Published Online November 29, 2011

Postnatal depression and its effects on child development: a review of evidence from low- and middle-income countries

Christine E. Parsons[†‡¶], Katherine S. Young[†‡¶], Tamsen J. Rochat[§], Morten. L. Kringelbach[†‡], and **Alan Stein[†¶*]**

[†]University Department of Psychiatry, University of Oxford, Oxford, UK; [‡]Center of Functionally Integrative Neuroscience, Aarhus University, Denmark; [§]Africa Centre for Health and Population Studies, University of KwaZulu-Natal, South Africa, and [¶]School of Public Health, University of Witwatersrand, Johannesburg, South Africa

Introduction or background: It is well established that postnatal depression (PND) is prevalent in high-income countries and is associated with negative personal, family and child developmental outcomes.

Sources of data: Here, studies on the prevalence of maternal PND in low- and middle-income countries are reviewed and a geographical prevalence map is presented. The impact of PND upon child outcomes is also reviewed.

Areas of agreement: The available evidence suggests that rates of PND are substantial, and in many regions, are higher than those reported for high-income countries. An association between PND and adverse child developmental outcomes was identified in many of the countries examined.

Areas of controversy: Significant heterogeneity in prevalence rates and impact on child outcomes across studies means that the true extent of the disease burden is still unclear.

Areas timely for developing research: Nonetheless, there is a compelling case for the implementation of interventions to reduce the impact of PND on the quality of the mother–infant relationship and improve child outcomes.

Keywords: postnatal depression/child development/low- and middle-income countries

Accepted: October 21, 2011

**Correspondence address. University Department of Psychiatry, University of Oxford, Oxford, UK; E-mail: alan.stein@psych.ox.ac.uk*

[¶]These authors contributed equally to this work.

Depression is the most frequently occurring psychiatric condition among women of childbearing age, with >8% being affected at any given time.[1] Depression occurring amongst women specifically in the postnatal period has been the focus of a great deal of research in the

high-income world for a number of reasons. Postnatal depression (PND) is common, with prevalence rates estimated at around 7–13% in high-income countries.[2] PND is associated with impairments in mother–infant interactions, as well as longer term disruption of emotional and cognitive development of the infant.[3] An important finding from research in high-income countries is that socio-economic status is a key moderator of the effects of PND on parenting difficulties and subsequent child development.[4] Thus, in poor economic environments, especially in the context of low levels of social support, parenting difficulties are more likely and the risk of negative child outcomes is raised. Until relatively recently, little research has been conducted on PND in low- and middle-income contexts.[5–7] This is important because socio-economic adversity in these contexts is high, not only raising the risk of negative effects on children, but also raising the risk of maternal depression itself.

A scientific consensus is emerging that the origins of adult disease are frequently found among developmental and biological disturbances that occur in the early years of life.[8] The extent to which early experiences are considered formative has also been underlined by the World Health Commission on Social Determinants of Health treatise (2008), which concludes that giving each child the best start in life is the highest priority for reducing health inequality. Thus, understanding the early rearing environment of young children is important because it has the potential to have effects on later health and development.

In this review, we first examine the prevalence rates of PND in low- and middle-income countries. We then consider what is known about the impact of PND on children in low- and middle-income contexts across the domains of physical and psychological development. We consider how the presence of HIV may impact on child development, indirectly by compromising maternal mental health, as well as through direct pathways. Finally, we review the small number of intervention studies conducted in this field. We conclude by considering priorities and strategies for intervention.

Search strategy and selection criteria

In order to examine prevalence rates of PND in developing countries, we searched Medline, Psychinfo, the Cochrane Library, PubMed, Web of Science, Scopus and Science Direct for reports published between 1970 and August 2010. We used the search terms ‘postpartum’ or ‘postnatal’ or ‘puerperium’ in combination with the terms ‘depression’, ‘low income country’, ‘middle-income country’, ‘LMIC’, ‘low and

middle income country', 'Africa', 'Asia' and 'South America'. We also searched the reference lists of articles identified by this search strategy and selected those we judged to be relevant. Because of the emerging nature of this body of research literature, we adopted an inclusive approach to study selection. Therefore, we included all relevant and accessible journal articles, dissertations and book chapters that assessed maternal depression occurring in the period 1 week to 1 year postpartum (see Fig. 1).

We included studies that reported an estimated number of cases of depression among identified mothers. Several studies measured depression at multiple time points. In these cases, one depression measure was selected based on the following order of preference: (i) data from standardized clinical interviews; (ii) data from the Edinburgh PND Scale; (iii) data from the earliest time point within 1 week to 1 year. For each country, a mean prevalence rate of PND was obtained by dividing the number of all cases by the total number of subjects across studies.[2]

Prevalence

Although almost 90% of the world's children live in low- and middle-income countries, far less is known about prevalence rates of PND in these countries in comparison to high-income countries. Reliable estimates of the prevalence of PND in these contexts are essential to the development of national and international health policies for intervention. Existing evidence suggests that PND is not only common, but also results in substantial risk to child development.[9] Epidemiological studies have found high rates of depression in low- and middle-income countries, particularly amongst women facing socio-economic difficulties[5,6,10] Furthermore, these studies report significant heterogeneity in prevalence across different regions. Given such heterogeneity, Figure 2 presents the mean prevalence in each individual country.

The majority of work to date has focused on prevalence rates in Asian countries, with a total of 33 studies conducted in 12 countries in the continent. Wide ranges in prevalence have been reported both within and between countries. Estimates have ranged from more than a third of women in a given region (e.g. India, Pakistan) to one woman in 20 in other regions (e.g. Nepal). The lowest average rates of PND have been reported in Nepal (4.9%) and the highest in Vietnam (33%). Nine countries had prevalence rates higher than the estimated prevalence of 13% in high-income countries.[2]

In Africa, a wide range of prevalence ranges have been reported in 23 studies conducted in 10 countries. No clear differences emerged in

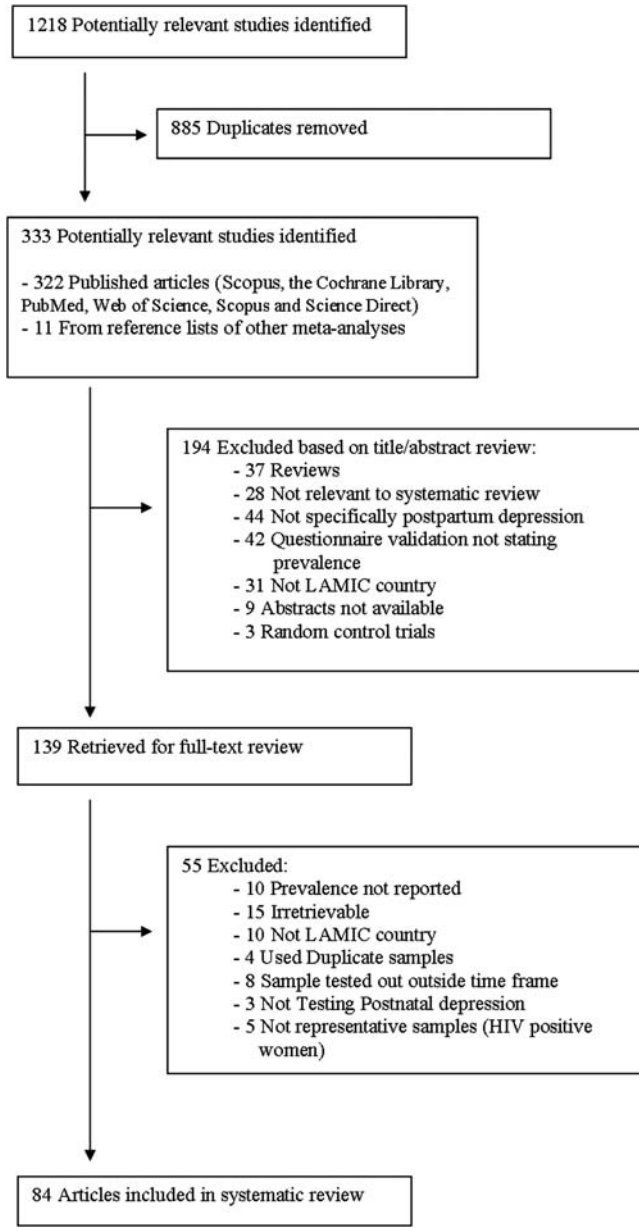

Fig. 1 Flow chart of studies included in systematic review.

prevalence rates between northern and sub-Saharan African countries. The lowest average rates have been reported in Uganda (7.1%) and highest in Zimbabwe (33%). The majority of African countries have estimated prevalence rates higher than that those found in high-income countries.

