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The effect of drinking alcohol during pregnancy on balance ability in childhood

Introduction

Maternal alcohol consumption in pregnancy has been found to adversely affect a number of neurodevelopmental outcomes, such as cognitive ability, behaviour, mental health and neuromotor development. However, there have been few studies of the effect of prenatal alcohol exposure on childhood balance ability. Studying balance is important as balance is the neurodevelopmental outcome that underpins many motor skills such as the ability to stand, sit and walk; deficits in balance are thought to be associated with a variety of adverse psychosocial and educational outcomes in children. A recent systematic review at the University of Bristol (see Humphriss et al, 2010) found limited evidence with regard to the effect of prenatal alcohol exposure on childhood balance, particularly for low to moderate levels of drinking.

Rachel Humphriss, Amanda Hall, Margaret May and John Macleod from the University of Bristol sought to explore this issue further using data from a UK-based birth cohort study, the Avon Longitudinal Study of Parents and Children (ALSPAC). ALSPAC includes prospective, "real-life" measures of maternal alcohol consumption taken at various time-points before, during and after pregnancy as well as measures of likely confounding variables (e.g. measures of socio-economic status). The balance ability of the ALSPAC children was assessed at both age 7 and age 10 years using commonly used clinical methods such as walking heel-to-toe on a line, standing-on-one-leg, and both walking and standing heel-to-toe on a beam. A total of 5402 children completed a test of dynamic balance at age 7 years; at age 10 years, 6915 children completed tests of both static and dynamic balance. For further information about these tests the reader is referred to Humphriss et al, *in press*.

Statistical analyses using logistic regression were performed to assess whether the measures of alcohol exposure were associated with the balance outcomes. Instrumental variable analyses were then performed using a genotype for alcohol dehydrogenase (ADH1B). The rare dominant allele of the ADH1B gene has been found to be associated with women drinking less during pregnancy (Zuccolo et al, 2009) and this was used as an instrumental variable to explore the findings from the observational data further. This analysis relies on Mendelian Randomisation of the gene at meiosis and therefore gives the opportunity for a 'natural randomised

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control trial'. Such randomisation means that a genotype such as ADH1B cannot be subject to confounding and analysis using this gene can therefore be used as a "deconfounder".

Findings

Regression analyses using the self-report measures of alcohol consumption revealed paradoxical findings in that alcohol was found to have a beneficial effect on balance ability, for several measures of exposure and for several of the balance outcomes. Such apparently beneficial effects of prenatal alcohol have been previously reported in different neurodevelopmental contexts, eg. Kelly et al, 2009.

Given the biological implausibility of this outcome, a final set of analyses were completed using the ADH1B gene as an instrumental variable to "deconfound" the analyses. No associations were found between ADH1B genotype and the balance outcome measures. Drinking alcohol during pregnancy was therefore not found to affect balance in children. The apparent beneficial effects of prenatal alcohol exposure found when using the self-report measures of alcohol consumption were in fact the result of residual confounding.

Implications

The results of this study indicate that maternal alcohol consumption in pregnancy at "real-life" levels does not affect balance in children of ages 7 and 10 years. Although initial analyses based on self-report measures of alcohol consumption suggested a beneficial effect of alcohol, instrumental variable analyses showed that these beneficial effects were in fact a result of residual confounding. Other researchers in this field need to be aware of the possibility of residual confounding and that the ADH1B gene can be used to "deconfound" analyses.

Further research in this area is needed, particularly using measures of alcohol consumption during the pre-pregnancy recognition period and using alternative measures of childhood balance.

References

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