Postnatal depression and infant growth and development in low income countries: a cohort study from Goa, India

V Patel, N DeSouza, M Rodrigues

Background: Postnatal depression is a recognised cause of delayed cognitive development in infants in developed countries. Being underweight is common in South Asia.

Aims: To determine whether postnatal depression contributes to poor growth and development outcomes in Goa, India.

Methods: Cohort study for growth outcomes with nested case-control study for developmental outcomes. A total of 171 babies were weighed and measured at 6–8 weeks following birth. The following measures were used: Edinburgh Postnatal Depression Scale for maternal mood, and sociodemographic and infant health variables. Outcome measures were: weight (<5th centile), length (<5th centile), and Developmental Assessment Scale for Indian Infants scores at six months.

Results: Postnatal depression was a strong, and independent, predictor of low weight and length and was significantly associated with adverse mental development quotient scores.

Conclusions: This study provides evidence for the first time that postnatal depression, a potentially treatable disorder, is a cause of poor growth and development in South Asia.

Postnatal depression (PND) is a psychological disorder which occurs within six weeks after childbirth. It is a serious mental health problem for women and its consequences have important implications for the welfare of the family and the development of the child. A meta-analysis has shown an average prevalence of 13% (95% CI 12.3 to 13.4). There is a large, and compelling body of evidence implicating PND with adverse child development outcomes, particularly cognitive development. All the published literature on the impact of PND on infant development is from developed countries.

Two hypotheses were tested in this study. First, we wished to replicate the well known association between PND and development in the setting of a low income country. Second, we wished to test the hypothesis that PND in the mother at 6–8 weeks after childbirth is a risk factor for poor growth outcomes at 6 months. The rationale behind the hypothesis is that if PND is linked to adverse developmental outcomes, it could be a risk factor for poor growth in developing countries where awareness of mental health problems is low and rates of undernutrition high. This would be especially relevant in regions like Goa which have relatively better economic standards relative to other states in India, but continue to experience persistently high levels of undernutrition.

METHODS

The study hospital was a district hospital in the state of Goa in India, with a catchment population of urban women living in the town of Mapusa and rural women from neighbouring villages. As with other public hospitals in India, patients are drawn from the lower socioeconomic strata. A cohort study design was used to test the growth outcome hypothesis; nested in the cohort was a case-control study of developmental outcomes. The sample consisted of consecutive babies whose mothers were participating in a study of PND and who were brought to the hospital immunisation clinic at 6–8 weeks. Of the 171 babies recruited in this manner, 37 had mothers who were suffering from PND (22%) and 134 had mothers who were not depressed (78%). Babies were weighed and measured on recruitment.

The following data were collected from mothers at recruitment: sociodemographic data, including maternal and paternal education; infant data (prematurity, gender, birth weight, hospital admissions, sickness episodes); and feeding history. Mothers were also interviewed using the Edinburgh Postnatal Depression Scale (EPDS), a 10 item questionnaire specifically developed to measure maternal mood in the postnatal period. Versions of the EPDS in Konkani, the most widely spoken language of Goa, were developed by translation, back-translation, consensus and field testing. A cut off score of 11/12 was found to detect caseness of PND with acceptable sensitivity and specificity. Using the EPDS, 23% of mothers were found to be suffering from depression.

Outcomes were measured at 6 months. Growth outcomes (weight and length) were carried out by clinical psychologists who had been trained by the second author using interobserver measurements in an immunisation clinic. Weight was recorded on a spring balance to the nearest 50 g. Length was measured using an infantometer, to the nearest 0.1 cm. Weight for age and length for age percentiles were computed using Epinut anthropometry software (World Health Organisation, 1994). Babies whose weight and length fell below the 5th centile for age were considered to be underweight and short for age respectively. Corrected age was used for the assessment of growth when the baby was premature.

Babies whose mothers were depressed (cases) and a subsample of controls (selected as the next infant recruited after a case) were invited to participate in an examination with the Developmental Assessment Scale for Indian Infants (DASII) at 6 months. This is a standardised developmental test that has been derived from Indian norms, based on the Bayley Scales of Infant Development. The DASII can be used for the assessment of motor and mental development of babies from 0 to 30 months of age. Independent motor and

Abbreviations: CI, confidence interval; DASII, Developmental Assessment Scale for Indian Infants; EPDS, Edinburgh Postnatal Depression Scale; MeDQ, mental development quotient; MoDQ, motor development quotient; PND, postnatal depression; RR, risk ratio
mental developmental quotients are generated based on the performance of the baby during testing. The DASII was administered blindly to the mental health status of the mother.

Univariate analyses were conducted to examine the association between growth outcomes and PND. Odds ratios and 95% confidence intervals were then computed for this association after adjustment for seven variables recognised to be associated with poor growth outcomes: prematurity; gender of the baby; paternal and maternal education (school completed or not); birth weight (below or above 5th centile); breast feeding practice (exclusive or not); and infant ill health (history of hospital admission or an episode of fever, diarrhoea, or vomiting in the first 6–8 weeks) (table 1). Multiple logistic regression was carried out using Stata version 6 (Stata Corporation, USA). In the nested case-control study of developmental outcomes, the motor (MoDQ) and mental (MeDQ) developmental quotients were calculated for each baby and analysed as categorical and continuous variables (table 2). For categorical outcomes, a developmental quotient below 85 was indicative of developmental delay in an individual baby following norms used in other Indian studies. All significance tests are two tailed.