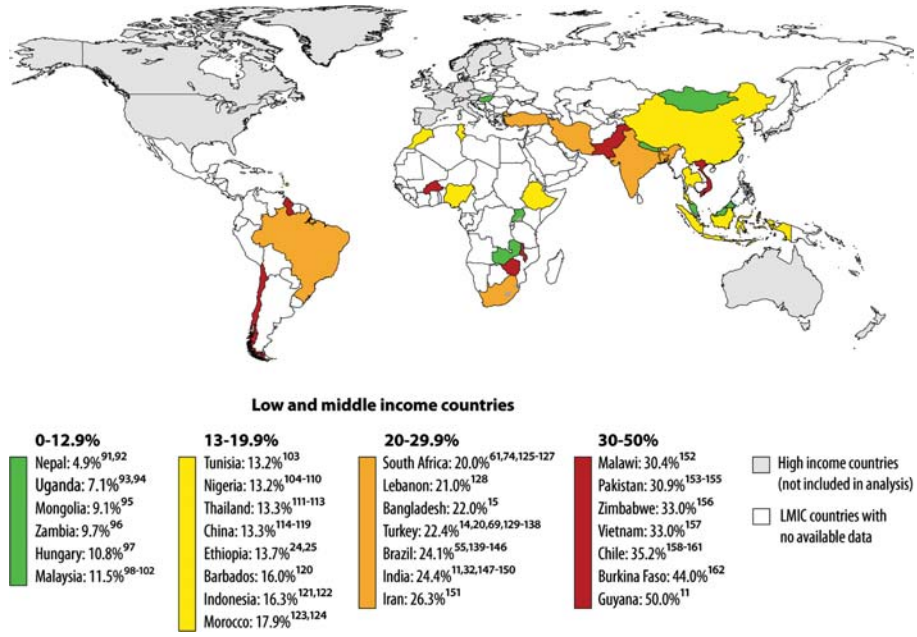

Fig. 2 Map displaying estimated prevalence of PND by country. Colours indicate the estimated prevalence of PND across studies in each country. Colours represent increasing prevalence: green indicates <13% (the established estimate across high-income countries); yellow, 13–19.9%; orange 20–29.9% and red 30–50%.

Prevalence studies in South America have reported wide estimate ranges within countries and across the continent. The 15 studies conducted to date from 4 South American countries suggest that prevalence, while highly variable, is at the higher end of the worldwide spectrum. The lowest average prevalence rate was found in Barbados (16.0%) and the highest in Guyana (50.0%). In Eastern Europe, data were available for two low- and middle-income countries, Hungary (10.8%) and Turkey (22.4%).

Of the 28 low- and middle-income countries where studies have been conducted, 22 have average prevalence estimates higher than those seen in high-income settings. However, the substantial variance in estimates seen across studies for almost all counties means that it is difficult to assess the extent of the disease burden.

At least part of the variation in prevalence estimates within and across countries may be related to the different screening tools, postnatal stage, assessment measures and cut-off scores used in these studies. The Edinburgh PND Scale (EPDS) is the most extensively used measure for PND across a wide variety of countries and languages, but other studies have employed structured psychiatric interviews (e.g. Structured Clinical Interview for Diagnostic and Statistical Manual of Mental Disorders,

4th Edition (DSM-IV)), or a range of self-report scales including the Beck Depression Inventory (BDI), revised Clinical Interview Schedule (CIS-R), the World Health Organization (WHO) Self-Reporting Questionnaire (SRQ), the Centre for Epidemiological Studies Depression Scale (CES-D), the Mini International Neuropsychiatric Interview, the Hamilton Depression Rating Scale, Zung's Self-Rating Depression Scale, and the Kessler scales. These different scales appear to result in quite different estimates, even for the same women at the same time point. For instance, one study in India reported a prevalence of 24.5% using the BDI and 32.4% using the EPDS.[11] There is also evidence to suggest that the CES-D classifies more women as having postnatal depressive symptoms than the EPDS.[12] It has also been suggested that the SRQ might be more widely applicable to different cultures than the EPDS, because it is simple, easy to translate, universally understood and includes 'somatic' items, while the EPDS does not.[13]

Only 24 of the 84 studies included here used diagnostic interviews to establish the presence of PND; the remainder report on the number of women scoring over specified thresholds on an inventory for depressive symptoms. Figure 3 presents a box plot comparing prevalence estimates

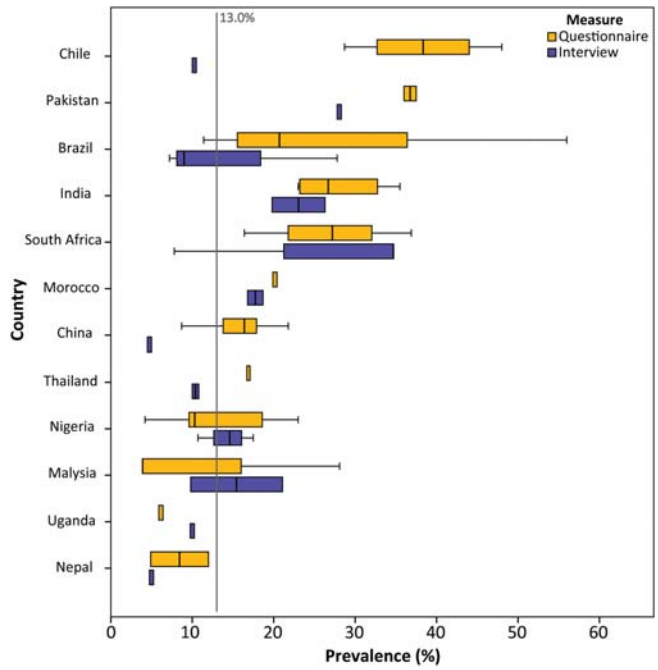

Fig. 3 Boxplot showing estimates of PND prevalence using questionnaires vs. clinical interviews. Estimates are based on all available data from questionnaires and interviews in each country. In studies with more than one time point, data from the earliest point (after 1 week) was used. The prevalence of PND in high-income countries is estimated at 13% (indicated by the grey line).

obtained from diagnostic interviews and questionnaires in the 12 countries where both sources of data are available. Although not consistent across all countries, questionnaires generally provide higher prevalence estimates than diagnostic interviews.

While the EPDS is the most widely used questionnaire measure, a range of cut-off points have been used in the studies included here. A general consensus for EPDS cut-offs is 13 or more. However, in the 36 studies with specified cut-offs, only 17 used this cut-off and the remaining studies used lower cut offs. At a cut-off of 13 or more, studies have still reported high prevalence rates, e.g. 50% in Turkey.[14] Other studies have used lower cut-off points, such as scores of >10 and have reported lower prevalence rates, e.g. 22% in Bangladesh.[15]

The timing of assessments has also differed considerably across studies, precluding direct comparisons. Some studies tested women as early as 2 weeks postpartum, others up to 52 weeks and others again included women both early and late in the postpartum period. A number of studies have examined samples of women ranging 8 to 52 weeks postpartum. In some studies in high-income countries, the prevalence of postnatal depressive symptoms has been shown to decrease as time passes,[16–18] while in others, prevalence remains relatively stable[19] and in others still, prevalence has been shown to increase over time.[20]

There is a clear need for a consensus on best practice cut-off scores, timing of assessment and scales if reliable estimates of prevalence are to be obtained.[21] Ensuring clinical and cost-effectiveness in screening requires this consensus, in particular given the high cost of treating false positives.[22,23] Further, research needs to consider the role of somatization both during pregnancy, and in particular cultural contexts, and how it may affect prevalence reporting particularly on measures such as the BDI.[24,25]

Risk factors for PND

Four systematic reviews have identified the following risk factors for PND in high-income countries: history of any psychopathology (including history of previous PND), a lack of social support, poor marital or partner relationship and recent negative life events.[2,26–28] There is also a raised risk of PND amongst immigrant populations.[29]

While poverty and economic adversity are associated with maternal depression in both high-income and low- and middle-income countries, low- and middle-income countries are characterized by higher rates of poverty and economic stress than elsewhere. The relatively high prevalence of maternal depression in low- and middle-income countries may be a result of women's exposure to risk factors for depression[30] such as socio-economic hardship, and especially in sub-Saharan Africa, the

high prevalence of HIV/AIDS.[5,6,31] Furthermore, gender inequalities may be relevant in some areas. For example, research from India has found that disappointment with the birth of a female child is associated with the development of PND.[32] In contrast, in Africa lack of support and marital or family conflict are more commonly associated with PND than gender of the infant.[33] High rates of PND in low- and middle-income countries may also reflect the lack of protective factors that can buffer against the onset of depression. For example, while better educated women are less likely to become depressed than poorly educated women,[10] gender inequalities in secondary education are typical in many low- and middle-income countries.

