Nutrition awareness before and throughout different trimesters in pregnancy: a quantitative study among Dutch women

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Objective. To examine the nutrition awareness of women before and during pregnancy in order to provide a greater understanding of the life course perspective (LCP) in relation to nutrition behaviours and pregnancy.

Method. Data were collected in a cross-sectional study with the aid of a face-to-face interview, based on our conceptualization of nutrition awareness and the ‘rules of thumb’ designed by the Dutch Nutrition Centre. The sample consisted of five groups each of ~100 Dutch nulliparous women: women not trying to conceive a child, women trying to conceive a child and women in their first, second or third trimesters of pregnancy.

Results. The measurement tool based on our conceptualization of nutrition awareness resulted in a Cronbach’s alpha of 0.84. Pregnant women are significantly more aware of their nutrition than women who are not trying to conceive. The scores on nutrition awareness do not differ significantly between the three trimester groups of pregnant women. Women who are trying to conceive do not have a significantly higher nutrition awareness than women who are not trying to conceive.

Conclusions. Our conceptualization of nutrition awareness has shown to be fruitful in obtaining a better understanding of behavioural changes in health. The study provided indications in favour of the LCP; pregnancy could indeed be an event in a woman’s life that causes increased nutrition awareness. This should be kept in mind when healthy nutrition promotion activities are being developed.

Keywords. Awareness, life course perspective, nutrition, pregnancy, survey.

Introduction

An adequate nutrition pattern is of major importance for one’s health and well-being, especially during pregnancy when a woman undergoes major biological, physical, psychological and social transformations. However, pregnancy and even pre-conception may also lead to uncertainties and concerns about a woman’s new identity as a (future) mother, triggering her to rethink and reconsider her nutrition. As a result, pregnancy, and particularly a first pregnancy, is likely to be one of the few critical periods when women are able to change nutrition-related behaviours that are difficult to modify at other times. Pregnancy can therefore be seen as a major transition in a woman’s life and may have a positive influence on a woman’s future health and nutrition behaviour and that of her family. In the literature, this phenomenon has been introduced as the ‘life course perspective’ (LCP). This life transition plays a role in addition to the more traditional variables, such as individual patterns of behaviour or health across time, cultural and contextual influences. It also provides a whole new window of opportunities for healthy nutrition promotion activities.

Efforts have been made to gain insights into the behavioural patterns of pre-conception, antenatal and postnatal smoking behaviours in relation to the LCP. However, studies on nutrition behaviours are scarce. The studies that are available are mainly directed at, and restricted to, topics such as maternal weight and diabetes. However, in order to obtain
insight into the LCP in relation to pregnancy and nutrition, it is interesting to ascertain whether women indeed become more aware of their nutrition and what importance they place on this in comparison to other lifestyle factors, such as physical exercise and hygiene. By awareness, we do not mean that women acquire more knowledge or a greater understanding of nutrition and nutrition behaviour. Many women know, more or less, what is healthy and what is not, but this knowledge is not translated into behaviour. This is what we call ‘passive’ or a ‘cold’ type of nutrition awareness. In this article, we use a more ‘active’ or ‘hot’ definition of awareness. Awareness is hot when it becomes:¹¹,¹²

- ‘more salient’ compared to other aspects in a woman’s life. She attaches greater value to nutrition than she used to do.
- a subject of ‘continuous attention’. A woman thinks more often about nutrition and everything to do with it. She is preoccupied by it.
- a subject of ‘deliberate supervision’ in daily life. A woman actively watches her nutrition.

In a qualitative in-depth study among 60 pregnant women and women trying to conceive,¹³ indications were found that the period around the pregnancy could indeed be an occasion in a woman’s life in which she becomes actively aware of her nutrition. The purpose of this present study is to examine cross-sectionally the nutrition awareness of women before and during pregnancy in order to provide a greater understanding of the LCP in relation to nutrition behaviour and pregnancy. In this way, we aim to contribute to the rationale for nutrition interventions aimed at women of childbearing age. More specifically, this study aims to answer the following research questions:

1. How do women whom are: not trying to conceive, trying to conceive and pregnant women perceive the influence of nutrition on their health as compared to other lifestyle factors?
2. Are women who are trying to conceive more aware of their nutrition than women not trying to conceive?
3. Are pregnant women more aware of their nutrition than both women not trying to conceive and those trying to conceive, and do women in different trimesters of pregnancy have differing levels of nutrition awareness?