**RESULTS**

**Sample**

The sample consisted of 171 babies. The average age of recruitment was 7.4 weeks. Just over half were boys (51%). Most babies were born at term (97%) and by normal vaginal delivery (83%); 71 (41%) were first children. The average maternal age was 26 years (range 18–37). Average birth weight was 2.9 kg (SD 0.44). All babies were weighed at recruitment; 30 (18%) were underweight. A total of 163 babies were measured; 14 (9%) were short for age. A total of 142 babies were weighed and measured at 6 months; 25 (17%) were underweight and 19 (13%) were short for age.

**Growth outcomes**

A higher proportion of babies in the PND group of mothers were underweight at birth, though this difference was not statistically significant (13% v 9%, p = 0.4). At 6 weeks, a higher proportion of babies in the PND mother group were underweight (24% v 9%, p = 0.01) and short for age (15% v 7%, p = 0.1). On univariate analysis, PND was strongly associated with being underweight at 6 months (30% v 12%, risk ratio (RR) 2.3, 95% confidence intervals (CI) 1.1 to 4.7, p = 0.01) and with being short for age (25% v 8%; RR 2.9, 95% CI 1.3 to 6.8, p = 0.008). Table 2 shows that these associations remained statistically significant after adjustment for other variables which influence infant growth.

**Developmental outcomes**

Eighty nine babies were examined using the DASII; 43 babies were from the group whose mothers were depressed (case group) and 46 babies were from the non-depressed group (control group). There were no statistically significant differences between the two groups on these key variables: gender of the baby; maternal employment status; maternal age and gravidity. However, babies in the case group were more likely to be underweight at birth (p = 0.03). Babies in the case group had significantly worse mental development scores, even after adjustment for birth weight and maternal education (tables 2 and 3).

**DISCUSSION**

This study shows that PND was associated with significantly poorer growth outcomes at 6 months, even after adjustment for other determinants of poor growth such as low birth weight.
A variety of factors have been suggested as mediating mechanisms between PND and adverse infant development. These can be grouped in three causal pathways: first, poorer development may be the result of direct exposure to mother’s depressive symptoms; second, development may be adversely affected by parenting difficulties, such as mother’s interactive style, associated with maternal depression; and third, risk factors for PND, such as poverty may also be independent risk factors for adverse infant development. It is not possible to study the relative role of the first two causal pathways: first, poorer development may be the result of direct exposure to mother’s depressive symptoms; second, development may be adversely affected by parenting difficulties, such as mother’s interactive style, associated with maternal depression; and third, risk factors for PND, such as poverty may also be independent risk factors for adverse infant development.

Table 3 Developmental quotients (DQ) of babies whose mothers were depressed at 6 weeks postnatally compared to a group whose mothers were not depressed: DQ as continuous measure

<table>
<thead>
<tr>
<th>Outcome</th>
<th>Mean (95%CI) for index group</th>
<th>Mean (95%CI) for control group</th>
<th>Two tailed p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mental DQ</td>
<td>86.4 (84.1 to 88.8)</td>
<td>90.3 (87.7 to 92.9)</td>
<td>0.02</td>
</tr>
<tr>
<td>Motor DQ</td>
<td>84.6 (81.7 to 87.6)</td>
<td>88.4 (85.3 to 91.5)</td>
<td>0.07</td>
</tr>
</tbody>
</table>

Key messages

- Postnatal depression may be a cause of poor growth outcomes in infants at 6 months in South Asia; this study has reported a strong association after adjustment for a number of possible confounders, but cannot rule out the role of an unmeasured variable
- Postnatal depression is associated with significantly poorer achievements of mental development in infants at 6 months
- This study provides evidence for a new, potentially treatable, cause for poor infant growth outcomes from a region which has the highest poor growth outcomes rates in the world
- Assessment and management of postnatal depression must be an integral part of antenatal and infant clinics in South Asia

ACKNOWLEDGEMENTS

We are grateful to the Directorate of Health Services (Government of Goa) for permission to conduct the study in the Asilo Hospital, the gynaecologists and nurses of Asilo Hospital, and the mothers who participated in the study. We acknowledge the contribution of Wilma D’Silva, who carried out infant development assessments. The study was funded by a MacArthur Foundation Fellowship for Population Innovations.

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POSTCARD FROM DOWN UNDER

Divided by a common language

George Bernard Shaw once remarked that the UK and the USA were two countries divided by a common language. This helped emphasise what was already well underway in the eighteenth century when Johnson and Webster wrote their separate dictionaries with different spellings and some different meanings.

What is less obvious to us Poms is that Australians speak a different language—sometimes known as Strine, from the local pronunciation of “Australian”. As an outsider you assume that Strine is the same as English English (hereafter referred to as English with no parochialism intended) at your peril.

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A good idiom will always confuse the outsider at first, and have a mix of poetry, precision and aptness. It is fairly easy to see how someone could be “madder than a cut snake,” although the madder is bent from angry to despondency and aptness. It is fairly easy to see how such a person could also refer to a wild party. A furfy or furphy is also a con, but is more sleight of hand by magic. Thus the headline “Pollie [Politician] in Tax Rort” manages to convey a degree of indignation and nefariousness that the English equivalent cannot. Apparently it can also refer to a police officer. A furphy (imagine a naughty boy swishing a poppy) is also a con, but is more sleight of hand by magic. Thus the headline “Pollie [Politician] in Tax Rort” manages to convey a degree of indignation and nefariousness that the English equivalent cannot. Apparently it can also refer to a police officer.

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Arch Dis Child 2003 88: 34-37
doi: 10.1136/adc.88.1.34

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