Improving calcium intake during pregnancy

IMPACT

This chapter addresses the relevance and the potential scientific and social impact of the research in this dissertation on the short – and longer term.

DISSEMINATION OF RESULTS DURING THE PHD TRAJECTORY

During the PhD trajectory various means were employed to disseminate the study results to a broad audience, including researchers and clinicians with an epidemiologic and/or obstetric background. Firstly, we published our study findings in international scientific journals, as detailed in the beginning of each chapter of this thesis. Secondly, we presented our scientific findings at various conferences and symposia for audiences with a broad background. In 2017 our scientific results were presented at the Dutch Epidemiological Conference (WEON) and, in the same year, at the Dutch gynaecological 'Gynaecongres' and at the research meeting at the Epidemiology department of Maastricht University. In 2018, we presented our research at the Dutch midwifery conference 'Kennispoort Congres', at several gynaecology departments of Dutch hospitals and at the 'Care and Public Health Research Institute' (CAPHRI) 'Research Day'. In this way, the results were shared with multidisciplinary audiences with a broad clinical and/or healthcare background. Thirdly, scientific results were presented professional and patient groups by means of semi-popular articles in magazines of the 'Nederlandse Vereniging voor Obstetrie en Gynaecologie'(NVOG) and HELLP Foundation. Lastly, our research on calcium intake and calculated (cost-) effectiveness of implementing the calcium supplementation advice was picked up by national press, which enabled our research to reach a broad audience beyond the scientific community.

RELEVANCE

An adequate calcium intake during pregnancy, of at least 1000 mg/day, lowers the risk for morbidity and mortality for both mother and fetus[1-7]. Dietary calcium intake during pregnancy was found to be alarmingly low in low-income populations[8]. Before our studies, total calcium intake from both diet and supplement use on the other hand had never been calculated in a high-income population. In this thesis, we aimed at estimating and improving total calcium intake from diet and supplement use during early pregnancy in The Netherlands. We found that 60% of the pregnant population had an inadequate total calcium intake and did not meet the Recommended Dietary Allowance (RDA). Specific calcium supplements were used by only 2% of the population. Even though multivitamin supplements were frequently used, their calcium content was insufficient to complement dietary calcium intake and achieve RDA for calcium. Next, we performed a decision analysis to provide insight whether advising calcium *supplementation* could be a (cost-)effective intervention for implementation in Dutch antenatal care. Advising calcium supplementation of 1000 mg/day to all pregnant women, women at risk for PE or women with low dietary calcium intakes was found to expectedly reduce incidence of PE with 25%, 8% or 13% respectively. Expected net financial benefits were €4,621,465, €2,059,165, or €2,822,115 per 100,000 pregnant women, respectively.

In 2016, to promote adequate calcium intake, gynecologists and midwives in the southeastern region of the Netherlands agreed to start counseling all pregnant women on the importance of an adequate calcium intake and to advise ingesting at least 1000 mg calcium per day. Calcium intake improved, with an absolute risk reduction of 11% in inadequate calcium intake. The effect was most pronounced among women with an increased risk of developing pre-eclampsia, who may benefit most from improved calcium intake. The intake of specific calcium supplements increased from 2 to 29%, while use of other multivitamin supplements remained comparable to use before the start of the calcium advice era, as expected. We identified lower age, nulliparity and non-Caucasian origin as risk factors for inadequate calcium intake during pregnancy. After the introduction of incorporating calcium advice into early pregnancy counseling, most women reported to have received the advice. Most of the women that said to have received the advice were initially positive intentioned to optimize calcium intake, and overall they had significantly less inadequate calcium intakes compared to women who did not receive the advice. Less than 2% of women discontinued the use of calcium supplements, and since still 49% of women have an inadequate calcium intake, there should be focus on initiation: the actual start of uptake of the calcium advice, which can be supported by responding to barriers and facilitators that were identified.

FUTURE IMPLICATIONS OF THE GENERATED KNOWLEDGE

The findings presented in this thesis may have various scientific and clinical implications in the (nearby) future. We have increased awareness for calcium intake during pregnancy, and the Dutch committee for Obstetrics and Gynaecology (NVOG) recently agreed to incorporate the calcium recommendation during pregnancy in national guidelines[9]. In this way the barrier in the social domain will be lowered. Our evidence shows that advising calcium to all pregnant women will have major impacts on health and related health care costs. Uptake of the advice could have significant worldwide impact on maternal and child outcomes.

It is important to know which women can benefit most from the calcium intake advice to pay extra attention to their calcium intake. Target groups are: a) women who, despite good intentions, do not initiate sufficient improvement of calcium intake (>1000 mg/day), b) women at risk for an inadequate calcium intake during pregnancy: young, nulliparous and/or non-Caucasian and c) women at increased risk of developing PE. The first group is already inclined to optimize

calcium intake. They simply do not seem to have the practical how-to knowledge on manners to achieve adequate intake. They could benefit from concrete and repeated advice from their obstetric caregiver on how to improve their calcium intake. This also applies to women of the second category, who are most at risk for inadequate calcium intake. Stressing the importance, and the lack of harm and repeat information on how to improve intake is expected to facilitate improvement. The last category were found to be aware of their increased risk and the potential of calcium to lower the risk: their calcium intake increased after obstetric caregivers started to counsel patients actively on calcium.

We showed that calcium intake improved only moderately when women were advised to improve their calcium intake either by diet or supplements. Dietary calcium intake may, however, easily be overestimated and total intake may still fall behind also after dietary changes. Complementary to our results, we suggest performing an implementation strategy study, empowering future implementation. We suggest to study advising calcium supplementation as a standard recommendation for all pregnant women. The results of our qualitative study indicate that making the calcium advice as practical as possible and repeating the advice will facilitate improved intake. In this way how-to knowledge among women will increase. Exceptions to calcium supplementation can be made, of course. However, the evidence from our studies shows that women do not easily achieve an adequate calcium intake from diet; simply adding one dairy product serving a day will not provide sufficient calcium to cover the gap for all pregnant women. An extra supplement, 500-1000 mg/day, on the other hand will.

The results provided by this thesis are relevant for obstetric caregivers and all pregnant women. Even when calcium supplementation is advised to all pregnant women, it is important to keep in mind which women are at risk for either developing PE, or low calcium intake – namely young, nulliparous and/or women of non-Caucasian origin - and have most benefit from the calcium advice. We suggest obstetric caregivers build in a verification moment into the care pathway of these women to check whether they use a calcium supplement, for instance at 16 weeks of pregnancy.

CONCLUSION

In this thesis, we have included several studies that provide insight in calcium intake during pregnancy, risk groups for low calcium intake, barriers and facilitators for uptake of calcium advice, and potential strategies for improvement of calcium intake during pregnancy. To disseminate this evidence to the right audiences and to increase the impact of this work, several strategies were employed to share these results with researchers, clinicians and general audiences. Yet, in order to further optimize the evidence base for effective implementation an implementation study should be performed, aiming to further improve calcium intake of pregnant women, nationally and internationally.

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