Method

Design and study participants
Data were collected by means of a face-to-face questionnaire administered at the homes of the study participants. Five groups of women were selected for this study. The first group consisted of nulliparous women who did not wish to become pregnant in the following year. The second group of women consisted of nulliparous women who had stopped using contraceptives in order to become pregnant. The third, fourth and fifth group consisted of nulliparous pregnant women at the end of the first, second or third trimester of their pregnancy. To avoid bias, women were informed that the questionnaire contained questions on lifestyle during pregnancy. They were not informed that it was particularly directed at nutrition or that the questionnaire would focus on nutritional awareness. In this way, study participants could not prepare themselves in completing the questionnaire.

The criteria for ‘healthy’ nutrition were based on the ‘rules of thumb’ designed by the Dutch Nutrition Centre (DNC) and aimed at all Dutch consumers. The DNC is an official, independent and scientifically based organization that is primarily financed by the Dutch government and informs consumers on healthy nutrition. The rules of thumb focus on the importance of a healthy and varied diet in general and more specifically on the importance of: fruit, vegetables, bread, dairy produce, number of calories, healthy and unhealthy fats, soft drinks and breakfast.

The conceptualization of ‘nutrition awareness’ developed for this study¹³ was based on three constructs of awareness derived from integrated theory:

1. Salience of nutrition, for example, ‘I need to eat vegetables every day’.
2. Pre-occupation with nutrition, for example, ‘I never think about whether or not I eat enough vegetables’.
3. Deliberate control of nutrition behaviour, for example, ‘I make sure that I eat enough vegetables every day’.

These three constructs were applied to each of the nine nutrition topics singled out by DNC, see Table 1. Nutrition awareness was thus assessed by (3 × 9) = 27 items. Reliability analysis of the measurement instrument resulted in a Cronbach’s alpha of 0.84. A Likert scale including all 27 items was constructed. This Likert scale was supposed to measure nutrition awareness. The total score or the summed rating for each respondent was the summed rating of the standardized scores¹⁴ on the separate items; total scores could (theoretically) vary between −70 and +36. Observed total scores ranged between −46 and +29.

The questionnaire also provided insight into the position of nutrition as compared to other lifestyle factors. Before implementation, the questionnaire was pilot tested and improved on readability of the containing questions.
TABLE 1 Statements contained in questionnaire for this study

Healthy eating
1. I need to eat healthy food every day.
2. I never think about whether or not I eat healthy food.
3. I rarely pay attention to whether or not I eat healthy food.
Vegetables
4. I need to eat vegetables every day.
5. I never think about whether or not I eat enough vegetables.
6. I make sure that I eat enough vegetables every day.
Fruit
7. I do not need to eat fruit every day.
8. I often think about whether or not I eat enough fruit.
9. I rarely pay attention to whether or not I eat enough fruit every day.
Bread
10. I do not need to eat bread every day.
11. I often think about how much bread I eat.
12. I rarely pay attention to whether or not I eat enough bread every day.
Dairy
13. I need to consume dairy products every day.
14. I often think about the amount of dairy I consume.
15. I rarely pay attention to the amount of dairy I consume daily.
Calorie intake
16. I need to control myself to adhere to a strict daily calorie intake.
17. I often think about my calorie intake.
18. I rarely pay attention to how many calories I take in every day.
Saturated and unsaturated fats
19. I should limit the saturated fat that I eat daily.
20. I never think about the amount of saturated fat I take in.
21. I always limit the saturated fat that I take in.
Soft drinks
22. I need to limit how many soft drinks I consume daily.
23. I never think about how many soft drinks I consume daily.
24. I pay attention to the number of soft drinks I drink each day.
Breakfast
25. I need to eat breakfast every day.
26. I never think about eating breakfast.
27. I make sure that I eat breakfast every day.

Answer options were: totally disagree; disagree; somewhat disagree, somewhat agree; agree; totally agree; ‘I did not take this before anyway’ (this last category was no option for statements on healthy eating and calorie intake).

Sample size
Respondents were approached through access panels of three market research organizations:

1. ‘GFK Script Panel’: this panel contains names and addresses of a representative sample of the Dutch population. Stratified samples were taken and were based on gender, age, residence and size of residence.15 Sixty per cent of the total panel was approached for this study.
2. ‘We Special Media’: this is an organization that has almost all the names and addresses of pregnant women in The Netherlands because it offers a free information pack to pregnant women. At random, samples were taken.
3. ‘Intomart’: this organization undertook a study directed at intended childlessness. The nulliparous women in that study who appeared to have a future child wish were excluded for the Intomart study and approached for our study. A stratified sample was taken.

