

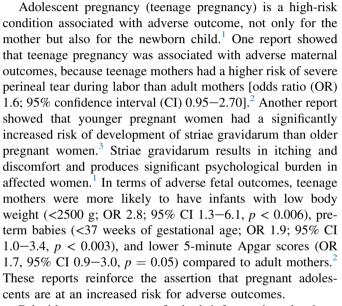




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Editorial

## Is nutrition deficiency a key factor of adverse outcomes for pregnant adolescents?



Palpably worse outcomes for both infant and mother have been noted in adolescent pregnancy by many studies, including: (1) an increase of fetal death, neonatal death, low birth weight, intrauterine growth retardation, prematurity; and (2) an increase of severe perineal laceration and a tendency to result in permanent body image changes, such as occurrence of striae gravidarum, and an increase of maternal mortality.<sup>2–5</sup> The results of these studies all suggest that health during and after adolescent pregnancy is an important issue that requires additional efforts to improve outcomes. Major underlying causes for worse outcome of both mothers and fetuses include: (1) unintended, unwanted, and unsupported pregnancy; (2) poor maternal nutrition; (3) not securing adequate care during the course of pregnancy; (4) labor without assistance by experienced obstetricians; and (5) not securing proper postpartum maternal and newborn care.<sup>4</sup> In addition, adolescent mothers were more likely to be unemployed, unmarried, and less educated than the adult mothers, and low socioeconomic status subsequently results in inadequate prenatal care, including poor nutrition support.<sup>2</sup>

In fact, malnutrition might be very common in adolescent pregnancy. A recent review article focusing on adolescent pregnancy and the first 1000 days after childbirth found that >35% of adolescent pregnancies were considered nutritionally at-risk.<sup>4</sup> The seventh National Nutrition Survey showed that >25% of female adolescents were underweight. In addition, based on the criteria which defined nutritionally at-risk pregnant women as those with body mass index-for-age  $<P_{95}$ , more than one-third of adolescent pregnancies were nutritionally at-risk. Adequate nutrition support for pregnant women, especially pregnancy during the period of adolescence, is very important because it positively affects fetal growth and minimizes the risk of intrauterine growth retardation.

The study by Guzel et al<sup>6</sup> in this issue of the *Journal of the* Chinese Medical Association focused on this issue to investigate the nutrition status in adolescent pregnancy. The authors evaluated the maternal serum amino acid levels in the first trimester of adolescent pregnancies, and found that nutrition may be one of the important factors contributing to worse fetal outcome in adolescent mothers.<sup>6</sup> The authors found that some amino acid levels, including isoleucine, leucine, lysine, methionine, phenylalanine, tyrosine, threonine, valine, arginine, and proline were statistically and significantly lower in adolescent pregnancies that were associated with low birth weight and prematurity.<sup>6</sup> Furthermore, pregnant adolescents who had lower serum levels of alanine and histidine were more at risk for preterm delivery and delivery of lower birthweight fetuses than those who had normal serum levels.<sup>6</sup> Other nutritional components have contributed to worse outcomes, including the association between low serum level of tryptophan and delivery of low birth-weight fetuses, and the association between low serum level of serine and delivery of low birth-weight fetuses.<sup>6</sup> All of these studies suggested that existing levels of nutrition support for adolescent pregnancy may not be adequate, which might partially explain why adolescent pregnancy might have a higher risk of delivery of low-weight births. However, it is uncertain whether malnutrition during the early pregnancy is predictive as to whether these adolescent mothers are still at-risk nutritionally. In addition, does any evidence support whether certain amino acids are particularly important in pregnant mothers, regardless whether they are adult or adolescent?

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It is well-known that some formula diets, such as a plantbased protein diet, might fail to provide adequate amounts of essential amino acids.<sup>7</sup> The proteins observed in these products are often considered to be low quality proteins. Therefore, it would be interesting to ascertain whether or not a maternal low quality protein diet might influence fetal growth and development. One study, using Wistar rats provided some interesting findings.<sup>7</sup> Plasma amino acid profiles of the offspring of adolescent mothers showed that plasma methionine, glutamine, and lysine were significantly lower and aspartic acid, ornithine, and glycine-proline were significantly higher in the low quality protein diet group (fed with 20% wheat gluten), but there was no difference of birth weights between the high quality protein diet groups (included 20% casein) and the low quality protein diet groups.<sup>7</sup> Although this study cannot be totally reflective of poor nutrition status, its results hinted that investigation of individual amino acids from either maternal serum or an offspring's serum might not always be an efficacious tool to examine aspects of the influence of maternal malnutrition on fetal growth and development.

Furthermore, it is also interesting to find that protein (amino acid) is seldom discussed as a public health problem among pregnant women. By contrast, vitamin A deficiency, iodine deficiency, and anemia were often considered as public health problems, reported by the seventh National Nutrition Survey consensus.<sup>4</sup> This is because good nutrition is essential to maintaining peak health and performance for humans. Besides amino acids, the following elements might be of considerably greater concern for pregnant women: (1) iron, which is essential for physical and cognitive performance; (2) calcium and vitamin D, which are essential for bone health; and (3) folate, which is essential for the prevention of neural tube defects during pregnancy and gestation. Therefore, do pregnant women need these nutrients to be supplemented? It should not be any surprise that the results are highly variable. A recent Cochrane Review indicated that there are no clear additional benefits to calcium supplementation in preventing preterm birth or low-birth-weight fetuses.<sup>8</sup> By contrast, in terms of childhood kidney outcome, a study from The Netherlands showed maternal blood 25(OH)D levels during pregnancy may influence childhood kidney outcome, because the authors found that higher maternal 25(OH)D levels were associated with lower childhood estimated glomerular filtration rate [a difference of -0.94 mL/min/1.73 m<sup>2</sup> (95% CI -1.73 to -0.15) per 1 standard deviation increase in 25(OH) D].<sup>9</sup> However, renal function might also be related to hormone profiles.<sup>10–12</sup> Since 25(OH)D is also a class of steroid-like hormones, it is hard to say that nutrition is the only factor contributing to renal function. However, it may partly explain why the observations are not always consistent. Although the data are not consistent, there is no doubt that adequate nutritional support is good for health, especially during the growth and development period.

In conclusion, two recent publications<sup>3,6</sup> of the *Journal of the Chinese Medical Association* recall the concerns of adolescent general health, especially issues addressing the physiological changes and neonatal outcomes of teenage pregnancy. Every effort should be made to care for and protect adolescents to avoid unwanted and unintended pregnancy.

## **Conflicts of interest**

The authors declare that they have no conflicts of interest related to the subject matter or materials discussed in this article.

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