A Pilot Study of Total Energy, Three Major Nutrients and Food Intakes among Pregnant Women: A Comparison with Nulliparous and Multiparous Women in Miyagi, Japan

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Abstract

In Japan, almost one-quarter of young women in their 20s are lean, with a body mass index less than 18.5 kg/m², and the number of thin pregnant women has also increased. Although the effects of several nutrients and foods have been well examined, little is known regarding the current status of foods and nutrients intake during pregnancy. The purpose of our pilot study was to investigate the current status among nutrients and foods intake during pregnancy, and parity.

Study subjects who were recruited 3-4 days after delivery were admitted to three maternity hospitals in Miyagi Prefecture in 2009. We analyzed 113 postpartum women. The subjects were divided into two groups according to the parity: 52 nulliparas and 61 multiparas. The questionnaire contained the following information: age, body mass index, gestational weight gain, parity, occupation, smoking habits, infant status (gestational weeks and birth weight) and a semi-quantitative food frequency questionnaire (FFQ) inquiring about foods. We examined categorical data using the chi-square test, and compared continuous variables using Student’s t-test.

Among the major macronutrients (carbohydrate, protein and fat), the multiparas group showed significantly higher fat intake than the nulliparas group. The nulliparas group showed significantly higher carbohydrate intake than the multiparas group.

Among food intakes, the multiparas group showed a higher intake of fish and a lower intake of fruits compared with the nulliparas group. Among the proportion of frequency of fish intake in both group, less than the nulliparas group had frequency of fish intake than did the multiparas group.

Our pilot study shows that the diet of Japanese pregnant women is insufficient and far below the recommended levels. Although fish intake is also insufficient, the proportion of fish intake increases with increasing parity. Pregnancy can be an opportune time to improve nutrition and presents an ideal time for promotion of health activities.

Introduction

The trend in Japanese women’s body size of being underweight is increasing, especially in young women. Almost one-quarter of young women in their 20s are lean, with a body mass index less than 18.5 kg/m², and the number of thin pregnant women has also increased [1,2]. For this reason, weight gain during pregnancy was classified into three categories of recommended levels of the Maternal and Child Health Division, the MHLW [3]. Moreover, a diet food guide for pregnant women was produced by the MHLW and the Ministry of Agriculture in Japan. Nevertheless, several studies have reported that dietary intake is insufficient among Japanese women during pregnancy [4,5]. Although the effects of several nutrients and foods have been well examined, little is known regarding the current status of foods and nutrients intake during pregnancy with reproductive factors, particularly parity.

The purpose of our pilot study was to investigate the current status among nutrients and foods intake during pregnancy, and the number of children previously borne (parity).

Materials and Methods

Subjects

Study subjects were admitted to three maternity hospitals in Miyagi Prefecture from March to October in 2009. These three maternity hospitals are located in Sendai, which is the prefectural capital of Miyagi Prefecture, and on the Pacific coast of Honshu (the largest of Japan’s four major islands).

Subjects were 124 postpartum women recruited 3-4 days after delivery. Those who had extreme levels of energy intake (in the upper or lower 2.5% of the range for all subjects; n = 8) were excluded in the present study. The subjects was divided into two groups according to the parity: nulliparas and multiparas. We excluded subjects for reasons, such as an incomplete answer (n = 3) or an implausible total energy intake (n = 8). Finally, 113 postpartum women were included as subjects in the present study.

Self-report assessments

We distributed self-administered questionnaires to subjects and collected them from the subjects during the hospital stay. The questionnaire contained the following information: age, body mass index, gestational weight gain, parity, occupation, smoking habits, and infant status (gestational weeks and birth weight). The questionnaire also contained a semi-quantitative food frequency questionnaire (FFQ) inquiring about foods.

Keywords:

Nutrients intakes, Food intakes, Pregnancy, Parity

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In this FFQ, we asked the subjects to recall the frequency of average consumption of 141 food items during pregnancy to the inquiry. There were six categories of responses to the question on food consumption: “almost never (<1 time/month),” “1-3 times/month,” “1-2 times/week,” “3-4 times/week,” “5-6 times/week,” and “every day.” The reliability and validity of this FFQ have already been assessed [6]. The nutrients and fish intake were analyzed by the National Institute of Health and Nutrition.

Statistical analysis

Normality of distribution was assessed through the use of the Shapiro-Wilk test, and equal variances. We examined categorical data using the chi-square test, and compared continuous variables using Student’s t-test. A sample size of 124 participants was chosen for conventional methodology [7] to have 80% power at α = 0.05 (two tailed) to detect an effect size of 0.5. All statistical analyses were performed with JMP version 11.0 for Windows (SAS Institute Inc., Tokyo, Japan). All reported p values were two-sided and were considered statistically significant if <0.05.

Ethics

The study was approved by the Ethics Committees of the University of Tohoku Fukushi. Written consent was obtained from all participants, after a researcher explained the purpose.