Impact of PND on child development

In this section, we examine whether PND is associated with disturbances in child health and development in low- and middle-income contexts by reviewing key studies. In low- and middle-income countries, carers, particularly the mother, play a critical role in child survival and development. The environment in which mothers provide caregiving is typically more adverse than in high-income countries, with mothers facing great physical burdens daily.[34] Overcrowding, a lack of running water or electricity and poor sanitation are common. In these circumstances, in addition to initiating and maintaining exclusive breastfeeding until 6 months, mothers have to manage weaning, hygiene, water sanitation and ensuring that the child is immunized. If the child becomes unwell, the mother needs to recognize the illness, provide care, obtain external help and carry out treatment. Clearly, the mother's mental health may play an important role in how well she is able to perform these caregiving behaviours. For example, depression is typically characterized by poor concentration, lethargy, sleep disturbance and low mood, all of which could interfere with a mother's capacity to carry out these tasks.

Until recently, most research on the impact of PND on child development has derived from populations in high-income countries. In high-income countries, there has been considerable research on the impact of maternal depression on infant psychological rather than physical development, whereas the reverse is true for low- and middle-income countries.

Infant physical health

The best global indicator of a child's well-being is growth, because infections, a lack of food or unsatisfactory feeding practices, or more frequently a combination of these, are principal factors affecting

physical growth and cognitive development. A child's body responds to poor nutrition in a number of ways that can be measured using growth indices. Wasting is a short-term response to inadequate nutritional intake and is measured by weight relative to length/height. Stunting is a longer term response that reflects a deceleration or cessation of growth measured by length/height relative to age. Wasting and stunting therefore discriminate between different processes. Wasting is considered to be the index of choice for severely malnourished children who may be at raised risk of death.[35,36] Stunting is thought to best reflect the long-term cumulative effects resulting from inadequate diet and/or recurrent illness. A third widely used growth index, weight for age, can reflect either stunting and or wasting, therefore does not discriminate between short- and longer term forms of poor nutrition. There is strong evidence that poor growth is associated with impaired cognitive development and deficits in school performance and intellectual achievement[37] Growth impairment in early childhood is also associated with significant functional impairment in adult life.[36,38]

Poor child growth is a major public health problem in low- and middle-income countries. It has been estimated that >220 million children aged <5 years in low- and middle-income countries have substantially impaired growth.[36] Recent estimates suggest that stunting, wasting and intrauterine growth restriction are the cause of 2.2 million deaths and 21% of disability-adjusted life years lost among children <5 years old.[39] Physical development of infants is a particular problem in Asia. In what is referred to as 'the Asian enigma', the nutritional status of children in South Asia has been found to be poorer than those of children in Africa, despite comparable economic conditions.[40] Determinants of the disproportionately higher rates of child undernutrition in this largely food-sufficient area are not well understood.[34] Evidence appears to indicate that as the amount of food available per person increases, its relative power to reduce child malnutrition weakens.[41] Consequently, attention has gradually been turning to factors other than nutritional intake, such as maternal behaviour and health and socio-cultural practices, which may influence child health and development.

A number of recent studies have examined whether maternal depressive symptoms are associated with child nutritional outcomes as indexed by inadequate growth. Overall, findings from these studies have been mixed, with strong associations reported in some regions but not others. Three published studies to date, all based in South Asia, have examined the predictive relationship between maternal mental health problems during pregnancy and child physical outcomes. One study of mothers in rural Pakistan found that depressive symptoms during pregnancy were associated with low birth weight status.[42] A second study in Pakistan found that prenatal depression in mothers

predicted poorer growth outcomes in infants at 2, 6 and 12 months, with poorest outcomes for those infants of mothers with persistent depression.[43] In this study, PND was also found to have an independent effect on growth outcomes. A third study in India found an association between more broadly defined maternal psychological morbidity during pregnancy and low birth weight.[44] It is interesting that evidence from high-income countries of an effect of depressive symptoms during pregnancy on birth weight has been conflicting.[45,46] However, if such an association does exist in low- and middle-income countries, these infants may be especially vulnerable because low birth weight is itself a risk factor for adverse outcomes; furthermore prenatal maternal depression is the strongest predictor of PND,[47] which itself is associated with compromised child development.

Several recent studies from South Asia have reported an association between maternal PND and concurrent measures of child growth. In a cohort study in Goa, India, PND between 6 and 8 weeks was an independent predictor of concurrent low weight and length for age.[48] A study in rural India produced similar findings: infants between 6 and 12 months who were underweight or stunted were more likely to have a mother with depression than infants with normal weight.[49] In Bangladesh, infants of mothers with high levels of depressive symptoms were more likely to be stunted at 6 and 12 months of age.[50] In Pakistan, one study reported that underweight 9-month-old infants were significantly more likely to have a mother with high levels of distress (defined by the WHO SRQ) than infants of normal weight.[51] A cross-sectional study in both India and Vietnam found that maternal common mental disorder, as measured by the SRQ, was associated with greater likelihood of stunting and underweight status in infants aged between 6 and 18 months.[52]

The association between maternal depressive symptoms and poor infant physical growth has been reported in some countries beyond South Asia, but not others. In Jamaica, mothers of infants aged between 9 and 30 months with impaired physical growth (stunting, wasting and underweight status) had more depressive symptoms than mothers of healthy infants.[53] However, when socio-economic status was taken into account, there was no independent relationship between psychosocial function of the mother and the infant's growth status. In one Brazilian study, the mothers of underweight infants aged <2 years were more likely to have a mental disturbance than mothers of healthy children.[54] More recent studies of Brazilian mother–infant dyads also found an association between maternal depressive symptoms and child growth measures, but the pattern of the relationship was somewhat different; maternal depressive symptoms were associated with stunting in infants aged between 6 and 24 months, but overweight rather than

underweight status.[55] A study in Peru found no association between maternal common mental disorder and stunting or weight for age.[52]

Findings from sub-Saharan Africa have differed from country to country, with some studies reporting an association and others not. In a longitudinal study in Nigeria, infants of mothers with depression at 6 weeks after birth had significantly poorer growth compared with infants of healthy mothers, as measured by weight for age and stunting, at 3 and 6 months, but not at 6 weeks and 9 months.[56] In Malawi, infants of mothers with common mental disorder were more likely to be stunted, but not underweight, than infants with healthy mothers at 9 months of age.[57] A study from Ethiopia found no association between maternal common mental disorder and infant underweight status or infant stunting.[58] One study in South Africa found no clear relationship between maternal depressive symptoms and infant stunting or weight for age.[7] One more recent longitudinal study in Soweto-Johannesburg in South Africa found that PND was associated with stunting at 2 years of age, and that stunting mediated the negative effect of PND on behaviour problems.[59]

It is unclear why maternal depression appears to be related to infant growth in some countries but not others. The most robust evidence base for an association between depressive symptoms and impaired growth comes from South Asia. Across countries and cultures, there are considerably different psychosocial experiences associated with the birth of a child, such as in the rates of lone motherhood, the nature of marriage, family and kinship and variations in the support that new mothers receive. It may be that socio-economic and socio-cultural factors interact in determining the effect of maternal mental health on child nutrition. It has been argued that South Asian women have a poorer social status and are less empowered than women elsewhere.[52] In such a context, a mother with depression may find it more difficult to secure appropriate nutrition for her infant. In South Asia, infant gender (having a girl) has been shown to be a powerful determinant of maternal mental health difficulties,[48] which does not appear to be the case in Africa. Other possible reasons include different breastfeeding practices and maternal nutrition, or other social and genetic factors. Further studies are necessary to determine whether antenatal depression has an impact upon birth weight in Sub-Saharan Africa and other low- and middle-income countries and whether this has an impact upon subsequent measures of infant growth. There are several possible mechanisms through which maternal depressive symptoms could be linked to impaired foetal and infant growth including, maternal under-nutrition and poor self-care,[60] disruption to mother–infant interactions,[61] increased rates of infant diarrhoea[62] and early termination of breastfeeding.[63]

