



COMPARATIVE ANALYSIS OF SPINAL ANTHROPOMETRIC PARAMETERS IN  
EARLY-AGED CHILDREN BORN TO MOTHERS WITH COVID-19

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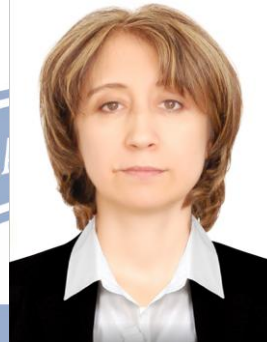
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**Abstract**

The COVID-19 pandemic has raised significant concerns regarding its possible effects on maternal and child health. Maternal infection during pregnancy may influence fetal development and postnatal growth, including the formation of the musculoskeletal system. The aim of this study was to perform a comparative analysis of spinal anthropometric parameters in early-aged children born to mothers with a history of COVID-19 during pregnancy. Anthropometric assessment of the vertebral column was carried out in children of early age, and the obtained parameters were compared with those of children born to mothers without COVID-19. The study revealed certain differences in spinal growth indicators, suggesting the possible influence of maternal viral infection on the physical development of offspring. These findings emphasize the importance of early screening and long-term follow-up of children exposed to maternal COVID-19 during the prenatal period.

**Keywords:** COVID-19, pregnancy, children, spine, anthropometric parameters, maternal infection, early age.

**Annotatsiya**

COVID-19 pandemiyasi ona va bola salomatligiga mumkin bo‘lgan ta’siri borasida jiddiy xavotirlarni keltirib chiqardi. Homiladorlik davrida ona organizmidagi infeksiya homila rivojlanishiga va tug‘ilgandan keyingi o‘shishiga, jumladan, tayanch-harakat tizimi shakllanishiga ta’sir ko‘rsatishi mumkin. Ushbu tadqiqotning maqsadi homiladorlik davrida COVID-19 bilan kasallangan onalardan tug‘ilgan erta yoshdagi bolalarda umurtqa pog‘onasining antropometrik ko‘rsatkichlarini qiyosiy tahlil qilishdan iborat. Erta yoshdagi bolalarda umurtqa pog‘onasi antropometrik baholandi va olingan natijalar COVID-19 bilan kasallanmagan onalardan tug‘ilgan bolalar ko‘rsatkichlari bilan taqqoslandi. Tadqiqot natijalari umurtqa o‘shish ko‘rsatkichlarida ayrim farqlar mavjudligini ko‘rsatdi, bu esa ona virusli infeksiyasining bolalarning jismoniy rivojlanishiga mumkin bo‘lgan ta’sirini anglatadi. Ushbu natijalar prenatal davrda COVID-19 ta’siriga uchragan bolalarni erta skrining qilish va uzoq muddatli kuzatish zarurligini ta’kidlaydi.

**Kalit so‘zlar:** COVID-19, homiladorlik, bolalar, umurtqa pog‘onasi, antropometrik ko‘rsatkichlar, ona infeksiyasi, erta yosh

**Аннотация**

Пандемия COVID-19 вызвала серьезные опасения относительно её возможного влияния на здоровье матери и ребёнка. Инфекция у матери во время беременности может оказывать



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влияние на развитие плода и постнатальный рост, включая формирование опорно-двигательной системы. Целью данного исследования является проведение сравнительного анализа антропометрических показателей позвоночника у детей раннего возраста, рождённых от матерей, перенёсших COVID-19 во время беременности. Проведена антропометрическая оценка позвоночника у детей раннего возраста, а полученные показатели были сопоставлены с данными детей, рождённых от матерей без COVID-19. Результаты исследования выявили определённые различия в показателях роста позвоночника, что свидетельствует о возможном влиянии вирусной инфекции матери на физическое развитие потомства. Полученные данные подчёркивают необходимость раннего скрининга и длительного наблюдения за детьми, подвергшимися воздействию COVID-19 в пренатальном периоде.

**Ключевые слова:** COVID-19, беременность, дети, позвоночник, антропометрические показатели, материнская инфекция, ранний возраст

### **Introduction**

The spread of COVID-19 has had a major impact on global health and has raised important questions about the long-term consequences of maternal infection during pregnancy. Pregnancy is a physiologically vulnerable period during which infectious diseases may affect both the mother and the developing fetus. In recent years, increasing attention has been given to the possible consequences of prenatal exposure to SARS-CoV-2 on neonatal and early childhood development.

The musculoskeletal system, including the vertebral column, undergoes active formation during the prenatal and early postnatal periods. Normal spinal development is essential for posture, locomotion, and the overall physical growth of the child. Any adverse maternal factors during pregnancy, including viral infections, hypoxia, systemic inflammation, and placental dysfunction, may potentially influence fetal bone and cartilage formation.

Children born to mothers who had COVID-19 during pregnancy may represent a special risk group requiring closer clinical observation. Although the immediate outcomes of neonatal health in such children have been studied in a number of clinical works, there is still insufficient information about the long-term effects of maternal COVID-19 on anthropometric and structural development, particularly regarding the spine.