Results

Maternal characteristics

The characteristics of the subjects are shown in Table 1. The mean age (+ SD) of the participants was 29.8 ±4.8 years for the nulliparas group and 32.0 ±3.7 years for the multiparas group. There was significant difference in age among the groups (p = 0.006). The body mass index was a normal body size for both groups. For infant, gestational weeks was significant difference in both groups (p = 0.01). There were no preterm births and no low birth weights. None of the other variables were significantly different in both groups.

Selected nutrients and foods

Table 2 shows the intake of selected nutrients and foods, according to the parity. In the total energy intake, multiparas groups was significantly higher than the nulliparas group (p = 0.02). Among the major macronutrients (carbohydrate, protein, and fat), the multiparas group showed significantly higher fat intake (44.7 ±10.9 g) than the nulliparas group (p = 0.02). The nulliparas group showed significantly higher carbohydrate intake (240.8 ±15.1 g) than the multiparas group (p = 0.01).

Among food intakes, the multiparas group showed a higher intake of fish (31.5 ±16.0 g, p=0.03) and a lower intake of fruits (57.8 ±41.7 g, p=0.03) compared with the nulliparas group. No significant differences in other food intake were observed between subjects in both groups.

Figure 1 shows the proportion of frequency of fish intake in both groups. Frequencies of fish intake were further classified into 3 groups as follows: a few times a month, a few times a week and most days. In the nulliparas group, the proportion of fish intake was 19.0% for a few times a month, 46.0% for a few times a week and 35.0% for most days. In the multiparas group, the proportion of fish intake was 14.0% for a few times a month, 40.0% for a few times a week and 46.0% for most days. Less than the nulliparas group had frequency of fish intake than did the multiparas group (χ² = 8.8, 2 df, p = 0.01).

Discussion

The present pilot study investigates the current status among and foods intake during pregnancy, and parity. The analyzed sample size
MeHg in Japan [14]. We consider that it is important to give advice for pregnant women are aware of the relation between fish intake and pregnancy might be insufficient because almost 80% of Japanese pregnant women are aware of the relation between fish intake and MeHg [13]. A previous study found that large predatory fish, such as tuna, swordfish, and marlin, are the main source of exposure to MeHg [12]. We consider that it is important to give advice for pregnant women to have sufficient intake of fish. However, intake of fish was significantly lower in the multiparas group compared with the nulliparas group, but the mean fish intake in study subjects was 28.8 ±14.2 g/day, which is far below the recommended levels. Intake of fish was significantly higher in the multiparas group compared with the nulliparas group, and the study had slightly lower statistical power (1-β ≥ 0.75) to investigate the associations among food in both groups. Consequently, we consider that error type II cannot be excluded.

The MHLW’s 2010 edition of ‘Dietary Reference Intakes for Japanese recommends a total calorie intake of 1950 and 2000 kcal/day for 18- to 29-year-old and 30- to 49-year-old non-pregnant women with ordinary levels of physical activity [8]. In the current study, mean total caloric intake for both groups was between 1416.0 ± 578.7 kcal/day and 1653.2 ± 624.1 kcal/day, which is far below the recommended levels. Intake of fish is becoming more common among Japanese women during pregnancy. The proportion of fish intake increases with increasing parity [2,17,18]. Low nutrition intake during pregnancy is also increasing [2,17,18]. Low nutrition intake during pregnancy may lead to restricted maternal weight gain.

Second, we lacked data on socioeconomic and educational status. However, for the Japanese population, higher education is easily accessible, and there is less diversity in socioeconomic levels than in other countries.

Third, there might have been issues in selection of subjects. We selected subjects who were residing at the same geographical region. To eliminate selection bias, we surveyed three maternity hospitals located in the same region in the present study. However, the diets of Japanese vary according to geography, culture, and socioeconomic status. Therefore, dietary during pregnancy needs to be studied in other areas of Japan.

In conclusion, our pilot study shows that the diet of Japanese pregnant women is insufficient and far below the recommended levels. Fish intake is also insufficient, and a lack of fish from the diet is becoming more common among Japanese women during pregnancy. The proportion of fish intake increases with increasing parity. Prenancy can be an opportune time to improve nutrition and presents an ideal time for promotion of health activities.

Acknowledgments
We would like to sincerely thank the mothers who took part in this study. We also thank all the hospital which participated in the study.

Funding
This study was supported by a Grant-in-Aid for Scientific Research (C) from the Japan Society for the Promotion of Science (grant number 20592601).

Competing Interests
The author(s) declare that they have no competing interests.
Author Contributions

All of authors were involved in designing the research. Megumi Fujita formulated and organized the project, analyzed the data and wrote the majority of the manuscripts. Megumi Tsubota provided a nutritional requirements in the analysis. Megumi Tsubota and Motoko Ishida assisted in the interpretation of results. All the co-authors contributed to the preparation and review of the content of manuscript.

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