Breastfeeding

It is recommended, as a critical public health measure, that all infants are breastfed exclusively up until 6 months of age (WHO, 2010). This recommendation is especially important for low- and middle-income contexts where the protective effects of breastfeeding are more evident than in high-income countries.[64] In high-income countries, there is evidence linking PND with premature cessation of breastfeeding or suboptimal breastfeeding practices[65] Consistent with this, depressive symptoms have been associated with premature cessation of breastfeeding across a number of studies in low- and middle-income countries. Mothers with depressive symptoms in the first 4–6 weeks postpartum were likely to stop breastfeeding earlier than non-depressed mothers, both in Nigeria[56] and in Brazil.[66] Mood at 7 weeks predicted Barbadian mothers' current and future preference for breastfeeding, as well as actual feeding behaviour at 6 months.[67] In Pakistan, the prevalence of depression was higher in a group of mothers who had stopped breastfeeding early than in a group of mothers who continued to breastfeed.[68] However, two studies have found similar rates of breastfeeding in the first 4 postnatal months in mothers with and without depression in Brazil[66] and Turkey,[69] suggesting that depressive symptoms do not necessarily disrupt breastfeeding. Again, the reasons for the association between maternal depression and breastfeeding duration are unclear, but are likely to be multi-factorial.

Diarrhoea

Diarrhoea is another major public health concern in low- and middle-income countries. Annually, it kills ~2.2 million people, the majority of whom are infants or young children.[70] Preventing diarrhoea in infants requires the caregiver, typically the mother, to take sanitation measures and be alert and responsive in the challenging environment of a poor community. Two studies have reported an association between maternal depressive symptoms and infant diarrhoeal episodes. Infants of depressed mothers had significantly higher rates of diarrhoea per year than those of healthy mothers in Pakistan[62] and in Nigeria, where the infants also had higher rates of other childhood illnesses.[56]

Cognitive and emotional development

Findings from a diverse range of studies in high-income countries suggest that PND, especially if chronic and in situations of wide socio-economic

difficulties, poses a risk for long-term poor cognitive functioning in the child.[3] While the vast majority of work on the impact of PND on infant cognitive development has been conducted in high-income settings, there is emerging evidence for an effect in at least some low- and middle-income countries. In India, Patel *et al.*[48] found that the 6-month-old infants of mothers who had PND at 6 weeks had significantly lower mental, but not motor, quotient scores, than infants of non-depressed mothers. A study of mothers in Barbados similarly found that PND at 7 weeks predicted lower infant social and cognitive performance at 6 months.[71] Finally, in Ethiopia, maternal symptoms of mental disorders were negatively associated with their children's scores on personal–social, fine motor, gross motor and overall development between 3 and 24 months, but not their language scores.[72] The limited number of studies in low- and middle-income contexts precludes conclusions about the impact of PND on cognitive development, but given that socio-economic hardship appears to moderate the impact of maternal depression on infant cognitive development, further studies in this area are clearly warranted.

The capacity of parents to provide the kind of care that promotes secure infant attachment and good psychological developmental in childhood may be compromised in adverse conditions such as poverty, especially in the context of maternal PND.[73] This is of particular concern for populations in low- and middle-income countries. Nonetheless, few studies have examined the emotional and behavioural development of children in the context of PND in low- and middle-income countries. One study in South Africa found marked impairments in interactions between dyads where the mother had depression compared with healthy mothers.[61] A follow-up study found that these early parenting difficulties were associated with subsequent insecure infant attachment.[74]

HIV, maternal depression and infant outcomes

Although it is increasingly recognized that Asia and parts of Eastern Europe are facing a major HIV problem, the HIV pandemic has been particularly devastating in sub-Saharan Africa where two-thirds of infected people live, and where widespread poverty and poor nutrition already undermine children's health and well-being. Half of the new infections in 2005 occurred in the 15–24 age group, the next generation of parents. In some parts of sub-Saharan Africa up to 50% of women attending antenatal clinics are HIV positive.[75] There is now a body of evidence that indicates that even uninfected children of HIV-positive mothers are at increased risk in terms of development.[31] There is concern that receiving a diagnosis of HIV will impact on the mother's caregiving capacity and that one of the ways that this occurs

is because of the effect on her mental state. Thus, being diagnosed with HIV during pregnancy, when most African women learn of their diagnosis, often leads to depression and even suicidal feelings.[76] While preparing to bring a new life into the world, the mother is, at the same time, confronted with the prospect of a chronic and potentially fatal illness. Questions hang over the fidelity of her relationships and her future fertility. In addition, the high levels of stigma associated with HIV often disrupt her social and material support networks.[77,78] The combination of being diagnosed with HIV and being depressed is likely to put particular pressure on a new mother and her parenting and may well have a cumulative negative effect on mother–child interaction and the child's development.[31] While some studies have shown that HIV infection is associated with disturbances in mother–infant interactions.[79] it is not clear whether this is related to the impact of maternal psychosocial functioning or other factors.

Mediating mechanisms

Recent research has begun to focus on the mechanisms mediating the relationship between PND and adverse child outcomes. Four main pathways for the transmission of risk have been proposed, namely genetic heritage, impairment of neuroregulatory systems, and indirect effects of depression on the quality of caregiving exposure to environmental stress.[80] It is not clear whether these mechanisms might vary between countries or cultures.[81]

Research, primarily from high-income countries, has shown that compromises to the quality of the mother's caregiving are a key mechanism by which maternal depression affects child development.[3]

There are several related, partially overlapping, dimensions of parenting that have been identified as significant: notably, the missing of infant cues, lack of contingent responsiveness, intrusiveness and poor facilitation, as well as low parental mood itself.[82] Some evidence exists to suggest that in the developing world also, major depression in the postnatal period can have a negative impact upon mother–infant interactions,[61] which in turn are related to negative outcomes in infant attachment security,[74] poor hygiene, gastrointestinal infections and diarrhoea. Notably, infants of depressed mothers were less likely to be fully immunized at 12 months compared with infants of non-depressed mothers in Pakistan, possibly indicating a lack of appropriate health-seeking behaviour in depressed mothers.[43] Further work is required to understand the mechanisms linking maternal PND and child outcome in low- and middle-income settings.

Interventions

The question that most urgently needs to be addressed is what can be done to help women and their children, and in particular, what intervention strategies are necessary to minimize the impact of maternal depression? Interventions in the high-income world (not in the context of depression) have been successful in effecting improvements in mother–infant interactions and infant attachment when addressing difficulties in parenting behaviours.[83] It has, however, become clear that interventions principally directed at improving mother–infant interactions do not necessarily lead to improvements in maternal depression,[84] and treating maternal depression alone does not lead to improvements in child outcome.[85] An additional concern is that healthcare resources are limited in the developing world, and consequently, interventions that use locally available resources are a priority.

Several randomized control trials (RCTs) in low- and middle-income contexts have demonstrated that psychological interventions delivered by local health workers may be helpful in reducing maternal depression and may have a positive impact upon some aspects of child development. In a large-scale RCT in rural Pakistan, a perinatal intervention programme using cognitive behavioural principles delivered by primary care health workers, compared with enhanced usual care, halved rates of maternal depression.[86] A reduction in maternal reports of rates of diarrhoea and higher rates of completed courses of immunization were found, but no overall difference in infant growth. In an RCT in a socio-economically disadvantaged periurban settlement in South Africa, examining an intervention specifically focused on the mother–infant relationship, Cooper *et al.*[87] found a significant positive impact of their intervention, delivered by trained local women, on the quality of the mother–infant interactions and on security of infant attachment. No significant impact on maternal depressive disorder was found.

In another RCT conducted in Jamaica of a more general intervention targeting child rearing and parenting self-esteem, improvements were found in both maternal depressive symptoms (as measured by the CES-D) and infant global development in the treatment compared with the control group who received standard care.[88] Again, the intervention was delivered by local community workers who were specifically trained. In India, community 'participatory learning and action' groups, focused on education and maternal and newborn health practices led to a significant reduction in neonatal mortality rates.[89] While the intervention was not targeted specifically at maternal depression, a

reduction in moderate depression, as measured by the Kessler-10 item scale, was found in the mother–infant intervention group compared with the control group in the third year after the start of the trial. Determining whether the improvements in the mother and infant outcomes are sustained over time will be an important question for future research.

