ENCYCLOPEDIA
on Early Childhood
Development

[Archived] Response to “Prenatal/Perinatal Stress and Its Impact on Psychosocial Child Development” by Dr Janet DiPietro

Vivette Glover, M.A., Phd, D.Sc.

Imperial College, United Kingdom

June 2002

Introduction

Janet DiPietro’s pioneering research has clearly shown the direct relation between the emotional state of the mother and the behaviour of the foetus,[1] and in the continuity of behaviour from foetus to child.[2] These findings make it plausible that the emotional state of mothers during pregnancy may have long-term effects on the behaviour of their children.

Research and Conclusions

As Dr DiPietro states, stress and anxiety are complex concepts; presumably with different, but overlapping, physiological correlates. Such observations complicate research in this area since most studies use different psychological measures.

©2002-2026 ABILIO | STRESS AND PREGNANCY (PRENATAL AND PERINATAL)

I agree with DiPetro's overall evaluation of the current research. There is strong evidence from animal models that prenatal stress can have long-term effects on the behaviour of offspring;[3, 4] there is also reasonable evidence from human research that antenatal stress or anxiety is a risk factor for preterm delivery and reduced foetal growth; [5–8] and there is some (rather limited) evidence in humans, of direct, long-term effects on child behaviour.[9] We are only just beginning to understand some of the possible physiological mechanisms which may mediate these effects.[10, 11]

There are other possible important sources of perinatal stress to the foetus and baby that may well have long-term effects on the psychosocial development of the child. Firstly, labour and delivery cause considerable increases of stress hormones in the foetus, and different methods of delivery have different effects on babies.[12] There is evidence from animal studies that different methods of delivery cause long-term differences in brain chemistry (e.g., in glucocorticoid and dopamine receptors), which are likely to affect behaviour in offspring.[13, 14] Secondly, it is known that neonates in special care units can have very high levels of stress hormones, and this may also be harmful in the long term. However, as yet there is no evidence in humans of the effects of either of these factors on child psychosocial development.

Implications for Policy and Services

I differ in opinion from Dr DiPietro regarding the implications of these findings. Concerning effects of shortened gestation and lowered birthweight, Dr DiPietro writes "that the small magnitude of these effects do not portend serious developmental effects." However, such effects are not always insignificant in a given population. Lou et al have shown that serious psychologically stressful events contributed to 11% of severe cases of prematurity (under 34 weeks).[5] Babies born this early have high levels of neurodevelopmental disability. The 11% in this cohort would be equivalent to about 1,500 births a year in the UK. The effects of antenatal anxiety or stress on birthweight have been found to be comparable to those of smoking, yeilding a mean reduction of about 160g.[6] Barker and his colleagues have shown that, across the board, lower birthweight is a major risk factor for coronary heart disease later in life.[15] Even if the proportion of heart disease attributable to the effects of antenatal stress on foetal growth were low, it would remain very significant in absolute numbers.

With regard to direct effects on subsequent behavioural problems, the study of O'Connor et al[9] suggests that the risk of boys showing signs of hyperactivity-attention deficit was approximately double if the mother's anxiety in later pregnancy was in the top 15%.Thus, if the contribution of

antenatal maternal anxiety to these behavioural problems could be reduced, it would have a significant effect on the incidence of this disorder.

A substantial proportion of child psychosocial difficulties may be attributable to genes and thus may not be readily amenable to change. Once established, both child behavioural problems and the long-term effects of prematurity are very hard to modify. But intervention in pregnancy to reduce maternal stress and anxiety is achievable and may contribute to preventing some such problems from developing in the first place.

Clearly, there is not yet enough evidence to be *certain* if and when maternal stress or anxiety in pregnancy affects the long-term psychosocial development of offspring. However, scientific prudence is currently inadequate in clinical settings. If we do not know, we should make an informed judgement and err on the side of caution (within reason) to reduce harm as much as possible**.** Our approach to the issue in social policy decisions should differ from that taken in basic science. Waiting until the evidence is conclusive may lead to unnecessary future problems. In my view, the evidence from animal experiments, from the human data on preterm delivery and growth restriction, and from the evidence of direct prenatal effects on child behaviour is currently strong enough to recommend new policies.