Potential study participants in the GFK script panel and the Intomart panel are collected through national representative written and face-to-face interviews by Intomart and via news letters of web portals. The GFK script panel and the Intomart panel represent all sorts of Internet users, also those who infrequently make use of the Internet. Every Internet user has the same change to participate in the panel. The majority of the GFK script panel and the Intomart panel do not participate in panels of other research organizations.

Potential respondents were invited twice to participate in this study, first by e-mail and 14 days later by phone. Women on these access panels knew beforehand that they could be approached for research. They were free to chose whether or not they would participate in this study. In dealing with our respondents, we carefully adhered to the research standards required by the graduate school to which we belong. Our study was granted ethically approval by this graduate school. The target was to have at least 100 women in each of the following five groups: nulliparous women not trying to conceive, nulliparous women trying to conceive and nulliparous pregnant women in their first, second and third trimester of their pregnancy. Women included had to meet the following criteria: aged between 20 and 40 years, born and raised in The Netherlands and if pregnant, treated by a midwife. (In The Netherlands, women with serious complications are treated by a gynaecologist rather than by a midwife. The profession of obstetrician does not exist in the Dutch health system.) Women who were seen exclusively by gynaecologists were excluded from participation in this study. Stratified samples were taken from the research panels to meet these criteria. Beforehand, all respondents were promised a small monetary compensation in the form of a €5 voucher and a gift (a cookery book) in appreciation for their participation.

For an overview of the origin of the sample and the distribution over the five groups studied, see Table 2.

Analyses
Statistical analyses were performed using SPSS 12.0. Comparisons within groups were performed using paired sample t-tests. Comparisons between groups were performed using General Linear Models (GLMs; analyses of variance) with F-tests and Student–Newman–Keuls (SNK) post hoc tests done to test differences in nutrition awareness. In GLMs, the following covariates were considered: education level, age and interactions.
Results

In total, 523 women completed the face-to-face questionnaire. Socio-demographic characteristics of the respondents are shown in Table 3. Values are expressed as a mean or as a percentage of respondents. The mean age of the group of women trying to conceive was significantly higher than that of women in their first and second trimester of pregnancy (post hoc test, $P = 0.01$). The education level did not differ significantly between the groups (chi-square 8.9, d.f. 8, $P = 0.35$).

The importance of healthy nutrition as a lifestyle factor

The first research question addressed the issue of the perceived influence of nutrition on general health, as compared to other lifestyle factors. Data analysis showed that all groups of women perceived excessive alcohol consumption and smoking as the two most important factors. Unhealthy nutrition came third, followed by stress, little physical exercise and bad hygiene, see Table 4. In all three groups, unhealthy nutrition was considered more important than little physical exercise (paired $t$-test, all $P < 0.0001$) and less important than smoking (all $P < 0.006$). This order was similar in both the smoking and the non-smoking group.

Nutrition awareness

Significant differences ($P = 0.05$) in scores on the nine nutrition-related areas between the five groups of Dutch nulliparous women were found for: vegetables, fruit, dairy and calorie intake, see Table 5.

The second and third research questions were directed at differences in nutrition awareness between women not trying to conceive, women trying to conceive and pregnant women. Scores for nutrition awareness ranged between −46 and +29. The over all mean score was −0.01 (SD 12.18). The effect of groups on nutrition awareness was significant, although $R^2$'s were low, see Table 6, Model I. This means that the group to which a woman belongs makes a difference in respect of her nutrition awareness. Including education level in the model slightly increased group contrasts, see Table 6, Model II. Results from the models including both age and education level and interactions are not presented because neither age nor interactions had a significant effect on nutrition awareness.

The group of women not trying to conceive had the lowest nutrition awareness score, followed by the group of women trying to conceive and then the pregnant group. The difference between pregnant women and women not trying to conceive was significant using SNK post hoc tests in GLM, see Table 6. There is a clear trend in mean scores towards women who are trying to conceive being slightly more aware of their nutrition than women who are not trying to conceive.

Examined in further detail, the data showed that there were no significant differences in nutrition awareness among the three trimester groups in pregnancy, see Table 7. Of the three groups of pregnant women, women in their first trimester of pregnancy had the lowest nutrition awareness score, followed by the group of women in their third trimester of pregnancy, than the second trimester. These differences in nutrition awareness score were not significant. Women not trying to conceive had a significant lower nutrition awareness score.
awareness than women in their second and third trimester of pregnancy.