Conclusion

Depression is a major contributor to the burden of disease in low- and middle-income countries.[90] PND is particularly important because it occurs at the time when both the mother and her rapidly developing infant are vulnerable to adverse effects in the environment. Prevalence studies have documented substantial rates of PND across many low- and middle-income countries, with rates typically significantly higher than in high-income contexts. Not only is an infant's development at increased risk of negative effects by the high levels of social and economic adversity often encountered in low- and middle-income contexts, but also it is likely to be further disrupted by the impact of PND on the quality of caregiving from the mother. There is compelling evidence linking PND to a raised risk of adverse infant outcomes in high-income countries, and increasing evidence for a similar association in low- and middle-income countries.[36] Further, socio-economic status has been shown to moderate the effects of PND on caregiving. There is a paucity of systematic intervention studies in low- and middle-income compared with high-income countries, but the available research suggests that mother–infant interactions and maternal depression should both be targets for treatment. Interventions that are sustainable and can be 'scaled up' in low- and middle-income countries with relatively limited resources are urgently required. The fact that such positive outcomes have been obtained in the RCTs to date using lay workers is particularly promising in this regard. It should be emphasized that despite the adversity faced by mothers with depression and their infants in low- and middle-income contexts, many children seem to remain physically healthy and develop normally, demonstrating remarkable resilience in both the quality of maternal caregiving and child development. One of the biggest issues facing clinicians and policy-makers is the stigmatization of psychological problems. In order to support families with young children, where a caregiver is struggling with depression, it is essential that community-based interventions are readily available without stigma.

Acknowledgments

The authors would like to thank Peter Cooper for comments on an earlier draft.

Funding

The authors gratefull acknowledge the Wellcome Trust, UK (090139/Z/09/Z), the Medical Research Council and the TrygFonden Charitable Foundation for supporting this work.

References

1 Weissman MM, Leaf PJ, Tischler GL *et al*. Affective disorders in five United States communities. *Psychol Med* 1988;**18**:141–53.
2 O'Hara MW, Swain AM. Rates and risk of postpartum depression—a meta-analysis. *Int Rev Psychiatry* 1996;**8**:37–54.
3 Murray L, Halligan SL, Cooper PJ. Effects of postnatal depression on mother-infant interactions, and child development. In: Wachs T, Bremner G (eds). *Handbook of Infant Development*. Wiley-Blackwell, Oxford, UK, 2009.
4 Stein A, Malmberg LE, Sylva K *et al*. The influence of maternal depression, caregiving, and socioeconomic status in the post-natal year on children's language development. *Child Care Health Dev* 2008;**34**:603–12.
5 Lund C, Breen A, Flisher AJ *et al*. Poverty and common mental disorders in low and middle income countries: a systematic review. *Soc Sci Med* 2010;**71**:517–28.
6 Saraceno B, Levav I, Kohn R. The public mental health significance of research on socioeconomic factors in schizophrenia and major depression. *World Psychiatry* 2005;**4**:181–5.
7 Tomlinson M, Cooper PJ, Stein A *et al*. Post-partum depression and infant growth in a South African peri-urban settlement. *Child Care Health Dev* 2006;**32**:81–6.
8 Shonkoff JP, Boyce WT, McEwen BS. Neuroscience, molecular biology, and the childhood roots of health disparities: building a new framework for health promotion and disease prevention. *JAMA* 2009;**301**:2252–9.
9 Walker SP, Wachs TD, Meeks Gardner J *et al*. Child development: risk factors for adverse outcomes in developing countries. *Lancet* 2007;**369**:145–57.
10 Husain N, Creed F, Tomenson B. Depression and social stress in Pakistan. *Psychol Med* 2000;**30**:395–402.
11 Affonso DD, De AK, Horowitz JA *et al*. An international study exploring levels of postpartum depressive symptomatology. *J Psychosom Res* 2000;**49**:207–16.
12 Mosack V, Shore ER. Screening for depression among pregnant and postpartum women. *J Community Health Nurs* 2006;**23**:37–47.
13 Pollock JI, Manaseki-Holland S, Patel V. Detection of depression in women of child-bearing age in non-western cultures: a comparison of the Edinburgh Postnatal Depression Scale and the Self-Reporting Questionnaire-20 in Mongolia. *J Affect Disord* 2006;**92**:267–71.
14 Alkar OY, Gencoz T. Critical factors associated with early postpartum depression among Turkish women. *Contemp Fam Ther* 2005;**27**:263–75.
15 Gausia K, Fisher C, Ali M *et al*. Magnitude and contributory factors of postnatal depression: a community-based cohort study from a rural subdistrict of Bangladesh. *Psychol Med* 2009;**39**:999–1007.
16 Evans J, Heron J, Francomb H *et al*. Cohort study of depressed mood during pregnancy and after childbirth. *Br Med J* 2001;**323**:257–260.
17 Horowitz JA, Goodman J. A longitudinal study of maternal postpartum depression symptoms. *Res Theory Nurs Pract* 2004;**18**:149–63.

18 Verkerk GJM, Pop VJM, Van Son MJM *et al*. Prediction of depression in the postpartum period: a longitudinal follow-up study in high-risk and low-risk women. *J Affect Disord* 2003;**77**:159–66.

19 Chien LY, Tai CJ, Hwang FM *et al*. Postpartum physical symptoms and depressive symptomatology at 1 month and 1 year after delivery: a longitudinal questionnaire survey. *Int J Nurs Stud* 2009;**46**:1201–8.

20 Ege E, Timur S, Zincir H *et al*. Social support and symptoms of postpartum depression among new mothers in Eastern Turkey. *J Obstet Gynaecol Res* 2008;**34**:585–93.

21 Halbreich U, Karkun S. Cross-cultural and social diversity of prevalence of postpartum depression and depressive symptoms. *J Affect Disord* 2006;**91**:97–111.

22 Hewitt CE, Gilbody SM. Is it clinically and cost effective to screen for postnatal depression: a systematic review of controlled clinical trials and economic evidence. *BJOG* 2009;**116**:1019–27.

23 Paulden M, Palmer S, Hewitt C *et al*. Screening for postnatal depression in primary care: cost effectiveness analysis. *Br Med J* 2009;**339**:b5203.

24 Hanlon C, Medhin G, Alem A *et al*. Detecting perinatal common mental disorders in Ethiopia: validation of the self-reporting questionnaire and Edinburgh Postnatal Depression Scale. *J Affect Disord* 2008;**108**:251–62.

25 Tesfaye M, Hanlon C, Wondimagegn D *et al*. Detecting postnatal common mental disorders in Addis Ababa, Ethiopia: validation of the Edinburgh Postnatal Depression Scale and Kessler Scales. *J Affect Disord* 2010;**122**:102–8.

26 Beck CT. A meta-analysis of predictors of postpartum depression. *Nurs Res* 1996;**45**:297–303.

27 Wilson LM, Reid AJ, Midmer DK *et al*. Antenatal psychosocial risk factors associated with adverse postpartum family outcomes. *Can Med Assoc J* 1996;**154**:785–98.

28 Robertson E, Grace S, Wallington T *et al*. Antenatal risk factors for postpartum depression: a synthesis of recent literature. *Gen Hosp Psychiatry* 2004;**26**:289–95.

29 Glasser S, Barell V, Shoham A *et al*. Prospective study of postpartum depression in an Israeli cohort: prevalence, incidence and demographic risk factors. *J Psychosom Obstet Gynaecol* 1998;**19**:155–64.

30 Broadhead JC, Abas MA. Life events, difficulties and depression among women in an urban setting in Zimbabwe. *Psychol Med* 1998;**28**:29–38.

31 Stein A, Krebs G, Richter L *et al*. Babies of a pandemic. *Arch Dis Child* 2005;**90**:116–8.

32 Chandran M, Tharyan P, Muliyil J *et al*. Post-partum depression in a cohort of women from a rural area of Tamil Nadu, India. Incidence and risk factors. *Br J Psychiatry* 2002;**181**:499–504.

33 Sawyer A, Ayers S, Smith H. Pre- and postnatal psychological wellbeing in Africa: a systematic review. *J Affect Disord* 2010;**123**:17–29.

34 Rahman A, Patel V, Maselko J *et al*. The neglected 'm' in MCH programmes—why mental health of mothers is important for child nutrition. *Trop Med Int Health* 2008;**13**:579–83.

