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The role of mycoplasma and ureaplasma in preterm birth: Correlation with maternal age, residence, neonatal a prospective study in Kosovo

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Abstract

The authors declare that they have no competing interests.Informed consent:written informed consent was obtained from all patient. This research was conducted at the University Clinical Center of Kosovo, Clinic of Gynecology and Obstetrics. The study did not receive any external funding and was supported by institutional resources. No funding agency had a role in the design, execution, or reporting of the studyDeclaration of Patient Consent:All participants provided written informed consent before enrollment in the study. They were informed about the study's objectives, procedures, potential risks and benefits, and their rights, including the right to withdraw at any time without consequence. Participants were also informed that anonymized data may be used for publication. Confidentiality and privacy have been fully respected throughout the research process.Ethical Approval All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee.This study was approved by the Research Etic Committee of the University of Medicine in Prishtina,Kosovo.KCE-174-2022:the datasets generated and analyzed during the current study are not pubicy available due to privacy concerns but are available from the athor.:Authors madee substantial intellectual contribution ,read and approved the final version of the manuscript and agreed to be responsible for all aspect of the work.FS and SB worked from the beginning to the end for research,literature review,the presentation of the results.FS contribute to the formulation of patient formulars,SB contribute to the extraction and processing of data

Keywords: Preterm births, Bacteria, Mycoplasma, Ureaplasma, Apgar score 1 and 2, Baby's weight

Introduction

According to the World Health Organization (WHO), preterm birth refers to the expulsion or complete removal of the product of conception from the mother's body with a weight of at least 500 grams. If the weight is unknown, a gestational age of 20 weeks or a length of at least 25 centimeters at birth is considered [1, 2, 3, 4]. Thus, preterm birth refers to any birth that occurs after the 20th–22nd week of pregnancy, involving a fetus weighing more than 500 grams, and before the completion of the 37th week of pregnancy, showing signs of breathing. Preterm birth is defined as the onset of labor after the 20th week and before the end of the 37th week or 259 days of pregnancy. Preterm birth remains the most significant cause of perinatal morbidity and mortality. Prematurity accounts for 70% of perinatal mortality, and 11.4% of all births are preterm births [1, 2, 3, 4]. In 2013, in the United States, 23,446 infants died within the first year of life, with one-third of these deaths attributed to preterm birth [5,27].

The incidence of preterm births is increasing globally, ranging from 6% to 12% in developed countries and rising even further in developing countries [26]

The causes of preterm birth are varied and can be categorized as follows:

1. Medical indications in 25% of cases.
2. Premature rupture of membranes in 25% of cases.
3. Spontaneous birth due to idiopathic causes in 50% of cases [9, 10, 11, 12].

Preterm Birth and Bacterial Vaginosis: Numerous studies, some dating back more than four decades, report a link between preterm birth and infections [13, 14,29]. The incidence of maternal and perinatal infections following preterm birth is higher than in full-term births. Researchers have increasingly focused on the connection between bacterial vaginosis and the increased risk of spontaneous preterm birth. This link has been confirmed through microbiological, histological, and clinical studies [15–

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25,28]. Ureaplasma and Mycoplasma are microorganisms that belong to the group of bacteria known as atypical bacteria or intracellular microorganisms. They are quite unique in the bacterial world due to their specific biology. Their presence in the genital tract can lead to unpleasant symptoms such as burning during urination, lower abdominal pain, increased vaginal discharge, and discomfort during sexual intercourse. It has been proven that Ureaplasma and Mycoplasma infections can increase the risk of preterm birth. It is important to understand that Ureaplasma alone does not directly cause preterm birth, but in combination with Mycoplasma, it is part of a set of factors that can contribute to this condition.

2.1 Objective

Preterm births are the leading cause of neonatal morbidity and mortality. The aim of this research is to identify Mycoplasma hominis and Ureaplasma urealyticum as key factors in preterm birth, as risk factors that could help reduce prematurity and, consequently, reduce associated morbidity, mortality, and costs.

2.2 General objective

The objective of this study is to determine the prevalence of Mycoplasma hominis and Ureaplasma urealyticum and to assess their correlation with preterm birth based on a group of patients at the Obstetrics and Gynecology Clinic in Pristina.

3. Materials

Our research approach is based on the prospective monitoring of pregnant women from their first presentation at the clinic until delivery. This approach allows for a direct assessment of the risk of disease development. The study includes 146 pregnant women with gestational ages ranging from 28 weeks and 0 days to 36 weeks and 6 days. Gestational age was calculated based on the first day of the last menstrual period and confirmed by the first ultrasound examination.

