Impact of Maternal and Neonatal Vitamin D Deficiency on Infant Morbidity

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The doctoral thesis entitled "Impact of Prenatal and Postnatal Vitamin D Levels on Infant Morbidity" evaluates the relationship between maternal and infant vitamin D status, with a focus on vulnerable populations and its implications for neonatal health and subsequent development.

Vitamin D, essential for calcium and phosphorus homeostasis, bone mineralization, and immune system modulation, has two main sources: cutaneous synthesis under UVB exposure and dietary intake, which is generally insufficient. During pregnancy, the requirement for vitamin D increases substantially, and maternal status is the principal determinant of fetal stores at birth.

Vitamin D deficiency in pregnant women is associated with an increased risk of preeclampsia, gestational diabetes, and preterm birth, while in newborns it is linked to low birth weight, rickets, and susceptibility to respiratory infections. The prevalence of deficiency remains significant both globally and in Romania, where 24.8–55.6% of adults exhibit low 25(OH)D concentrations, with heightened vulnerability during the cold season and within marginalized groups.

The thesis comprises two cross-sectional observational studies conducted in the Department of Obstetrics and Gynecology of the Mureș County Clinical Hospital. The first study analyzed the impact of socio-demographic and behavioral factors, dietary intake, and maternal supplementation on 25(OH)D status in 322 pregnant women and their newborns. The findings revealed that vitamin D insufficiency and deficiency are common, and that pharmacological supplementation remains the most effective predictor of achieving normal levels in both mothers and neonates.

Socio-economically disadvantaged status (low education, reduced income, unemployment) increased the risk of maternal hypovitaminosis D, and multiparity further depleted 25(OH)D reserves. Fish consumption and sun exposure showed a positive association in univariate analyses but not in multivariable models, where vitamin D supplementation remained the principal determinant.

The second study included 131 Roma mothers and their newborns, assessing the prevalence of vitamin D deficiency and its relationship with socio-economic variables and neonatal anthropometric parameters. Results demonstrated that all mothers and over

95% of newborns presented with deficiency or insufficiency, reflecting a major public health disparity in this community.

Socio-economic factors such as lack of schooling, extremely low income, unemployment, and poor living conditions had a clear impact on maternal vitamin D status among Roma women. Additional contributors included infrequent fish consumption and insufficient sun exposure, often related to traditional clothing habits.

A strong correlation was observed between maternal and neonatal serum vitamin D levels, underscoring the dependence of placental transfer on maternal status. No significant associations were found between maternal vitamin D deficiency and neonatal anthropometric parameters (weight, length, head circumference), aligning with certain international randomized trials but differing from some meta-analyses that reported links to impaired intrauterine growth.

Methodology involved standardized immunoassay measurement of 25(OH)D and rigorous collection of sociodemographic, clinical, and behavioral data. Validated instruments were employed (APGAR scores, INTERGROWTH-21 growth charts) to ensure accuracy and reproducibility of results.

The studies confirmed that prophylaxis of vitamin D deficiency during pregnancy cannot rely solely on dietary modification or behavioral sun exposure; it requires universal supplementation adapted to local conditions and prioritization of marginalized categories (multiparous women, Roma ethnicity, low income and education).

The thesis emphasizes the need for multifactorial public health interventions including routine vitamin D supplementation in pregnancy, systematic screening, educational initiatives, and coordinated social and nutritional policies.

A key finding of the research is the demonstrated efficacy of daily supplementation with 2000–4000 IU in rapidly correcting maternal deficiency and preventing neonatal deficiency, irrespective of urban–rural residence or socio-economic status. Pharmacological supplementation proved superior to all other tested factors.

Limitations of the thesis include the cross-sectional design, lack of long-term neonatal follow-up, and reliance on self-reported behavioral data, which are inherent to epidemiological research. The relatively small sample size of the Roma subgroup limits extrapolation to all similar communities nationwide.

The originality of the thesis lies in its multidimensional and integrative approach, quantification of the impact of pharmacological supplementation, and development of a theoretical regional risk-prediction model with relevance for adapting clinical guidelines and local public health interventions.

In conclusion, the findings strongly support the implementation of universal screening and supplementation for pregnant women in Romania, with targeted focus on socio-economically vulnerable groups, to reduce ante- and postnatal complications

associated with vitamin D deficiency and to improve long-term maternal and child health outcomes.