35 World Health Organisation. **Maternal mental health and child health and development in low and middle income countries**. Report of the meeting held in Geneva, Switzerland, 30 January—1 February, 2008. Geneva, Switerzland: WHO, 2008.

36 World Health Organisation. *Mental Health Aspects of Women's Reproductive Health*: A *Global Review of Literature*. Geneva, Switerzland: WHO, 2009.

37 Grantham-McGregor S, Cheung YB, Cueto S *et al*. Developmental potential in the first 5 years for children in developing countries. *Lancet* 2007;**369**:60–70.

38 World Health Organization. Physical status: the use and interpretation of anthropometry. Report of a WHO Expert Committee. World Health Organization Technical Report Series volume 854, 1995,1–452.

39 Black MM, Walker SP, Wachs TD *et al*. Policies to reduce undernutrition include child development. *Lancet* 2008;**371**:454–5.

40 Ramalingaswami V, Jonsson U, Rohde J. Commentary: the Asian enigma. In: *The Progress of Nations I*, UNICEF, New York, NY, 1996.

41 Smith LC, Haddad L. Explaining child malnutrition in developing countries. A cross-country analysis. Research Report of the International Food Policy Research Institute, 2000,1–112.

42 Rahman A, Bunn J, Lovel H *et al*. Association between antenatal depression and low birthweight in a developing country. *Acta Psychiatr Scand* 2007;**115**:481–6.
43 Rahman A, Iqbal Z, Bunn J *et al*. Impact of maternal depression on infant nutritional status and illness: a cohort study. *Arch Gen Psychiatry* 2004;**61**:946–52.
44 Patel V, Prince M. Maternal psychological morbidity and low birth weight in India. *Br J Psychiatry* 2006;**188**:284–5.
45 Evans J, Heron J, Patel RR *et al*. Depressive symptoms during pregnancy and low birth weight at term: longitudinal study. *Br J Psychiatry* 2007;**191**:84–5.
46 Field T, Diego M, Dieter J *et al*. Prenatal depression effects on the fetus and the newborn. *Infant Behav Dev* 2004;**27**:216–29.
47 Dennis CLE, Janssen PA, Singer J. Identifying women at-risk for postpartum depression in the immediate postpartum period. *Acta Psychiatr Scand* 2004;**110**:338–46.
48 Patel V, DeSouza N, Rodrigues M. Postnatal depression and infant growth and development in low income countries: a cohort study from Goa, India. *Arch Dis Child* 2003;**88**:34–7.
49 Anoop S, Saravanan B, Joseph A *et al*. Maternal depression and low maternal intelligence as risk factors for malnutrition in children: a community based case-control study from South India. *Arch Dis Child* 2004;**89**:325–9.
50 Black MM, Baqui AH, Zaman K *et al*. Maternal depressive symptoms and infant growth in rural Bangladesh. *Am J Clin Nutr* 2009;**89**:951S–7S.
51 Rahman A, Lovel H, Bunn J *et al*. Mothers' mental health and infant growth: a case-control study from Rawalpindi, Pakistan. *Child Care Health Dev* 2004;**30**:21–7.
52 Harpham T, Huttly S, De Silva MJ *et al*. Maternal mental health and child nutritional status in four developing countries. *J Epidemiol Community Health* 2005;**59**:1060–4.
53 Baker-Henningham H, Powell C, Walker S *et al*. Mothers of undernourished Jamaican children have poorer psychosocial functioning and this is associated with stimulation provided in the home. *Eur J Clin Nutr* 2003;**57**:786–92.
54 De Miranda CT, Turecki G, De Jesus Mari J *et al*. Mental health of the mothers of malnourished children. *Int J Epidemiol* 1996;**25**:128–33.
55 Surkan PJ, Kawachi I, Peterson KE. Childhood overweight and maternal depressive symptoms. *J Epidemiol Community Health* 2008;**62**(5):e11.
56 Adewuya AO, Ola BO, Aloba OO *et al*. Impact of postnatal depression on infants' growth in Nigeria. *J Affect Disord* 2008;**108**:191–3.
57 Stewart RC, Umar E, Kauye F *et al*. Maternal common mental disorder and infant growth—a cross-sectional study from Malawi. *Matern Child Nutr* 2008;**4**:209–19.
58 Medhin G, Hanlon C, Dewey M *et al*. Prevalence and predictors of undernutrition among infants aged six and twelve months in Butajira, Ethiopia: the P-MaMiE Birth Cohort. *BMC Public Health* 2010;**10**:27.
59 Avan B, Richter LM, Ramchandani PG *et al*. Maternal postnatal depression and children's growth and behaviour during the early years of life: exploring the interaction between physical and mental health. *Arch Dis Child* 2010;**95**:690–5.
60 Rahman A, Harrington R, Bunn J. Can maternal depression increase infant risk of illness and growth impairment in developing countries? *Child Care Health Dev* 2002;**28**:51–6.
61 Cooper PJ, Tomlinson M, Swartz L *et al*. Post-partum depression and the mother-infant relationship in a South African peri-urban settlement. *Br J Psychiatry* 1999;**175**:554–8.
62 Rahman A, Bunn J, Lovel H *et al*. Maternal depression increases infant risk of diarrhoeal illness:—a cohort study. *Arch Dis Child* 2007;**92**:24–8.
63 Henderson JJ, Evans SF, Straton JAY *et al*. Impact of postnatal depression on breastfeeding duration. *Birth* 2003;**30**:175–80.
64 Cattaneo A, Quintero-Romero S. Protection, promotion and support of breastfeeding in low-income countries. *Semin Fetal Neonatal Med* 2006;**11**:48–53.
65 Cooper PJ, Murray L, Stein A. Psychosocial factors associated with the early termination of breast-feeding. *J Psychosom Res* 1993;**37**:171–6.
66 Falceto OG, Giugliani ERJ, Fernandes CLC. Influence of parental mental health on early termination of breast-feeding: a case-control study. *J Am Board Fam Pract* 2004;**17**:173–83.
67 Galler JR, Harrison RH, Ramsey F *et al*. Postpartum feeding attitudes, maternal depression, and breastfeeding in Barbados. *Infant Behav Dev* 2006;**29**:189–203.

68 Taj R, Sikander KS. Effects of maternal depression on breast-feeding. *JPMA* 2003;**53**:8–11.
69 Kara B, Ünalan P, Çifçili S *et al*. Is there a role for the family and close community to help reduce the risk of postpartum depression in new mothers? A cross-sectional study of Turkish Women. *Matern Child Health J* 2008;**12**:155–61.
70 World Health Organization. *Global Water Supply and Sanitation Assessment*. WHO and UNICEF: Geneva, 2000.
71 Galler JR, Harrison RH, Ramsey F *et al*. Maternal depressive symptoms affect infant cognitive development in Barbados. *J Child Psychol Psychiatry* 2000;**41**:747–57.
72 Hadley C, Tegegn A, Tessema F *et al*. Parental symptoms of common mental disorders and children's social, motor, and language development in sub-Saharan Africa. *Ann Hum Biol* 2008;**35**:259–75.
73 Atkinson L, Paglia A, Coolbear J *et al*. Attachment security: a meta-analysis of maternal mental health correlates. *Clin Psychol Rev* 2000;**20**:1019–40.
74 Tomlinson M, Cooper P, Murray L. The mother—infant relationship and infant attachment in a South African peri-urban settlement. *Child Dev* 2005;**76**:1044–54.
75 Department of Health. **2008 National Antenatal Sentinel HIV and Syphilis Prevalence Survey**. South Africa, 2009.
76 Rochat TJ, Richter LM, Doll HA *et al*. Depression among pregnant rural South African women undergoing HIV testing [3]. *JAMA* 2006;**295**:1376–8.
77 Kwalombota M. The effect of pregnancy in HIV-infected women. *AIDS Care* 2002;**14**:431–3.
78 Brandt R. Putting mental health on the agenda for HIV+ women: a review of evidence from sub-Saharan Africa. *Women Health* 2009;**49**:215–28.
79 Kotchick BA, Forehand R, Brody G *et al*. The impact of maternal HIV infection on parenting in inner-city African American families. *J Fam Psychol* 1997;**11**:447–61.
80 Gotlib IH, Goodman SH. Children of parents with depression. In W. K. Silverman & T.H. Ollendick (Eds.), and adolescents, *Dev Issues Clin Treatment Child* Boston: Allyn Bacon. 1999;415–32.
81 Surkan PJ, Kennedy CE, Hurley KM *et al*. Maternal depression and early childhood growth in developing countries: systematic review and meta-analysis. *Bulletin of the World Health Organization* 2011;**89**:607–15.
82 Stein A, Gath DH, Bucher J *et al*. The relationship between post-natal depression and mother-child interaction. *Br J Psychiatry* 1991;**158**:46–52.
83 Bakermans-Kranenburg MJ, Van Ijzendoorn MH, Juffer F. Less is more: meta-analyses of sensitivity and attachment interventions in early childhood. *Psychol Bull* 2003;**129**:195–215.
84 Nylen KJ, Moran TE, Franklin CL *et al*. Maternal depression: a review of relevant treatment approaches for mothers and infants. *Infant Ment Health J* 2006;**27**:327–43.
85 Forman DR, O'Hara MW, Stuart S *et al*. Effective treatment for postpartum depression is not sufficient to improve the developing mother-child relationship. *Dev Psychopathol* 2007;**19**:585–602.
86 Rahman A, Malik A, Sikander S *et al*. Cognitive behaviour therapy-based intervention by community health workers for mothers with depression and their infants in rural Pakistan: a cluster-randomised controlled trial. *Lancet* 2008;**372**:902–9.
87 Cooper PJ, Tomlinson M, Swartz L *et al*. Improving quality of mother-infant relationship and infant attachment in socioeconomically deprived community in South Africa: randomised controlled trial. *BMJ* 2009;**338**:b974.
88 Baker-Henningham H, Powell C, Walker S *et al*. The effect of early stimulation on maternal depression: a cluster randomised controlled trial. *Arch Dis Child* 2005;**90**:1230–4.
89 Tripathy P, Nair N, Barnett S *et al*. Effect of a participatory intervention with women's groups on birth outcomes and maternal depression in Jharkhand and Orissa, India: a cluster-randomised controlled trial. *Lancet* 2010;**375**:1182–92.
90 Murray C, Lopez AD. Global mortality, disability, and the contribution of risk factors: Global burden of disease study. *Lancet* 1997;**349**:1436–42.
91 Ho-Yen SD, Bondevik GT, Eberhard-Gran M *et al*. The prevalence of depressive symptoms in the postnatal period in Lalitpur district, Nepal. *Acta Obstet Gynecol Scand* 2006;**85**:1186–92.