3.1 Type of study

This is a descriptive, prospective cohort study. A cohort study design was chosen because it effectively describes the simultaneous distribution of exposure and health outcomes in a population. This design is particularly useful for common conditions such as Mycoplasma hominis and Ureaplasma urealyticum, given their high frequency.

3.2 Study period

The study covers the period from January 1, 2024, to December31, 2024.

3.3 Study institution

The study was conducted at the Obstetrics and Gynecology Clinic of the University Clinical Center of Kosovo, the only tertiary hospital in Kosovo.

3.4 Informed consent

All participants were informed about the necessary procedures for completing standardized medical data and agreed to undergo regular examinations. All actions were carried out in complete confidentiality, and participation was based on the free will of the participants.

3.5 Data collection

Data were collected through a standardized form using the patients' clinical records.

4. Methodology

The methodology used for testing the hypotheses includes a full range of statistical techniques, including multiple linear regression, descriptive statistics, frequencies, cross-tabulations, chi-square tests, correlation, and other data analysis methods. The combination of these methods provides a strong and accurate framework for understanding the relationships and effects between dependent and independent variables. The use of multiple linear regression serves as a method for evaluating the linear relationships between a dependent variable and one or more independent variables. Applying this method in data analysis allows for the identification and assessment of potential effects of independent variables on the dependent variable, facilitating hypothesis testing. This combination of statistical techniques ensures a comprehensive understanding of the nature of the data and the relationships among variables, offering a solid basis for making accurate

and reliable evaluations of the tested hypotheses. The adopted methodology thus ensures a thorough and consistent analysis of the data.

5.Results

At the beginning of our study of 815 premature births, we selected 73 births that tested positive for the bacteria Mycoplasma hominis and Ureaplasma urealyticum and compared the following parameters:Mother's age,place of residence,baby's weight,weeks(days)of birth,Apgar Score 1 and 2 and previous Births.

5.1. Mothers 'age and place of residence

Based on the data, we can observe that younger women (18–25 years old) had a higher number of positive cases for the bacteria, while the lowest number of positive cases was among women aged 31–35.(Fig1)

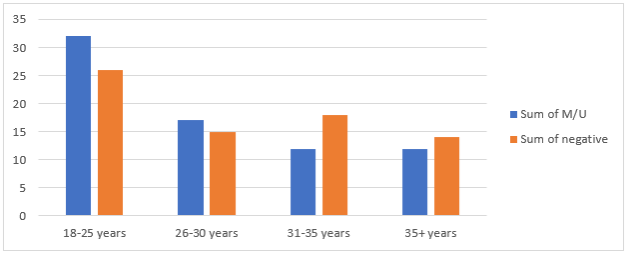

Figure1. Mother age
Blue-Mycoplasma Urea plasma Positive
Orange-bacteria Negative

Regarding the place of residence, women who tested positive for the bacteria were more frequently residents of rural areas.(Fig2)

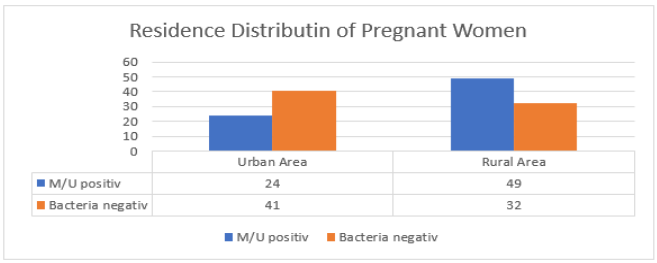

Figure 2. Residence distribution of pregnant women

5.2. Baby's weight

As for the baby's weight, the difference is significant. We can observe how the bacteria affected the slower development of the baby and hindered normal growth. In the diagram, we can see that none of the newborns from positive mothers had a normal weight; 60 had low birth weight, and 13 had very low birth weight. On the other hand, among negative mothers, 66 babies were born with normal weight, while only 7 had low birth weight. (Fig3)

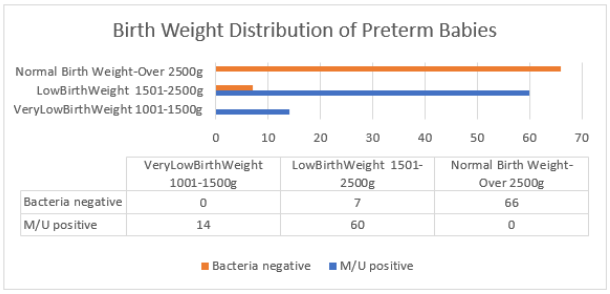

Figure 3. Birth weight of preterm babies

Blue Bacteria Positive
Orange Bacteria Negative

5.3. Weeks of birth

When it comes to weeks and days of pregnancy, only one baby from negative mothers was born before 238 days, while 72 babies were born as Late Preterm (238–258 days). Regarding positive mothers, only 5 babies were born as Late Preterm, 30 as Early Preterm (224–237 days), and 38 as Very Early Preterm (196–223 days). Based on this data, we can observe that Mycoplasma and Ureaplasma significantly influenced the rupture of the amniotic membranes and accelerated preterm labor. (Fig4)

