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# Milk intake during pregnancy is inversely associated with the risk of postpartum depressive symptoms in Japan: the Kyushu Okinawa Maternal and Child Health Study

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## ABSTRACT

Only one epidemiologic study has investigated the association between dairy product intake during pregnancy and postpartum depressive symptoms. Epidemiologic evidence on the relationships between calcium and vitamin D intake during pregnancy and postpartum depressive symptoms is also lacking. The present prospective study examined these issues in Japan. Study subjects were 1319 women. During pregnancy, dietary intake during the preceding month was assessed using a self-administered diet history questionnaire in the baseline survey. Postpartum depressive symptoms were defined as present when subjects had an Edinburgh Postnatal Depression Scale score of 9 or higher between 3 and 4 months postpartum. Adjustment was made for age, gestation at baseline, region of residence, number of children, family structure, history of depression, family history of depression, job type, education, body mass index, having smoked during pregnancy, cesarean delivery, baby's sex, baby's birth weight, and total energy intake. After adjustment for the confounding factors, compared with milk intake in the lowest quartile, intake levels in the second and fourth quartiles were independently associated with a reduced risk of postpartum depressive symptoms, although the inverse exposure-response relationship was not significant: the adjusted odds ratio between extreme quartiles was 0.51 (95% confidence interval, 0.28–0.93; *P* for trend = .12). No material relationships were observed between intake of total dairy products, yogurt, cheese, calcium, or vitamin D and the risk of postpartum depressive symptoms. The present prospective cohort study in Japan suggests that higher milk intake during pregnancy is associated with a reduced risk of postpartum depressive symptoms.

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**Abbreviations:** CES-D, Center for Epidemiologic Studies Depression Scale; CI, confidence interval; DHQ, diet history questionnaire; EPDS, Edinburgh Postnatal Depression Scale; KOMCHS, Kyushu Okinawa Maternal and Child Health Study; OR, odds ratio.

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## 1. Introduction

Epidemiologic investigations on the relationship between dietary factors and depressive symptoms have been a focus of constant attention in recent years [1]. Nevertheless, only one epidemiologic study has previously investigated the association between dairy product intake during pregnancy and postpartum depressive symptoms, showing no significant association in a prebirth cohort study in Japan [2]. To our knowledge, there have been no epidemiologic studies regarding the relationship between intake of calcium or vitamin D and postpartum depressive symptoms. In our previous studies [3,4], higher intake levels of yogurt, calcium, and vitamin D, but not total dairy products, milk, or cheese, were significantly associated with a lower prevalence of depressive symptoms during pregnancy, defined as a score of 16 or higher on the Center for Epidemiologic Studies Depression Scale (CES-D), in this population. The objective of the present prospective cohort study was to examine the relationships between dietary intake of dairy products, calcium, and vitamin D during pregnancy and the risk of postpartum depressive symptoms using data from the Kyushu Okinawa Maternal and Child Health Study (KOMCHS). We hypothesized that higher intake of dairy products, calcium, and vitamin D during pregnancy would be related to a reduced risk of postpartum depressive symptoms.

## 2. Methods and materials

### 2.1. Study population

The KOMCHS is an ongoing prospective prebirth cohort study performed to identify risk and preventive factors for maternal and child health problems. Details of the baseline survey of the KOMCHS have been described elsewhere [5]. Eligible pregnant women were those who lived in 1 of 7 prefectures on Kyushu Island in southern Japan, with a total population of approximately 13.26 million, or in Okinawa Prefecture, an island chain in the southwest of Japan, with a total population of nearly 1.37 million. Between April 2007 and March 2008, we requested that 423 obstetric hospitals in the abovementioned 8 prefectures provide as many pregnant women as possible with a set of leaflets explaining the KOMCHS, an application form to participate in the KOMCHS, and a self-addressed and stamped return envelope. Pregnant women who were willing to participate in the KOMCHS returned the application form containing a written description of their personal information to the data management center. Based on this personal information, research technicians gave each participant a detailed explanation of the KOMCHS by telephone and sent them a self-administered questionnaire after obtaining their agreement. In total, 1757 pregnant women between the 5th and 39th weeks of pregnancy gave their written informed consent to participate in the KOMCHS and completed the baseline survey. Of the 1757 women, 1590 (90.5%) and 1527 (86.9%) mother-child pairs participated in the second (after delivery) and third (around 4 months postpartum) surveys, respectively (Figure). After excluding 2 pairs with missing data on the child's sex and 206 pairs who participated in the third survey at <3 or

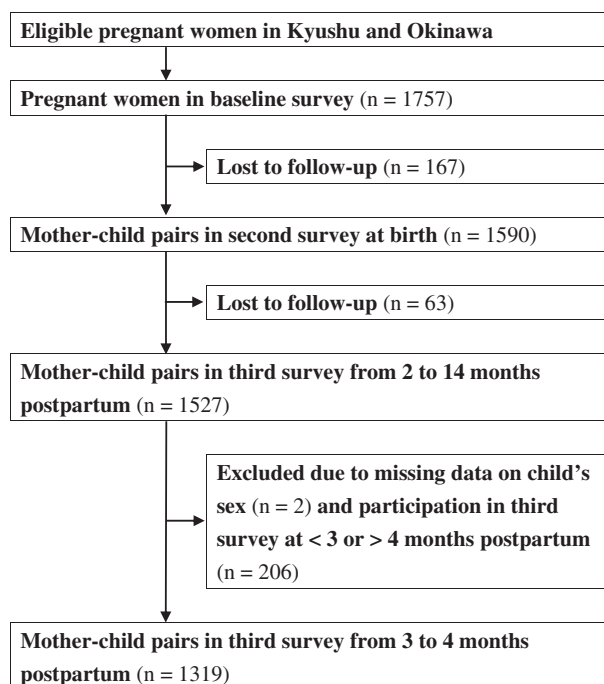


Figure – Eligibility for and participation in the KOMCHS.

>4 months postpartum, the final analysis sample consisted of 1319 women who took part in the third survey between 3 and 4 months postpartum. The KOMCHS was approved by the ethics committees of the Faculty of Medicine, Fukuoka University, and Ehime University Graduate School of Medicine.

### 2.2. Measurements

Each survey consisted of a self-administered questionnaire. Participants filled out the questionnaires and then mailed them to the data management center at the time of each survey. Research technicians completed missing or illogical data by telephone interview.

In the first part of the questionnaire at baseline during pregnancy, we obtained information on maternal age, gestation, region of residence, number of children, family structure, personal history of doctor-diagnosed depression, family history of depression, employment status, and educational level. A family history of depression was considered to be present if one or more parents or siblings of the study subjects had been diagnosed as having depression by a physician. Women were classified as being unemployed if they were unemployed both in the year the baseline survey was performed and in the preceding year.

The second part of the questionnaire at baseline was a semiquantitative, comprehensive diet history questionnaire (DHQ) that assessed dietary habits during the preceding month [6–12]. Estimates of daily intake for 150 food and beverage items as well as for energy, nutrients, and alcohol were calculated using an ad hoc computer algorithm for the DHQ, which was based on the Standard Tables of Food and Composition in Japan [13]. Total dairy product intake was defined as the sum of full-fat milk, low-fat milk, yogurt, cheese, and cottage cheese intake.

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