92 Regmi S, Sligl W, Carter D *et al*. A controlled study of postpartum depression among Nepalese women: validation of the Edinburgh Postpartum Depression Scale in Kathmandu. *Trop Med Int Health* 2002;**7**:378–82.
93 Cox JL. Postnatal depression: a comparison of African and Scottish women. *Soc Psychiatry* 1983;**18**:25–8.
94 Nakku JEM, Nakasi G, Mirembe F. Postpartum major depression at six weeks in primary health care: prevalence and associated factors. *Afr Health Sci* 2006;**6**:207–14.
95 Pollock JI, Manaseki-Holland S, Patel V. Depression in Mongolian women over the first 2 months after childbirth: prevalence and risk factors. *J Affect Disord* 2009;**116**:126–33.
96 Ndokera R, MacArthur C. The relationship between maternal depression and adverse infant health outcomes in Zambia: a cross-sectional feasibility study. *Child Care Health Dev* 2011;**37**:74–81.
97 Nagy E, Molnar P, Pal A *et al*. Prevalence rates and socioeconomic characteristics of post-partum depression in Hungary. *Psychiatry Res* 2011.
98 Grace J, Lee KK, Ballard C *et al*. The relationship between post-natal depression, somatization and behaviour in Malaysian women. *Transcult Psychiatry* 2001;**38**:27–34.
99 Kadir AA, Nordin R, Ismail SB *et al*. Validation of the Malay version of Edinburgh Postnatal Depression Scale for postnatal women in Kelantan, Malaysia. *Asia Pac Fam Med* 2004;**3**:9–18.
100 Kit LK, Janet G, Jegasothy R. Incidence of postnatal depression in Malaysian women. *J Obstet Gynaecol Res* 1997;**23**:85–9.
101 Mahmud WMRW, Shariff S, Yaacob MJ. Postpartum depression: a survey of the incidence and associated risk factors among Malay Women in Meris Kubor Besar, Bachok, Kelantan. *Malays J Med Sci* 2002;**9**:41–8.
102 Rushidi WM, Hayati MR, Maizuri B *et al*. Postpartum depression among Malay women from a rural area in Kedah, NorthWest of Peninsular Malaysia: prevalence and risk factor. *Malays J Psychiatry* 2005;**13**:3–19.
103 Masmoudi J, Tabelsi S, Charfeddine F *et al*. Study of the prevalence of postpartum depression among 213 Tunisian parturients. *Gynécologie Obstétrique and Fertilité* 2008; **36**:782–7.
104 Abiodun OA. Postnatal depression in primary care populations in Nigeria. *Gen Hosp Psychiatry* 2006;**28**:133–6.
105 Adewuya AO, Afolabi OT. The course of anxiety and depressive symptoms in Nigerian postpartum women. *Arch Womens Ment Health* 2005;**8**:257–9.
106 Adewuya AO, Eegunranti AB, Lawal AM. Prevalence of postnatal depression in Western Nigerian women: a controlled study. *Int J Psychiatry Clin Pract* 2005;**9**:60–4.
107 Adewuya AO. Early postpartum mood as a risk factor for postnatal depression in Nigerian women. *Am J Psychiatry* 2006;**163**:1435–7.
108 Fatoye FO, Oladimeji BY, Adeyemi AB. Difficult delivery and some selected factors as predictors of early postpartum psychological symptoms among Nigerian women. *J Psychosom Res* 2006;**60**:299–301.
109 Owoeye AO, Aina OF, Morakinyo O. Risk factors of postpartum depression and EPDS scores in a group of Nigerian women. *Trop Doct* 2006;**36**:100–3.
110 Ukpong DI, Owolabi AT. Postpartum emotional distress: a controlled study of Nigerian women after caesarean childbirth. *J Obstet Gynaecol* 2006;**26**:127–9.
111 Liabsuetrakul T, Vittayanont A, Pitanupong J. Clinical applications of anxiety, social support, stressors, and self-esteem measured during pregnancy and postpartum for screening postpartum depression in Thai women. *J Obstet Gynaecol Res* 2007;**33**:333–40.
112 Limlomwongse N, Liabsuetrakul T. Cohort study of depressive moods in Thai women during late pregnancy and 6–8 weeks of postpartum using the Edinburgh Postnatal Depression Scale (EPDS). *Arch Womens Ment Health* 2006;**9**:131–8.
113 Pitanupong J, Liabsuetrakul T, Vittayanont A. Validation of the Thai Edinburgh Postnatal Depression Scale for screening postpartum depression. *Psychiatry Res* 2007;**149**:253–9.
114 Gao LL, Chan SWC, Mao Q. Depression, perceived stress, and social support among first-time Chinese mothers and fathers in the postpartum period. *Res Nurs Health* 2009;**32**:50–8.
115 Guo SF. Postpartum depression. *Zhonghua Fu Chan Ke Za Zhi* 1993;**28**:532–3, 569.

116 Lau Y, Wang Y, Yin L *et al*. Validation of the Mainland Chinese version of the Edinburgh Postnatal Depression Scale in Chengdu mothers. *Int J Nurs Stud* 2010;**47**:1139–51.

117 Wan EY, Moyer CA, Harlow SD *et al*. Postpartum depression and traditional postpartum care in China: role of Zuoyuezi. *Int J Gynecol and Obstet* 2009;**104**:209–13.

118 Wang SY, Jiang XY, Jan WC *et al*. A comparative study of postnatal depression and its predictors in Taiwan and mainland China. *Am J Obstet Gynecol* 2003;**189**:1407–12.

119 Xie Rh, He G, Liu A *et al*. Fetal gender and postpartum depression in a cohort of Chinese women. *Soc Sci Med* 2007;**65**:680–4.

120 Galler JR, Harrison RH, Biggs MA *et al*. Maternal moods predict breastfeeding in Barbados. *J Dev Behav Pediatr* 1999;**20**:80–7.

121 Andajani-Sutjahjo S, Manderson L, Astbury J. Complex emotions, complex problems: understanding the experiences of perinatal depression among new mothers in urban Indonesia. *Cult Med Psychiatry* 2007;**31**:101–22.

