INTERNATIONAL JOURNAL OF EPIDEMIOLOGY (2001) 30(6):1269-1271.

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Word count: abstract 200 keywords 10 text 903 references 204 figure legend 157

Background: The proportion of low birthweight babies (LBW: 1500-2499 g) in Japan decreased steadily from 1950 to the 1970s. However, since then it has started to increase consistently, the reason for which has not been discussed in detail.

Methods: Trends of birthweight and the two known factors for low birthweight (maternal smoking, and pre-pregnacy weight) were analysed with vital statistics, national nutritional and smoking prevalence survey data.

Results: Increase in term LBW due to intrauterine growth retardation, is the major risk factor for the overall increase since the 1970s. The increase of smoking prevalence in women in their thirties started in the 1970s, while that for women in their twenties started in the 1960s. The decrease of body mass index for women in their thirties also began in the 1970s, while that for women in their twenties began in the 1960s. The ratio of delivery to mothers in their thirties to mothers in their twenties has increased more than threefold compared to the late 1970s.

Conclusions: Since the 1970s increase in smoking prevalence and decrease in body mass index in young women, especially those in their thirties, appeared to be the major factors involved in the increase in LBW babies.

Keywords: Low birthweight, intrauterine growth retardation, maternal smoking, pre-pregnancy weight

Low birthweight is a major public health problem. There are two categories: intrauterine growth retardation (IUGR), and preterm birth. In developed countries, IUGR is associated with three major risk factors: cigarette smoking during pregnancy, low maternal weight gain, and low pre-pregnancy weight. These three factors account for nearly two-third of all IUGR cases[1]. Cigarette smoking is the most important risk factor for preterm birth[1]. Other risk factors for low birthweight include maternal age, race, maternal illness and so on[1].

A recent trend of increase in proportion of low birthweight (LBW) infants in Japan has been reported[2-4]. We have analysed the trend of birthweight and related factors in Japan using vital statistics and national nutritional survey data (1950-1998) provided by Japan Ministry of Health and Welfare, and smoking prevalence survey data (1965-1998) provided by Japan Tobacco Inc. From the 1950s to the 1970s, the proportion of LBW babies (LBW: 1500-2499g) decreased steadily, on the other hand, that of very low birthweight babies (VLBW: <1500g) increased (Fig. 1A). General improvements in obstetric care, socioeconomic status, education and nutrition during pregnancy could explain the former, while decreased spontaneous abortion and stillbirth are considered to be the reasons for the increase in VLBW. However, since 1970s, a consistently increased proportion of both weight groups has been observed. The increase in VLBW could be explained by the same reasons as previously. On the other hand, term LBW or IUGR, has contributed most to he increase in LBW since the 1970s (Fig. 1B), but the reasons for this have not been analysed yet. Mean maternal height in Japan can be considered to increase—based on t national statistics data for senior high school students, the mean height of girls aged 17 or 18 years old has been reported to have increased from 155.6 cm (1970) to 158.1 cm (1998). Maternal height was reported to inversely correlate with the risk of IUGR[1]. Thus, the rise of term LBW is paradoxical. An analysis of the factors causing this rise is important.

What then, are the major factors for the recent trend of increased LBW since 1970s?

The two known factors causing LBW (i.e., maternal smoking, and pre-pregnancy weight) were analysed using the statistics data. First, unlike other developed countries, smoking prevalence in young women increased rapidly in Japan (Fig. 1C). The increase in women in their thirties started in the 1970s, but that in women in their twenties started in the 1960s. Second, although the prevalence of obesity is increasing and becoming a major risk factor for common diseases for most Japanese people, body mass index has been decreasing only in subgroups of young women, presumably due to excessive dieting (Fig. 1D). In this area, the decrease in women in their thirties also began in the 1970s, while that of women in their twenties began in the 1960s. In order to detect major factors for increasing IUGR since the 1970s, the points to which special attention should be paid are the health and behaviour of mothers in their thirties and for both smoking and dieting, the increase began in the 1970s. Moreover, since the late 1970s the ratio of deliveries from mothers in their thirties has increased by more than three times compared to mothers in their twenties (Fig. 1E). In addition, increased *Chlamydia trachomatis* infection among young women, which is considered to be a risk factor for low birthweight, was also described recently. The prevalence among pregnant women in their twenties and thirties was reported to be over 7.0 %[5].

Three other possibilities have to be examined. First, paediatiricians are beginning to register preterm infants as livebirths: these would not have been registered in earlier years because most of them died. This factor might be a possible cause given the increasing survival of LBW babies. However, the number of livebirths before 32 weeks of gestation has consistently decreased until now, indicating this possibility being unlikely. Second, the legal gestational age limit for abortion on request in Japan has been determined by foetal viability; 32 weeks gestation until 1975, 28 week until 1978, 24 week until 1990, and it is now 22 weeks gestation. If terminated babies were selected because of their apparent small

size, changes in the legal gestational age limits for abortion and the abandonment of this practice might be associated with an increase in LBW. However, the number of terminations after 20 weeks of gestation ranged between 2527 and 7362 per year over the period 1970-1998, corresponding to 0.2-0.5% of singleton livebirths. On the other hand, the proportion of LBW among singleton livebirths ranged between 4.6% and 7.5%, thus the influence of terminations, because of small size or other problems on the proportion of LBW considered to be negligible. Finally, increased multiple births due to the use of stimulated ovulation for infertility treatment could be one factor, but the actual increase resulting from this was assumed to be minor.

Low birthweight and, in particular VLBW, predispose to a variety of neurodevelopmental disorders and later suboptimal health[6]. Moderately reduced birthweight as well as VLBW are hypothesised to be relevant to cardiovascular disease and non-insulin dependent diabetes in adult life[7]. To reduce morbidity and mortality related to LBW, and to offer long-term benefits to their offspring, the education programme directed at girls and young women to prevent smoking, excessive dieting and sexually transmitted disease should be strengthened. Monitoring of factors relating to LBW should be continued in Japan.

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Figure legend

Figure 1. Trends in proportion of LBW, VLBW and related factors in Japan.

Panel A: Proportion of LBW and VLBW among singleton livebirths.

Panel B: Proportion of LBW for strata of gestational age among singleton livebirths. Values prior to 1979 were not recorded in vital statistics.

Panel C: Smoking prevalence among women in the age of 30s and 20s.

Panel D: Mean body mass index of women in the age of 30s and 20s.

Panel E: Numbers of livebirths from mothers in the age of 30s and those from mothers in the age of 20s, and a ratio of the former to the latter: (Number of livebirths from mothers in the age of 30s)/(Number of livebirths from mothers in the age of 20s). Because of Japanese superstition that women born in “Hinoeuma” years (1966) would lead unhappy lives, parents tended to register the birth of their female infants in the previous or the next year.

Figure 1 Trends in proportion of LBW, VLBW and related factors in Japan.