

Low sodium diet in pregnancy: effects on maternal nutritional status

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Abstract

In the present study, besides the effect on blood pressure, the effects of a low sodium diet in pregnancy on maternal energy and nutrient intake, calcium metabolism, zinc and magnesium status, weight gain and body fat storage were investigated. No effect of the low sodium diet in pregnancy on the course of blood pressure and the incidence of hypertensive disorders was observed. The reduction in sodium intake also caused a significant reduction in the intake of energy, protein, carbohydrates, fat, calcium, zinc, magnesium, iron and cholesterol. The reduced intake of calcium, zinc and magnesium in the women on the low sodium diet did not result in significant changes in circulating total calcium, ionized calcium, parathyroid hormone, zinc, alkaline phosphatase or magnesium, probably because of homeostatic adaptations by the kidneys. In the women on the low sodium diet non-significant reductions in weight gain (1.5 kg) and fat mass gain (0.9 kg) over pregnancy were observed. These reductions in weight and fat mass gain were more pronounced (3.4 kg ($P = 0.003$) and 1.3 kg ($P = 0.15$), respectively) when only the data of the women with good compliance were analyzed. The use of a low sodium diet in pregnancy did not have significant effects on infant birth weight, placental weight or other pregnancy outcome variables.

Keywords: Pregnancy; Low sodium diet; Nutritional status

Summary of PhD thesis [1]

Since there seemed to be no controlled studies that allow firm conclusions about the value of dietary sodium restriction during pregnancy, a multicenter controlled randomized study was initiated in the Netherlands to evaluate the prophylactic effect of a low sodium diet during pregnancy on hypertensive disorders. However, before proper recommendations on sodium intake during pregnancy can be made, it is important to have a thorough understanding of the (patho)physiological consequences of a change in sodium intake for mother and fetus. Only very few studies have been conducted on this subject, and therefore each participating hospital also investigated different side-effects of a low sodium diet in pregnancy. In the hospital Bosch Medicentrum in 's-Hertogenbosch, the multicenter study protocol was extended in such a way that the effects of a low sodium diet on maternal energy and nutrient intake, calcium metabolism, zinc and magnesium status, weight gain and body fat storage were also

investigated. Since there are indications that these variables are related to pregnancy outcome, in affecting these variables, a low sodium diet may have implications for the health of the mother and fetus. The results and conclusions of the study conducted in the hospital Bosch Medicentrum are described in the present summary.

Ninety-four nulliparous women were studied longitudinally from early pregnancy until 6 weeks post-partum. They were randomly divided into an intervention group ($n = 41$), which used a low sodium diet (mean urinary sodium excretion of 61 mmol/24 h) from week 14 of pregnancy onwards until delivery, and a control group ($n = 53$), which continued their ad libitum dietary intake (mean urinary sodium excretion of 142 mmol/24 h). Measurements were performed in both groups before the start of the intervention (week 13 of pregnancy), thereafter about every 4 weeks until delivery and at 1, 2 and 6 weeks post-partum.

No effect of the low sodium diet in pregnancy on the course of blood pressure and the incidence of hypertensive disorders was observed. The reduction in sodium intake during pregnancy also caused a significant reduction in the intake of energy, protein, carbohydrates, fat,

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calcium, zinc, magnesium, iron and cholesterol. This reduced intake of energy and several nutrients increased the risk for an inadequate supply of nutrients to mother and fetus. This particularly applied for the reduced intake of zinc and iron, since the intake of these micronutrients in the control group was already far below the Dutch recommended dietary allowances for pregnant women (respectively 35% and 43% below the recommended dietary allowances). In the women on the low sodium diet, a significantly reduced urinary calcium excretion was found. Changes in dietary calcium intake appear to alter urinary calcium excretion, mainly by altering the secretion of parathyroid hormone. However, no change in circulating parathyroid hormone was found in the women on the low sodium diet. Therefore, the reduced urinary calcium excretion was more likely due to the reduced urinary sodium excretion. A direct and positive relationship between urinary sodium and calcium excretion has been reported previously. The reductions in dietary calcium intake and urinary calcium excretion probably counterbalanced each other, resulting in an absence of changes in circulating total calcium, ionized calcium and parathyroid hormone in the women on the low sodium diet during pregnancy. The significant reduced intake of zinc and magnesium in the women on the low sodium diet did not result in significant changes in serum zinc, plasma alkaline phosphatase or serum magnesium, probably because of homeostatic adaptations by the kidneys. Thus, sodium restriction during pregnancy had no effect on maternal zinc and magnesium status. In the women on the low sodium diet, non-significant reductions in weight gain (1.5 kg) and fat mass gain (0.9 kg) over pregnancy were observed. These reductions in weight and fat mass gain were more pronounced (3.4 kg ($P = 0.003$) and 1.3 kg ($P = 0.15$), respectively), when only the data of the

women with good compliance (based on their urinary sodium excretion during intervention) were analyzed. It is concluded that a low sodium diet in pregnancy reduces maternal weight gain, probably due to a reduced extracellular fluid volume expansion and partly also as a result of a reduction in fat accumulation. No significant effects of a low sodium diet on infant birth weight, placental weight or other pregnancy outcome variables (length and head circumference of the infant, apgar scores and arterial pH of the cord blood) were found.

In the present study, the prescription of a low sodium diet in pregnancy resulted in a reduced intake of energy and several nutrients. Nevertheless, the pregnant women appeared to be able to adapt quite well to this reduced intake, since calcium, zinc and magnesium homeostasis was maintained. Also, no effect on infant birth weight, considered to be the best measure of the quality of pregnancy, was found. Therefore, the results of the present study give no reason to advise against sodium restriction in healthy well-nourished Dutch pregnant women. However, in the light of lack of a beneficial effect of the low sodium diet on blood pressure and the incidence of hypertensive disorders, the prescription of such a diet as a prophylactic measure in pregnancy should not be advocated. For a definitive conclusion on the recommendation on sodium intake during pregnancy, the results of the multicenter trial and the results on the side-effects of a low sodium diet studied by the other participating hospitals remain to be seen.

References

- [1] van der Maten GD. Low sodium diet in pregnancy: effects on maternal nutritional status. PhD-thesis, Nijmegen 1995 (results of the study will also be published in separate articles).