



## **Tobacco Consumption During Pregnancy and its Impact on Psychosocial Child Development**

***PATRICIA BRENNAN, PhD***

*Emory University, USA*

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### **Topic**

*Tobacco and pregnancy*

### **Introduction**

There is a growing body of literature suggesting that maternal tobacco consumption during pregnancy may have specific, negative effects on child behavioural outcomes.<sup>1-5</sup> Given the finding that half of the women who smoke cigarettes will continue to do so during pregnancy,<sup>6</sup> these tobacco-behavioural linkages may have far-reaching implications for development and mental health in children.

### **Subject**

Studies have linked maternal tobacco consumption during pregnancy to a number of adverse medical outcomes. For example, prenatal maternal smoking has been associated with low birthweight, chronic ischemia, hypoxia, hypertonicity, increased tremors, and increased startle response in infants.<sup>6-9</sup> It has recently been suggested that the deleterious effects of maternal prenatal smoking on child development may extend to the psychosocial realm as well. This report reviews the evidence for the connection between maternal tobacco consumption and psychosocial child development and discusses relevant implications for interventions and public health policy.

### **Problems**

The study of maternal tobacco consumption and its effect on child behavioural or psychosocial outcomes is fraught with methodological problems. The most serious methodological concern is the difficulty in establishing a causal connection due to the potential role of confounds in this process.<sup>10</sup> Research in this area is quasi-experimental. For obvious ethical reasons, women are not randomly assigned to smoke or not to smoke during pregnancy. However, the factors identified with women who *do* smoke typically differ from those of women who *do not* in a number of different areas, including childhood history of antisocial behaviour, socioeconomic status, mental health, personality traits, parenting styles, and exposure to stressful life events. These factors, in turn, are associated with greater risk for problematic child psychosocial development. However, no single study has been able to control for all of these potential confounds. Another methodological concern is the common use of retrospective rather than

prospective reports of maternal smoking. The recent finding that maternal self-reports of smoking during pregnancy are highly correlated with direct biochemical measures<sup>11</sup> alleviates concerns about the exclusive use of self-reports of maternal smoking in this research area.

### **Research Context**

Maternal prenatal smoking and its relationship to child psychosocial outcome has been examined in both cross-sectional and longitudinal studies, and in both clinical and community samples. Animal studies have examined the effect of nicotine exposure on behavioural outcomes and brain functioning.<sup>12</sup> More recent work with human populations has examined the early adult outcomes of maternal prenatal smoking, particularly in the area of persistent and violent criminal activity.<sup>13,14</sup> Neurobiological deficits have been hypothesized to mediate the effects of maternal prenatal smoking in youth behaviour problems and adult criminal outcomes, however, no research with humans has directly assessed for or tested this hypothesized mediator model.

### **Key Research Questions**

The key research questions in this area are as follows:

- a) Is maternal tobacco consumption during pregnancy associated with deleterious behavioural outcomes in youth? And, if so:
- b) Can potential methodological confound account for this association? And, if not:
- c) Are these risks specific to particular behavioural outcomes?
- d) Are these risks moderated by other factors including genetics, the gender of the child, or the environmental context of development?

### **Recent Research Results**

Maternal prenatal smoking has been associated with increased risk for Attention Deficit Hyperactivity Disorder, oppositional behaviour, conduct disorder, and substance abuse outcomes in youth.<sup>3,5,15,16</sup> Evidence from twin studies suggests that the relationship between maternal smoking during pregnancy and child behaviour problems cannot be entirely accounted for by genetic influences.<sup>17,18</sup> Moreover, statistical control for a range of potential confounds, including parental criminality, maternal mental health, parenting behaviour, socioeconomic status, prenatal exposure to drugs and alcohol, and other perinatal complications, does not change the general pattern of results. Two recent studies, however, suggest that maternal childhood history of conduct problems is not only strongly related to persistent smoking during pregnancy,<sup>19</sup> but also a neglected, but significant confound in the relationship between prenatal smoking and child aggressive behaviour outcomes.<sup>17</sup>

The effects of maternal prenatal smoking appear to be specific to externalizing or acting out behaviours; there does not appear to be an association between maternal prenatal smoking and increased risk for internalizing problems such as depression.<sup>20</sup> In addition, gender appears to moderate the effects of maternal prenatal smoking on child psychosocial outcomes. Specifically, results are stronger for males in terms of the outcome of conduct disorder, and stronger for females in terms of the outcome of

substance abuse.<sup>16,21</sup> Family context has also been shown to moderate the effect of maternal prenatal smoking on child outcomes.<sup>22</sup> Although no study to date has examined whether particular genetic factors moderate the association between maternal prenatal smoking and child behaviour outcomes, one recent study noted that genetic factors moderate the effect of maternal prenatal smoking on infant birthweight,<sup>23</sup> suggesting this might be a fruitful area for future research.

### Conclusions

There are several possible mechanisms or explanations for the noted relationship between maternal prenatal smoking and behavioural problems in offspring. One possible explanation is that potential environmental or genetic confounds exist, but they have not been adequately assessed or controlled in the studies to date. For example, one potential confound that is difficult to control is the teratogenic effect of maternal alcohol or illicit drug use during pregnancy. Although several studies that have statistically controlled for these factors have found that they do not account for the effects of maternal prenatal cigarette smoking on child outcomes,<sup>3,24</sup> all of these studies have relied solely on *self-reports* of maternal substance use. Because of social desirability concerns, these measures may not be valid, and are likely to reflect under-reporting.

Alternatively, maternal prenatal smoking may serve as a marker for other environmental effects that increase the risk of externalizing problems in children. For example, maternal prenatal smoking may be an indicator of a passive, neglectful parenting style. It may not reflect abuse or overt parental hostility but rather a subtle disruption in the parent-child relationship that is difficult to measure via questionnaires or short-term observations, but that nevertheless increases the risk for externalizing problems in children. Maternal cigarette smoking may set off a chain of transactional biological and environmental factors that act together to increase risk for deleterious child development. Our understanding of this transactional process is rudimentary at this time.

### Implications

Not all children whose mothers smoked during pregnancy will manifest deleterious behavioural or developmental outcomes. Future studies aimed at assessing the potential protective factors in this process would be useful in designing effective prevention and intervention programs. A public health approach calls for prevention and intervention strategies designed to reduce the known risk factors for these deleterious psychosocial outcomes in children. Maternal prenatal smoking is a relatively modifiable perinatal risk factor. Smoking cessation programs for pregnant women,<sup>25</sup> (even low-intensity counselling interventions by general practitioners<sup>26</sup>), have been found to reduce or eliminate maternal smoking during pregnancy. An examination of the behavioural profiles of the children whose mothers successfully completed such programs would help provide important experimental evidence concerning the potentially causal role of maternal prenatal smoking on child behaviour problems.

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