**Discussion**

As far as we know, this is the first quantitative study about nutrition awareness before and throughout pregnancy in relation to the LCP. Our conceptualization of nutrition awareness is based on integrated theory and is distinctive from the more commonly used definitions of this concept. Generally, nutrition awareness has been defined as having knowledge or some kind of understanding of nutrition.\(^{16-19}\) It has also been associated with having an accurate estimation of one’s own food intake compared to one’s actual nutrition behaviour (measured by researchers) or to the recommended food intake.\(^{20-23}\) However, many people know, more or less, what healthy nutrition is and what is not, but this knowledge is not translated directly into behaviour; they are not really using their knowledge or putting it into practice.\(^{24}\)

This study shows that our conceptualization of awareness (saliency, pre-occupation with and deliberate control of nutrition) as an important determinant of behaviour is fruitful in obtaining a better understanding of behavioural changes in relation to health.\(^{13}\) It reveals how personally relevant nutrition-related knowledge becomes personally relevant to women during pre-conception and pregnancy. This is an important condition for rethinking nutrition habits.\(^{25}\)

<table>
<thead>
<tr>
<th>Nine nutrition-related areas</th>
<th>Groups</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Not trying to conceive</td>
</tr>
<tr>
<td></td>
<td>n = 101</td>
</tr>
<tr>
<td>Healthy eating</td>
<td>4.63 ± 0.08</td>
</tr>
<tr>
<td>Vegetables</td>
<td>4.48 ± 0.09(^a)</td>
</tr>
<tr>
<td>Fruit</td>
<td>4.35 ± 0.10</td>
</tr>
<tr>
<td>Bread</td>
<td>3.00 ± 0.11</td>
</tr>
<tr>
<td>Dairy</td>
<td>3.67 ± 0.13</td>
</tr>
<tr>
<td>Calorie intake</td>
<td>3.46 ± 0.14</td>
</tr>
<tr>
<td>Saturated and unsaturated fats</td>
<td>3.74 ± 0.12</td>
</tr>
<tr>
<td>Soft drinks</td>
<td>4.30 ± 0.15</td>
</tr>
<tr>
<td>Breakfast</td>
<td>5.09 ± 0.12</td>
</tr>
</tbody>
</table>

Groups with different letters differ significantly from each other on nutrition awareness scores (\textit{post hoc} test \(P = 0.05\)).

**Table 6 Estimated marginal means and standard errors for the three groups on nutrition awareness**

<table>
<thead>
<tr>
<th>Groups</th>
<th>Estimated marginal means and standard errors</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Model I independent variable: groups ((N = 521))</td>
</tr>
<tr>
<td>Not trying to conceive</td>
<td>(-2.70 \pm 1.20 (n = 101)^*)</td>
</tr>
<tr>
<td>Trying to conceive</td>
<td>(-1.71 \pm 1.21 (n = 100)^{<em>,</em>})</td>
</tr>
<tr>
<td>Pregnant</td>
<td>(1.36 \pm 0.68 (n = 320)^{*,**})</td>
</tr>
<tr>
<td>(F)-statistic group ((dF_1, dF_2))(^a)</td>
<td>(5.561 (2, 518))</td>
</tr>
<tr>
<td>(F)-statistic education ((dF_1, dF_2))(^b)</td>
<td>(6.043 (2, 514))</td>
</tr>
<tr>
<td>(R^2)</td>
<td>2.1%</td>
</tr>
</tbody>
</table>

Groups with different * differ significantly from each other on nutrition awareness scores (\textit{post hoc} test \(P = 0.03\)).

\(^a\)Model I \(P = 0.004\) and Model II \(P = 0.002\).

\(^b\)\(P = 0.003\).
nutrition awareness in more active terms. In addition, the measurement of our concept of nutrition awareness is extremely interesting for the development of nutrition promotion activities. It is directed at women’s world of reference, their personal involvement in nutrition and their nutrition behaviour.

The objective of this study was to examine cross-sectionally the nutrition awareness of women before and during pregnancy. In this way, the authors wish to provide a greater understanding of the LCP in relation to nutrition behaviours and pregnancy and to contribute to the rationale of nutrition interventions aimed at women of childbearing age.

