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Cord blood concentration of selected adipokines and lipid markers in children born as a result of assisted reproduction

Abstract

Introduction: The health of an adult individual is influenced by their development in the early life, also in the prenatal period. Diagnostics of the metabolic processes in this period, knowledge of the health indicators of children conceived as a result of assisted reproduction and well-exercised mother and child care allow for early preventive and therapeutic measures. A relationship has been demonstrated between low birth weight and the development of obesity or cardiovascular disease in adulthood, and assisted reproduction predisposes to multiple pregnancies, prematurity and low birth weight. It is important to look for biochemical markers in umbilical cord blood as indicators of future fertility health as more and more children are born worldwide as a result of assisted reproduction. The indicators in the umbilical blood of newborns and in the blood of women in labour may include the concentration of total cholesterol and its fractions, the concentration of triglycerides (TG), the concentration of leptin and adiponectin. It is important to look for indicators that may suggest a predisposition to a specific disease already in the prenatal or neonatal period.

Aim: Assessing the effect of assisted reproduction on the concentration of leptin and adiponectin as well as lipid indices in the umbilical cord blood of newborns and analysis of the correlation of the results obtained from children with the results obtained from the mother's blood analysis and from the questionnaire.

Materials and Methods: The Study was conducted 206 pregnant women during delivery and their newborns in 2016 – 2020 in four hospitals in Warsaw. The blood from 192 mother-child pairs was included in the analyzes. The study group (n=75) were comprised mothers after IVF and their children who were conceived as a result of infertility treatment. The control group (n=77) were consisted of fertility mothers were not treated with infertility and their children who were conceived in a natural way. The additionally control group (n=39) were comprise infertility mothers and their children who were conceived in a natural way but after infertility treatment. We have been included children who are born without birth defects, by labour and Cesarean section and mothers without rare diseases or without chronic systemic diseases and they were 25-40 years old.

Results: In the umbilical cord blood of newborns, the concentration of adiponectin was significantly higher ($p = 0.012$) in the control group than in the IVF group (MD = -1.88; 95% CI (-3.35; -0.42)) and further post hoc analysis for the three groups with an additional control group confirmed these results. Children born in vitro (Group IVF) had a significantly higher concentration of cholesterol in the umbilical cord blood than children from the control group of naturally conceived (Control group) ($p = 0.008$; MD = 27.52; 95% CI (7.38; 47.66))). A further post hoc analysis with an additional control group showed a higher concentration of cholesterol in the umbilical cord blood among children from the IVF group and the infertile - other therapies group than in the control group ($p = 0.001$; $p = 0.015$ for the IVF group vs the control group; $p < 0.001$ for the group infertile - other therapies vs control group; $p = 0.120$ for IVF group vs infertile group with other therapies in post hoc analyzes). The concentration of TG in the umbilical cord blood of newborns was significantly higher in the group infertile - other therapies than in the control group ($p = 0.026$ and $p = 0.007$). There were no significant differences in the blood of mothers from different groups and in the umbilical cord blood of newborns and their mothers.

Conclusions: Differences in the concentration of adiponectin and in the concentration of cholesterol in the umbilical cord blood of newborns (IVF group vs control group) were demonstrated. A post hoc analysis with an additional control group (infertile - other therapies) confirmed the effect of assisted reproduction on the concentration of adiponectin in the umbilical cord blood of newborns. Adiponectin may therefore be an important marker for children conceived through assisted reproduction. It was indicated that the differences in the concentration of cholesterol in the umbilical cord blood of newborns may be related to the burden of infertility itself and infertility therapy, and not to the method of conceiving a child. It has been shown that a higher concentration of triglycerides in the umbilical cord blood is characteristic of children of patients who have been treated with methods such as ovulation stimulation, insemination, hormone therapy, surgery and a special diet with psychotherapy, without ART (Assisted Reproduction Technology).