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Maternal Nutrition Including Fetal Imprinting for Future Health and Disease

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Limitations in fetal nutrition contribute to intrauterine growth restriction and the increased risk for development of some chronic noncommunicable diereses in adulthood in later life. These observations have led to the hypothesis that the risk of developing some chronic diseases in adulthood is influenced not only by genetic and adult life style but also by the environmental process during the periconceptual, fetal and infant stage of life, Fetal Origins of Adult Disease (FOAD). In the 20^{th} century, this hypothesis has been supposed as the most important medical hypothesis in the 21st century. Although this observation was derived from numerous epidemiological studies, experimental studies in animals and human further support this fetal programming of adult diseases in cell and molecular levels. World widely, this research has been now advancing rapidly and exploiting the molecular mechanisms of hypertension and insulin resistance by renal hyonephrosis with p53 DNA hypomethylation and hepatic acetylation of histone III protein, respectively, and so on. So this has been changing from the hypothesis into the established medical theory, Developmental Origins of Health and Disease (DOHaD) theory.

In Japan, after the world war II、the frequency of the low birth weight infant had been decreasing until the latter half of 1970's (5.3－5.7%.). Afterwards, there has appeared the oppositely increasing tendency to approach to 9.0%(2000). A lot of people think that birthing smaller babies and taking care of them for catching up is the best in the modernized Japan. However, the low birth weight of infant means the result of exposing to malnutrition for developing in the intrauterine environment and they are facing the higher risk for future chronic adult diseases. About 1/4 of women in their twenties are under 18.5 of BMI and some of them are in a undernourished state. There is actually an increasing tendency of congenital anomaly, spina bifida, partially caused by folic acid deficiency. A lot of hospitals and clinics pay much attention to control and restrict the maternal weight gain during pregnancy; these social phenomena may induce miserable victims. So now we should pay much attention to the health of no guilty next generations

Precisely, in Japan, the average birth weight (g) is decline from 3,194 in 1980 to 2,982 in

2003 and the rate (%) of low birth weight infant (LBW: under 2500 g) is conversely increasing from 5.1 in 1980, to 9.1 in 2002. To elucidate this trend, we compared the 866 and 628 singleton term birth records of 1992 and 2002, in Kanagawa Kyodo Hospital, Kanagawa, Japan. In this hospital, average birth weight (g) declined from 3166±379 into 3050±367 and the rate of LBW (%) increased from 3.2 to 5.6 in 1992 and 2002, respectively, showing similar general tendency during Japanese last two decades. Mothers were divided into three groups following prepregnant BMI (body weight (Kg) / square of height (M), thin: under 18.5, normal, and obesity : over 25.0 The average birth weight (g) in each group decreased from 3016±345 to 2977±345, from 3170±357 to 3060±363 ($p<0.001$), and 3399±469 to 3183±387 ($p<0.001$), respectively. The infant birth weight mainly depends upon the prepregnant and pregnant maternal nutrition, if she does not smoke without any placental dysfunction like preeclampsia. In Japan, the prevalence of thin women (BMI under 18.5) in their twenties are increasing from 21.0 % in 1980 to 25.1 in 2003. This hospital, however, does not any difference in prepregnant BMI, 20.9 ±4.0, 21.0±2.9, respectively. The average maternal weight gain (Kg) decreased from 10.8±3.5 to 9.5±3.7 ($p<0.01$), and maternal weight gain under 7 kg increased from 13 to 49 %, respectively. The incidence of preterm delivery is not so high. These results suggest that the Japanese declining birth weight of term is partly caused by restriction of maternal weight gain. Japanese young ladies have strong slim body desiring and dislike to weight gain much during pregnancy. So mothers should gain the optimal maternal weight during pregnancy following each prepregnant nutritional state and prohibit the fetal programming of adult diseases. Perinatal care specialists should intensely recommend of balanced and good nutrition.