I suggest that some type of health professional be responsible for women throughout their pregnancy to monitor their mental health (the nature of this care would vary accordingly in different countries). Interventions to reduce stress, anxiety or depression, as appropriate, should be introduced (with the awareness that much more research needs to be done to evaluate efficacy). We know that antenatal depression is the main risk factor for postnatal depression,[16] and that postnatal depression is linked to adverse psychosocial outcomes in children. Reducing risk factors for depression alone would be of great benefit. Although the timing of effects is not entirely clear, there is evidence that anxiety in the third trimester is of particular importance with regard to both preterm delivery and child behavioural problems. Thus, intervention, even towards the end of gestation, may be effective.

Working while pregnant is a question unto itself and it is unlikely that any one formula will suit all women. Some women enjoy working and may find it more stressful to stay at home. Homer et al[17] showed that while physical exertion was strongly associated with preterm delivery, psychological workload, as such, was not. However, for those women who work, contrary to their wishes, during their pregnancy, stress increases the risk of preterm delivery eight-fold. Policy

and law could therefore be formulated to allow women more choice regarding when and how to work while pregnant.

References

1. DiPietro JA, Hodgson DM, Costigan KA, Hilton SC, Johnson TRB. Development of fetal movement-fetal heart rate coupling from 20 weeks through term. *Early Human Development* 1996;44(2):139-151.
2. DiPietro JA, Hodgson DM, Costigan KA, Johnson TRB. Fetal antecedents of infant temperament. *Child Development* 1996;67(5):2568-2583.
3. Wienstock M. Effects of maternal stress on development and behaviour in rat offspring. *Stress* 2001;4:157-167.
4. Schneider ML, Moore CF, Roberts AD, Dejesus O. Prenatal stress alters early neurobehavior, stress reactivity and learning in non-human primates: a brief review. *Stress* 2001;4:183-193.
5. Lou HC, Nordentoft M, Jensen F, Pryds O, Nim J, Hemmingsen R. Psychosocial stress and severe prematurity. *Lancet* 1992;340(8810):54.
6. Lou HC, Hansen D, Nordentoft M, Pyrds O, Jensenn F, Nim J, Hemmingsen R. Prenatal stressors of human life affect fetal brain development. *Developmental Medicine and Child Neurology* 1994;36(9):826-832.
7. Hedegaard M, Henriksen TB, Sabroe S, Secher NJ. Psychological distress in pregnancy and preterm delivery. *BMJ–British Medical Journal* 1993;307(6898):234-239.
8. Copper RL, Goldenber RL, Das A, Elder N, Swain M, Norman G, Ramsey R, Cotroneo P, Collins BA, Johnson F, Jones P, Meier AM. The preterm prediction study: maternal stress is associated with spontaneous preterm birth at less than thirty-five weeks' gestation. *American Journal of Obstetrics and Gynecology* 1996;175(5):1286-1292.
9. O'Connor TG, Heron J, Golding J, Beveridge M, Glover V. Maternal antenatal anxiety and children's behavioural/emotional problems at 4 years. *British Journal of Psychiatry* 2002;180(6):502-508.
10. Gitau R, Cameron A, Fisk NM, Glover V. Fetal exposure to maternal cortisol. *Lancet* 1998;352(9129):707-708.
11. Teixeira JMA, Fisk NM, Glover V. Association between maternal anxiety in pregnancy and increased uterine artery resistance index: cohort based study. *BMJ–British Medical Journal* 1999;318(7177):153-157.
12. Gitau R, Menson E, Pickles V, Fisk NM, Glover V, MacLachlan N. Umbelical cortisol levels as an indicator of the fetal stress response to assisted vaginal delivery. *European Journal of Obstetrics Gynecology and Reproductive Biology* 2001;98(1):14-17.
13. Boksa P, Krishnamurthy A, Sharma S. Hippocampal and hypothalamic type 1 corticosteroid receptor affinities are reduced in adult rats born by a caesarean section procedure with or without an added period of anoxia. *Neuroendocrinology* 1996;64(1):25-34.
14. El-Khodor B, Boksa P. Caesarean section birth produces long term changes in dopamine D1 receptors and in stress-induced regulation of D3 and D4 receptors in the rat brain. *Neuropsychopharmacology* 2001;25(3):423-39.
15. Barker DJ.The Wellcome Foundation Lecture, 1994. The fetal origins of adult disease. *Proceedings of the Royal Society of London - Series B: Biological Sciences* 1995;262(1363):37-43.
16. Evans J, Heron J, Francomb H, Oke S, Golding O. Cohort study of depressed mood during pregnancy and after childbirth. *BMJ–British Medical Journal* 2001;323(7307):257-260.

17. Homer CJ, James SA, Siegal E. Work-related psychosocial stress and risk of preterm, low birthweight delivery. *American Journal of Public Health* 1990;80(2):173-177.