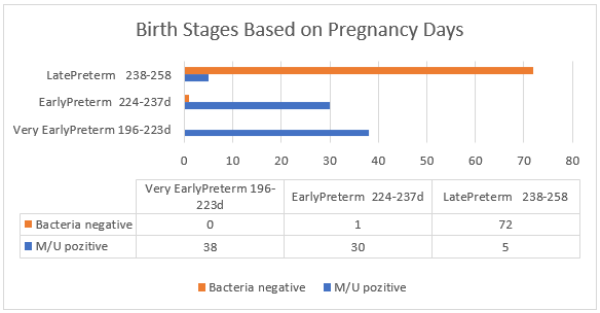

Figure 4. Birth Stages Based on Pregnancy Days

5.4. Apgar score 1

Based on Apgar Score 1, we can observe that babies

of negative mothers were born with normal vital parameters, and their first score was above 7. In contrast, among positive mothers, 60 babies had mild asphyxia, and two babies were born with severe asphyxia, while only 11 had a normal score.(Fig5)

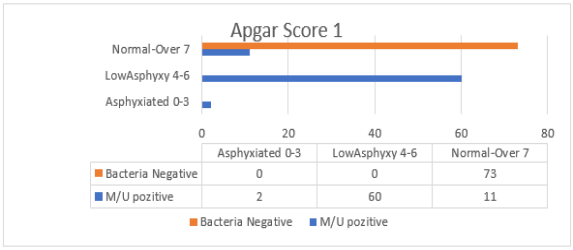

Figure4. Apgar score1

5.5. Apgar score 2

Fifteen minutes after birth, the Apgar Score statistics changed significantly. 33 babies had a normal Apgar Score, 40 had mild asphyxia, and none were asphyxiated. (Fig6)

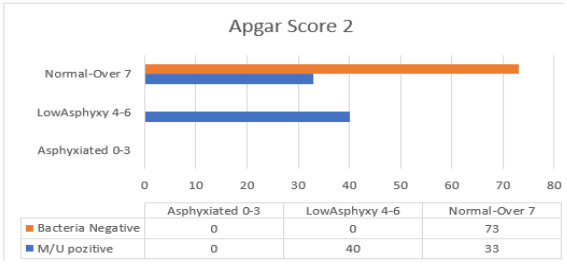

Figure 6. Apgar score 2

5.6. Previous births

Based on the data regarding previous pregnancies and deliveries, we can conclude that mothers who tested positive for Mycoplasma and Ureaplasma were mostly primiparous. Specifically, 33 of them had no previous births, 22 had one prior birth, 13 had two, and only 5 had more than three deliveries. (Fig7)

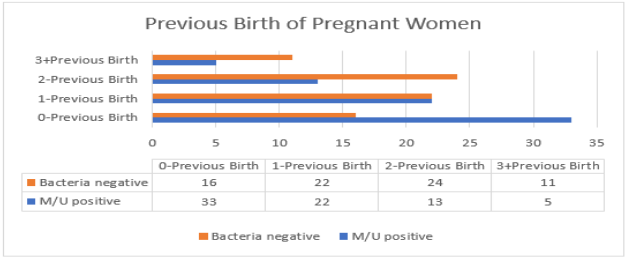

Figure 7. Previous birth of pregnant women

Conclusion

Preterm birth remains a leading cause of neonatal morbidity and mortality worldwide. This study highlights a significant association between preterm birth and bacterial vaginosis, particularly infections caused by Mycoplasma hominis and Ureaplasma urealyticum. The presence of these bacteria appears to play a crucial role in the weakening of amniotic membranes and the triggering of early labor, especially in cases of very early and early preterm births.

Our findings suggest that early screening for Mycoplasma and Ureaplasma—ideally before the 28th week of pregnancy—can provide critical opportunities for timely intervention. When identified and treated based on targeted antibiograms, the risk of preterm birth related to these infections can be significantly reduced.

In conclusion, early diagnosis and appropriate antimicrobial therapy are essential, strategies in preventing infection-related preterm labor. Implementing routine screening protocols for these pathogens in pregnant women, particularly those at high risk, may lead to better pregnancy outcomes and a reduction in complications associated with prematurity.

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