Therefore, the study of spinal anthropometric parameters in early-aged children born to mothers with COVID-19 is of considerable scientific and practical importance. Comparative evaluation of such parameters may help identify possible developmental deviations at an early stage and improve preventive and rehabilitative strategies. The purpose of this study was to conduct a comparative analysis of spinal anthropometric parameters in early-aged children born to mothers who had COVID-19 during pregnancy and children born to mothers without a history of COVID-19.

### **Materials and Methods**

The study included early-aged children divided into two groups. The main group consisted of children born to mothers who had COVID-19 during pregnancy. The control group included children born to mothers without confirmed COVID-19 during gestation.

Anthropometric evaluation of the vertebral column was carried out using standard pediatric examination methods. The assessment included measurement of body length, trunk length, spinal curvature characteristics, and age-related proportional indicators associated with vertebral development. Clinical examination was supplemented by analysis of medical history, including maternal health during pregnancy, gestational age, and perinatal outcomes.

Comparative statistical analysis was performed to identify differences between the two groups. The obtained data were processed using generally accepted methods of biomedical statistics.

### **Results**

The comparative analysis demonstrated that children born to mothers with a history of COVID-19 during pregnancy showed certain differences in spinal anthropometric parameters



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compared with the control group. In the main group, some indicators of spinal growth and proportional development tended to be lower than in children born to mothers without prenatal exposure to COVID-19.

In particular, changes were observed in trunk length and in parameters reflecting the physiological formation of spinal curves. These findings may indicate a slower rate of musculoskeletal adaptation and development in children prenatally exposed to maternal infection. At the same time, the severity of changes varied depending on the clinical course of maternal COVID-19 and the timing of infection during pregnancy.

The obtained results suggest that maternal COVID-19 may be associated with subtle alterations in early postnatal physical development, including vertebral anthropometric characteristics.

## Discussion

The results of this study suggest that maternal COVID-19 during pregnancy may influence the anthropometric development of the vertebral column in early-aged children. These findings can be explained by several possible mechanisms. First, viral infection during pregnancy may contribute to systemic inflammatory responses, which can affect placental blood flow and fetal growth. Second, maternal hypoxia and metabolic disturbances associated with COVID-19 may negatively influence intrauterine development of the skeletal system.

The vertebral column is one of the most important structural components of the musculoskeletal system, and its formation begins during early embryogenesis and continues actively after birth. Even minor disturbances during prenatal life may influence postnatal spinal growth and posture formation. The observed differences in spinal anthropometric indicators may therefore reflect the impact of unfavorable prenatal conditions.

At the same time, it should be noted that spinal development in children depends on multiple factors, including nutrition, heredity, physical activity, and general health status. Therefore, maternal COVID-19 should be considered as one of several possible contributing factors rather than the only determinant.

The findings of this study underline the importance of regular pediatric follow-up and musculoskeletal assessment in children born to mothers who had COVID-19 during pregnancy. Early identification of developmental deviations may support timely preventive interventions, rehabilitation, and individualized monitoring strategies.

## Conclusion

In conclusion, the comparative analysis of spinal anthropometric parameters in early-aged children born to mothers with COVID-19 suggests that maternal infection during pregnancy may have a measurable influence on the early development of the musculoskeletal system. The identified differences in vertebral growth indicators, although not always severe, indicate that prenatal exposure to maternal viral infection can be associated with subtle changes in physical development that may become more significant over time if not properly monitored.

The results of the study emphasize that the prenatal period is critically important for the formation of the fetal skeletal system, including the vertebral column. Any unfavorable maternal condition, such as viral infection, systemic inflammation, hypoxia, or placental dysfunction, may affect the normal growth processes of the fetus and later manifest in postnatal anthropometric characteristics. In this regard, children born to mothers who had COVID-19 during pregnancy should be considered a group requiring increased medical attention during the first years of life.

Particular importance should be given to early screening programs aimed at assessing the physical and musculoskeletal development of such children. Regular anthropometric examination of the spine, monitoring of posture formation, and evaluation of age-related growth dynamics may help identify deviations at an early stage. Early detection of these changes makes it possible to implement



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timely preventive, corrective, and rehabilitative measures, thereby reducing the risk of future orthopedic disorders and functional impairments.

The study also underlines the importance of a multidisciplinary approach that involves pediatricians, neonatologists, orthopedists, rehabilitation specialists, and primary care physicians. Such cooperation is essential for comprehensive follow-up and for developing individualized observation plans for children with prenatal exposure to COVID-19. In addition, greater attention should be paid to maternal health during pregnancy, as prevention and timely management of infectious diseases in pregnant women may contribute to reducing possible adverse outcomes in offspring.

At the same time, it should be noted that spinal development in early childhood depends on many factors, including nutrition, heredity, motor activity, general health status, and environmental conditions. Therefore, maternal COVID-19 should be considered as one of the potentially significant factors influencing a child's anthropometric development, but not as the sole determinant. This highlights the need for broader clinical investigations with larger study populations and longer follow-up periods.

Overall, the findings of this study support the need for continued research into the long-term consequences of maternal COVID-19 on child development. Expanded studies may help clarify the mechanisms underlying the observed anthropometric differences and provide a scientific basis for improved pediatric monitoring, preventive care, and rehabilitation strategies. Such efforts will contribute to protecting the health of children born during and after the COVID-19 pandemic and to improving the quality of maternal and child healthcare.

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