

Tab. 4. Increased risk for foetal complications caused by lowered maternal magnesium levels or due to magnesium restrictions

Anatomical foetal body systems	Increased risk for foetal complications by magnesium deficiency
exocrine or integumentary systems	insufficient data
skeletal system	insufficient data
muscular system	insufficient data
nervous system	anxiety in the offspring in adulthood ² decrease in foetal neuroprotection ^{2,51} worsened cognitive outcomes ²
respiratory system	insufficient data
gastrointestinal and excretory systems	insufficient data
endocrine system	IUGR ² /foetal growth restriction ⁵⁰ problems in foetal development ² increase in body fat ² induced insulin resistance and impaired glucose tolerance ² small for gestational age ² /foetal growth retardation ⁹ lower birth weight ⁹
circulatory and cardiovascular systems	foetal anaemia ⁵²
immune and lymphatic systems	insufficient data
renal and urinary systems	insufficient data
reproductive system	insufficient data
other foetal complications	foetal programming theory of diseases later in life ² increased risk for metabolic syndrome later in life ² premature birth ^{1, 2, 9, 49, 53} epigenetic dysregulation ² foetal malformation ⁵² placental dysfunction ⁹ worsened placental development ⁵⁰ worsened foetal growth ⁵⁰ foetal loss ⁵⁰ increased ROS production between maternal-foetal units ⁵⁴ indirect decrease in antioxidant defence ⁵⁴

Note: Insufficient data: more detailed information that could provide a closer explanation is not available. IUGR (intrauterine growth restriction) and SGA (small for gestational age) pathologies may overlap with those of other conditions that can be influenced by nutrition.¹

increased risk that intravenous administration can lead to the development of foetal skeletal demineralization and hypocalcaemia which can occur after the fifth day of administration (38, 56). These limitations are not related to the oral form (56).

Recommendations whether to supplement or not

Approximately half of the women in the United Kingdom and the United States of America between 19 and 50 years old do not

meet the requirements for magnesium intake (61), and during pregnancy, a 10% higher supply of magnesium is required (2). Normomagnesaemia may not rule out magnesium deficiency (4). Maternal hypomagnesaemia has clinical symptoms, but may also occur without clinical symptoms (56). Oral form of magnesium is safer than parenteral administration, which has limitations and belongs in the hands of healthcare specialists (56). In non-pregnant patients, hypomagnesaemia can manifest with the highest frequency at the cardiovascular level, but

symptoms can also be observed in the nervous and muscular systems (5); we suppose this to be similar in the case of pregnant patients. In obstetrics and gynaecology, magnesium is used as a vasodilator and muscle relaxant, and its effect on the cardiovascular system is used to regulate blood pressure and in addition also to lower the levels of prostaglandins (62). However, a study by Makrides et al. (2014), explains that there is not enough high-quality evidence for confirmation that dietary magnesium supplementation during pregnancy is beneficial (63). To sum up, maternal hypomagnesaemia can increase the risk for pregnancy complications and, in certain cases, lead to foetal hypomagnesaemia, which can have a far-reaching impact on the future health of the offspring.

Conclusion

Magnesium has a crucial role in normal cellular and organ functioning and in the metabolic and biochemical pathways of the cells of maternal and foetal organisms. During pregnancy, there is an increased need for magnesium. The maternal serum magnesium values during trimesters may fluctuate slightly, but more significantly so when approaching the third trimester. Maternal hypermagnesaemia during pregnancy is a rather rare medical condition, and maternal hypomagnesaemia can be caused by pregnancy-related or pregnancy-unrelated factors. Lowered maternal magnesium levels or magnesium restriction can lead to foetal complications; however, there is still limited data. If required, magnesium supplementation seems to be safe for maternal and foetal health with appropriately adjusted doses in the form of oral administration. Parenteral magnesium administration belongs in the hands of healthcare specialists and requires careful monitoring.

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