

Vitamin B3 Levels and Miscarriage: A Pilot Study

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Background

Miscarriage is the most common complication of early pregnancy. A Sydney study hypothesised that vitamin B3 (niacin or nicotinamide), known to be important in synthesising nicotinamide adenine nucleotide (NAD), a cofactor for key metabolic processes such as ATP production, DNA repair and macromolecular synthesis, may play a role in preventing miscarriage(1). Previous studies have identified the role of niacin in implantation, preeclampsia and miscarriage in mice(2). In the Sydney study, offspring of mice with NAD deficiency had embryo defects. Correction of deficiency with niacin supplementation resulted in normal offspring. These results suggest a link between niacin and early embryonic development and miscarriage. However, human trials are lacking and further research into human pregnancy is required.

Aim & Hypothesis

The aim of this pilot study was to explore whether there was an association between Vitamin B3 levels and first trimester miscarriage. The underlying hypothesis was that low levels of Vitamin B3 will be associated with miscarriage.

Methods

A prospective pilot study was performed. From November 2018 to March 2019, 24 women in the first trimester of pregnancy were recruited from the Fetal Medicine Unit at the Centenary Hospital for Women and Children and a private clinic in Canberra.

All women completed a 24-hour food diary recording food and liquid beverage consumption and a subset of women also completed a 24-hour urine collection. Niacin content levels from the food diary were calculated using a combination of FoodWorks software (Xyris Software, Brisbane, Food Works, version 3.01 2002), multivitamin brand websites, The United States Department of Agriculture Food Composition Databases and the Eat This Much website. In a sub-set of women, 24-hour urine samples were collected. Urinary levels of 2-pyr, MNA and 2-pyr/MNA ratio indicated niacin status.

The primary outcome was miscarriage. Patients were classified as having a 'miscarriage' if the pregnancy ended less than 20 weeks. Otherwise, women were classified as 'control'.

As this was a pilot study, a power calculation was not performed. Binomial logistic regression modelling evaluated if niacin intake or urinary 2-pyr/MNA ratio predicted miscarriage.

Results

- Women who miscarried had a lower mean niacin intake compared to controls (miscarriage 33 (SD = 16.64) vs control 43.3 (SD = 19.66) mg/day).
- Similarly, the average urinary 2-pyr/MNA ratio of women who miscarried was lower compared to controls (miscarriage 2.2 (SD = 0.2) vs controls 3.8 (SD = 0.54)).
- Binary logistic regression modelling indicated that neither daily-recorded niacin intake ($p = 0.24$) nor urinary 2-pyr/MNA ratio ($p = 1.00$) predicted miscarriage.

Conclusion

Niacin intake and urinary niacin levels did not predict miscarriage. However, women who miscarried had lower levels of dietary intake and urinary niacin compared to controls. Overall Vitamin B3 intake was higher than recommended daily pregnancy intakes. A larger study, adequately powered on this pilot data, could confirm whether Vitamin B3 plays a role in early pregnancy outcome.

References

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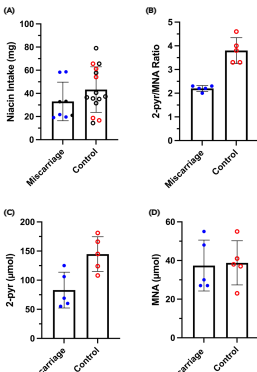


Figure 1 Niacin outcomes of women experiencing miscarriage (solid blue circles) compared to control women with term pregnancy (open red circles). Three women in the miscarriage group (solid black circles) and ten women in the control group (open black circles) did not provide urine samples. Graphs document niacin intake levels from a 24-hour food diary (A) and niacin measurements from a 24-hour urine collection of 2-pyr/MNA ratios (B), 2-pyr levels (C) and MNA levels (D). Data are means \pm SD. Levels of niacin intake in women who miscarried are lower than the control group. The 2-pyr/MNA ratio and levels of 2-pyr in women who miscarried are lower than that of the control group. The levels of MNA in the miscarriage group are slightly lower compared to that of the control group.

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