122 Edwards GD, Shinfuku N, Gittelman M *et al*. Postnatal depression in Surabaya, Indonesia. *Int J Mental Health* 2006;**35**:62–74.

123 Agoub M, Moussaoui D, Battas O. Prevalence of postpartum depression in a Moroccan sample. *Arch Womens Ment Health* 2005;**8**:37–43.

124 Alami KM, Kadri N, Berrada S. Prevalence and psychosocial correlates of depressed mood during pregnancy and after childbirth in a Moroccan sample. *Arch Womens Ment Health* 2006;**9**:343–6.

125 Lawrie TA, Hofmeyr GJ, De Jager M *et al*. Validation of the Edinburgh Postnatal Depression Scale on a cohort of South African women. *S Afr Med J* 1998;**88**:1340–4.

126 Ramchandani PG, Richter LM, Stein A *et al*. Predictors of postnatal depression in an urban South African cohort. *J Affect Disord* 2009;**113**:279–84.

127 Spangenberg JJ, Pieters HC. Factors related to postpartum depression. *S Afr J Psychol* 1991;**21**:159–65.

128 Chaaya M, Campbell OM, El Kak F *et al*. Postpartum depression: prevalence and determinants in Lebanon. *Arch Womens Ment Health* 2002;**5**:65–72.

129 Ayvaz S, Hocaoglu C, Tiryaki A *et al*. Incidence of postpartum depression in Trabzon province and risk factors at gestation. *Turk Psikiyatri Derg* 2006;**17**:243–51.

130 Bugdayci R, Sasmaz CT, Tezcan H *et al*. A cross-sectional prevalence study of depression at various times after delivery in Mersin province in Turkey. *J Womens Health (Larchmt)* 2004;**13**:63–8.

131 Danaci AE, Dinc G, Deveci A *et al*. Postnatal depression in Turkey: epidemiological and cultural aspects. *Soc Psychiatry Psychiatr Epidemiol* 2002;**37**:125–9.

132 Durat G, Kutlu Y. The prevalance of postpartum depression and related factors in Sakarya. *Yeni Symposium* 2010;**48**:63–8.

133 Ekuklu G, Tokuc B, Eskiocak M *et al*. Prevalence of postpartum depression in Edirne, Turkey, and related factors. *J Reprod Med Obstet Gynecol* 2004;**49**:908–14.

134 Gulseren L, Erol A, Gulseren S *et al*. From antepartum to postpartum: a prospective study on the prevalence of peripartum depression in a semiurban Turkish community. *J Reprod Med Obstet Gynecol* 2006;**51**:955–60.

135 Kirpinar I, Gozum S, Pasinliolu T. Prospective study of postpartum depression in eastern Turkey prevalence, socio-demographic and obstetric correlates, prenatal anxiety and early awareness. *J Clin Nurs* 2010;**19**:422–31.

136 Özbaşaran F, Çoban A, Kucuk M. Prevalence and risk factors concerning postpartum depression among women within early postnatal periods in Turkey. *Arch Gynecol Obstet* 2010;1–8.

137 Ozdemir H, Ergin N, Selimoglu K *et al*. Postnatal depressive mood in Turkish women. *Psych Health Med* 2005;**10**:96–107.

138 Yağmur Y, Ulukoca N. Social support and postpartum depression in low-socioeconomic level postpartum women in Eastern Turkey. *Int J Public Health* 2010;**55**:543–9.

139 Cantilino A, Zambaldi CF, De Albuquerque TLC *et al*. Postpartum depression in Recife—Brazil: prevalence and association with bio-socio-demographic factors. *Jornal Brasileiro Psiquiatria* 2010;**59**:1–9.

140 Cruz EBdS, Simões GL, Faisal-Cury A. Rastreamento da depressão pós-parto em mulheres atendidas pelo Programa de Saúde da Família. *Revista Brasileira Ginecologia Obstetrícia* 2005;**27**:181–8.

141 da Silva Moraes IG, Pinheiro RT, da Silva RA *et al*. Prevalence of postpartum depression and associated factors. Revista de Saúde Pública. 2006;**40**:65–70.

142 Da-Silva VA, Moraes-Santos AR, Carvalho MS *et al*. Prenatal and postnatal depression among low income Brazilian women. *Braz J Med Biol Res* 1998;**31**:799–804.

143 Matijasevich A, Golding J, Smith GD *et al*. Differentials and income-related inequalities in maternal depression during the first two years after childbirth: Birth cohort studies from Brazil and the UK. *Clin Pract Epidemiol Ment Health* 2009;**5**:5–12.

144 Tannous L, Gigante LP, Fuchs SC *et al*. Postnatal depression in Southern Brazil: prevalence and its demographic and socioeconomic determinants. *BMC Psychiatry* 2008;8.

145 Vitolo MR, Benetti SPDC, Bortolini GA *et al*. Depression and its implications in breast feeding. Revista de Psiquiatria do Rio Grande do Sul. 2007;**29**:28–34.

146 Zubaran C, Foresti K, Schumacher MV *et al*. Validation of a screening instrument for post-partum depression in Southern Brazil. *J Psychosom Obstet Gynecol* 2009;**30**:244–54.

147 Mariam KA, Srinivasan K. Antenatal psychological distress and postnatal depression: a prospective study from an urban clinic. *Asian J Psychiatry* 2009;**2**:71–3.

148 Patel V, Rodrigues M, DeSouza N. Gender, poverty, and postnatal depression: a study of mothers in Goa, India. *Am J Psychiatry* 2002;**159**:43–7.

149 Rodrigues M, Patel V, Jaswal S *et al*. Listening to mothers: qualitative studies on motherhood and depression from Goa, India. *Soc Sci Med* 2003;**57**:1797–806.

150 Savarimuthu RJS, Ezhilarasu P, Charles H *et al*. Post-partum depression in the community: a qualitative study from rural south India. *Int J Soc Psychiatry* 2010;**56**:94–102.

151 Kheirabadi GR, Maracy MR. Perinatal depression in a cohort study on Iranian women. *J Res Med Sci* 2010;**15**:41–9.

152 Stewart RC, Bunn J, Vokhiwa M *et al*. Common mental disorder and associated factors amongst women with young infants in rural Malawi. *Soc Psychiatry Psychiatr Epidemiol* 2010;**45**:551–9.

153 Husain N, Bevc I, Husain M *et al*. Prevalence and social correlates of postnatal depression in a low income country. *Arch Womens Ment Health* 2006;**9**:197–202.

154 Kalyani GHS, Saeed K, Rehman CIU *et al*. Incidence of depressive illness in Pakistani women during postnatal period. *J Coll Physicians Surg Pak* 2001;**11**:246–8.

155 Rahman A, Iqbal Z, Harrington R. Life events, social support and depression in childbirth: perspectives from a rural community in the developing world. *Psychol Med* 2003;**33**:1161–7.

156 Chibanda D, Mangezi W, Tshimanga M *et al*. Validation of the Edinburgh Postnatal Depression Scale among women in a high HIV prevalence area in urban Zimbabwe. *Arch Womens Ment Health* 2010a;**13**:201–6.

157 Fisher JRW, Morrow MM, Ngoc NTN *et al*. Prevalence, nature, severity and correlates of postpartum depressive symptoms in Vietnam. *BJOG* 2004;**111**:1353–60.

158 Jadresic E, Araya R. Prevalence of postpartum depression and associated factors in Santiago, Revista medica de Chile, Chile. 1995;**123**:694–9.

159 Jadresic E, Jara C, Araya R. Depression in pregnancy and puerperium: study of risk factors. [Depresión en el embarazo y el puerperio: estudio de factores de riesgo]. *Acta Psiquiatria y Psicologica de America Latina* 1993;**39**:63–74.

160 Lemus V, Yanez N. *Estudio Descriptivo-comparativo de la Sintomatologia Neurotica Depresivo-angustiosa del pre y Postparto en Mujeres Primiparas. Escuela de Psicologia volume Tesis para optar al titulo de Psicologo*. Universidad Catolica de Chile, Santiago, Chile, 1986.

161 Risco L, Jadresic E, Galleguillos T *et al*. Depresión postparto: a lta frecuencia en puérperas chilenas, detección precoz, seguimiento y factores de riesgo. *Psiquiatr Salud Integr* 2002;**2**:61.

162 Baggaley RF, Ganaba R, Filippi V *et al*. Detecting depression after pregnancy: the validity of the K10 and K6 in Burkina Faso. *Trop Med Int Health* 2007;**12**:1225–9.