe a general distribution of all he symptoms that were previously mentioned depending on their prevalence between the 40 cases that were used for the study. Elevated WBC and fever was the most present in between the clinical data.

Results have showed that the most reliable markers for the diagnosis are elevated WBC, which was present in 80% of the cases and fever which was present in 55% of the cases. Prediction of chorioamnionitis is a hard task, since the risks that the mother and fetus are at, are severe and could be fatal. The struggle for the diagnosis of chorioamnionitis appears in the clinical presentation, where the diagnostic criteria currently existing, is based on clinical symptoms which separately could be from many different etiologies but when combined, arises the suspicion of chorioamnionitis. Due to the time frame for the diagnosis and treatment, further procedures to confirm are not viable. Hemocultures and amniotic fluid culturing would be very useful but they aren’t available fast enough. This is the reason why empiric antibiotherapy treatment is started without a definite confirmation.
External factors that could alter the results or clinical presentation of the patients:

27.5% of patients had metronidazole administered during the delivery: the administration of antiobiotherapy in certain protocols is included for patients with a risk of preterm labor. In certain studies, it has been proved that the prophylactic treatment doesn’t prevent preterm deliveries, intramniotic or postpartum infections, neonatal sepsis or admission to the neonatal Intensive care unit.

Whereas the side effects of metronidazole treatment could possibly affect the physiological status of the patient at the delivery, giving misleading readings. Metronidazole treatment has been proved effective in cases where a previous gram staining and pH meet criteria for administration of the treatment.

Misoprostol was given to 22.5% of patients, which is given for cervical ripening and induction of labor, so we assume that these deliveries where prolonged, and again can affect the general status of the patient during the delivery.

Patients with Epidural Analgesia:
Neuraxial analgesia during the peripartum period can have certain adverse effect:
Randomized trials and observational studies have consistently observed a frequent and significant association between the use of epidural analgesia and rise in maternal temperature.

27.5% of patients had an epidural during the delivery. APGAR 5 was over 7 in 90% of the cases. CRP was found to be elevated in all the patients that received the epidural, White blood cell counts were elevated in 60% of the cases and pathological CTGs where found in 54% of the patients. When taken into account that the neonatal status was recorded as optimal, within the high levels of APGAR scores, we could consider that these clinical signs could be adverse side effects of the epidural treatment without any obvious repercussion in the fetal health.

APGAR scores:
APGAR scores are known to be affected by multiple reasons. Fetus that are exposed to the infection, develop fetal inflammatory response which is responsible for poor cerebral, renal and cardiovascular outcomes. Based on the long term complications for the fetus due to the exposure, we could assume a direct correlation on the APGAR scores.
APGAR scores of the whole sample were analyzed showing a median APGAR score of 5 in the first minute (APGAR1) and a median of 8 after 5 minutes (APGAR 5). In healthy deliveries APGAR scores range from values from 7-10. As we can observe there is a correlation between the fetal exposure to the infection, and the APGAR score levels being in the lower limits of the normal range.

Gestational age has a direct effect on the reactivity of the newborn when delivered. From the 40 case sample, 19 of the deliveries were term deliveries. The median APGAR 1 score was 5 and the median APGAR 5 score was 8 in the deliveries with gestational ages between 37+3 – 41+3 (term deliveries). Showing that the newborns delivered under the condition of chorioamnionitis, but within term gestational age, presented as well slightly decreased APGAR 1 score compared to what the expectations would be in a healthy delivery. Affected newborns would be expected to have a delayed reactivity manifested as a lower APGAR score which would predict a disfavorable prognosis. Median APGAR 5 in these cases was within normal values, towards the lower range. Presenting a favorable development of the newborn.

Group B streptococcus infection group was also sampled separately for an analysis of their APGAR scores, in order to see if a known infection could be assessed directly on the fetal status. The median values of the APGAR scores of the Group B streptococcus positive patients were of: APGAR1 of 4, and APGAR 5 of 7.

We could consider these results as a direct correlation of the infection outcomes on the newborn, presenting with a diminished reactivity when compared with healthy deliveries and healthy newborns with APGAR scores above 7.

APGAR scores of the newborns of the patients that received medications were also assessed. Different medications were administered for different conditions, but medication could have side effects that could present physiologically as symptoms that could be mistaken for a Chorioamnionitis presentation.

The neonatal situation is a preliminary assessment that could indicate if there has been such infection or if it has been misdiagnosed depending on the fetal status.

Misoprostol was given in some of the cases for the ripening of the cervical os and an aid in the case of long deliveries. APGAR median scores of those newborns who were exposed to the misoprostol were as follows: APGAR 1 of 6 and APGAR 5 of 7.
Epidural analgesia was also one of the medications administered to some of the patients in the 40 case sample. Median APGAR 1 score of those newborns was 5 and median APGAR 5 score was 8.

However those patients that received metronidazole are suspected to have presented a significant clinical presentation for the administration of the antibiotherapy. Regarding the APGAR median values of the neonates of those patients who received metronidazole; APGAR 1 median was of 6 and APGAR 5 median was of 8. Those that have received the antibiotherapy presented better APGAR scores than those who did not receive the antibiotherapy. We assume that administration of antibiiotics in a chorioamnionitis presentation, improves the neonatal the outcome at the moment of the delivery.

APGAR scores were at the lower limit of normal values, which complicated a clear assessment of the correlation between the infection, medications and adverse fetal outcomes. Further analysis of the possible side effects of the medications received during the labor could be interesting, by comparing a sample of patients receiving the same medication and a sample of non medicated deliveries, possible showing a trend within the presenting symptoms, as well as APGAR comparison between both groups to asses fetal condition.

**IX. Conclusion:**

1) In our study we found as the most reliable markers for the diagnosis to be elevated WBC, which was present in 80% of the cases and fever which was present in 55% of the cases. In our sample CRP was found to be elevated in all the patients that received the epidural, White blood cell counts were elevated in 60% of the cases and pathological CTGs where found in 54% of the patients.

2) APGAR scores of the whole sample where analyzed showing a median APGAR score of 5 in the first minute (APGAR1) and a median of 8 after 5 minutes (APGAR 5).

3) There is not a clear relationship between Apgar score and chorioamnionitis exposure since APGAR score can be diminished due to multiple reasons. However, patients receiving metronidazole as prevention for chorioamnionitis show a better median APGAR score than the group without the antibiotherapy prevention. We can suspect a relationship between choriamniotis and APGAR score of those newborns which were suspected to be affected by chorioamnitiotis. In order to have a better assessment of the relationship between choriomnionitis and lowered APGAR scores, further investigations should be conducted, hemocultures and maternal and fetal follow up would give a more accurate picture of the direct relationship.
X. References