In a range of six lifestyle behaviours, unhealthy nutrition comes in the third place, after excessive alcohol consumption and smoking and followed by stress, little physical exercise and bad hygiene. The study provided indications in favour of the LCP; pregnancy could indeed be an event in a woman’s life causing an increased or ‘hotter’ nutrition awareness. Pregnant women are most aware of their nutrition, followed by women that wish to conceive a child and then the women with no such wish. No significant differences were found in nutrition awareness among the three trimester groups in pregnancy.

The few LCP studies available on pregnancy and nutrition are difficult to compare because of the diversity in focus and methodological designs. In addition, they often do not have a sound theoretical base. Some of them have shown that nutrition habits do not change significantly during pregnancy, whereas others have found support for the proposition that pregnant women clearly do show some changes in dietary behaviour, such as an increased consumption of fruit, vegetables and dairy products. The results of our current study, however, are in line with our previous studies: pregnant women are more aware of their nutrition and there is a clear trend towards women who are trying to conceive being slightly more aware of their nutrition than women who are not trying to conceive.

An important methodological limitation is that the sampling did not meet the highest criteria required to guarantee randomness because we had to rely on existing panels. For practical reasons, the study participants originated from different, though representative, access panels. Although we made corrections for education and age, the samples are biased towards more highly educated and slightly older women trying to conceive limits the possibility of generalizing the results to the overall Dutch population of women in this phase of life. The age difference between those trying for a pregnancy could reflect infertility. On the other hand, the average age of Dutch mothers giving birth to their first child was 29 years in 2003. This is relatively high compared to other countries. Another limitation of this study is that it was unclear whether they had any of the known gastrointestinal symptoms associated with pregnancy.

**Implications for research and practice**

A number of implications for research and practice can be inferred from this study. Firstly, health promoters should realize that pregnancy can indeed be one of the few special or critical events in life that trigger women to become more nutritionally aware. This increased awareness may not only benefit maternal, foetal and infant health and well-being but also equally have positive consequences for postpartum nutrition behaviours, as the repetitive character of these adjustments could make them automatic responses for women after a while. Adequate healthy nutrition promotion activities directed at general nutrition would then be of major importance.

**Table 7** Estimated marginal means and standard errors for women not trying to conceive, women trying to conceive and the three pregnant trimester groups on nutrition awareness

<table>
<thead>
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</thead>
<tbody>
<tr>
<td></td>
<td>Model I independent variable: groups (N = 521)</td>
</tr>
<tr>
<td>Not trying to conceive</td>
<td>-2.70 ± 1.20 (n = 101)*</td>
</tr>
<tr>
<td>Trying to conceive</td>
<td>-1.71 ± 1.20 (n = 100)</td>
</tr>
<tr>
<td>First trimester</td>
<td>0.52 ± 1.20 (n = 101)</td>
</tr>
<tr>
<td>Second trimester</td>
<td>1.80 ± 1.15 (n = 110)**</td>
</tr>
<tr>
<td>Third trimester</td>
<td>1.71 ± 1.16 (n = 109)**</td>
</tr>
<tr>
<td>F-statistic group (dF1, dF2)*</td>
<td>2.952 (5, 16)</td>
</tr>
<tr>
<td>F-statistic education (dF1, dF2)*</td>
<td></td>
</tr>
<tr>
<td>$R^2$</td>
<td>2.2%</td>
</tr>
</tbody>
</table>

Groups with different * differ significantly from each other on nutrition awareness scores (Model I post hoc test $P = 0.06$, Model II post hoc test $P = 0.063$).

$a$Model I $P = 0.02$ and Model II $P = 0.013$.

$bP = 0.003$. 

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In order to study the possibility of the pregnancy being a catalyzing life event that gives rise to longer term revision of nutrition issues, a longitudinal study is required from pre-conception, pregnancy and all the way to the postpartum period, to track the process and factors that might influence nutrition awareness during these transitions. A longitudinal study also makes it possible to assess whether marginal differences in nutrition awareness found in this study lead to practical or clinical effects. It would be interesting to study women’s awareness of pregnancy-specific nutrition-related issues, such as the consumption of folic acid and unpasteurized cheeses and meat, and other lifestyle factors, such as physical exercise and stress. Measurement of nutrition awareness in other special or critical transitions in life, such as adolescence, moving out of the parental home and retirement, would be interesting as well as in the contribution of the LCP on food decision making.  

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Declaration

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Ethical approval: Approval of the research protocol by the Scientific Assessment Committee of Mansholt Graduate School of Social Sciences, Wageningen University (15-01-2003), which at that time also acted as the Ethics Committee.

Conflict of interest: none.

References