Mothers' mental health and infant growth: a case–control study from Rawalpindi, Pakistan

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Abstract

Background   Epidemiological studies in Pakistan show high rates of depression in women, while rates of malnutrition in children are also high. This study aimed to determine whether poor maternal mental health is associated with an increased risk of infant undernutrition.

Methods   Clinic-based case–control study. A total of 172 consecutive infants and their mothers attending for 9-month measles immunization were recruited over a 3-month period. Eighty-two undernourished infants [weight for age below the National Centre for Health Statistics (NCHS)/World Health Organization (WHO) third centile] were matched to 90 controls (weight for age above 10th centile), and their mothers interviewed for mental distress using the Self-Reporting Questionnaire (WHO SRQ-20, a psychiatric screening instrument). Infants' exposure to maternal distress (score ≥ 10 on SRQ-20) and other potential risk or protective biological, social, socio-economic and family factors were measured.

Results   Mental distress determined by WHO SRQ-20 was associated with increased risk of undernutrition in infants (odds ratio 3.91, 95% confidence interval 1.95–7.86). This association remained significant after controlling for birthweight and social factors.

Conclusion   Exposure to maternal mental distress is associated with undernutrition in 9-month infants in urban Pakistan. These mothers may represent a group whose children are at higher risk of ill health, and potentially be a specific target for advice on infant care. Early recognition and treatment of mental health problems in mothers may help reduce morbidity and mortality rates in children.

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Introduction

Epidemiological studies show that disorders such as depression are highly prevalent in developing countries, with reported point prevalence rates of 45% to 57% for women in rural Pakistan (Mumford *et al.* 1997; Husain *et al.* 2000). Although common, depression is associated with a high degree of disability and chronicity, with symptoms such as low mood, lack of energy, poor concentration, low self-esteem, and a lack of interest in the environment. In developing countries, the mother is the central figure in child survival programmes (Claeson & Waldman 2000). She is expected to initiate preventive measures such as breastfeeding, weaning, hygiene, water sanitation, and immunization. If the child is unwell, the mother is expected to recognize the illness, provide care, seek outside

help, and implement the treatment. Clearly, the mother's mental state is an important determinant of how well she is able to perform these functions.

While there is considerable evidence from developed countries that post-natal depression is associated with disturbances in child cognitive and emotional development (Cooper & Murray 1998), the mother's mental state as a risk factor for the infant's physical health in developing countries has received little attention. Kerr *et al.* (1978) in Kingston, Jamaica, found evidence of poor psychosocial functioning in mothers of hospital-referred malnourished children. These mothers had more chronically disrupted lives, unsupportive partners, and fewer social contacts. Many of these mothers were described as 'apathetic' and 'dependant' by the authors. Psychiatric evaluation in these mothers was not carried out. De Miranda *et al.* (1996) studied mothers and children attending a health centre in an urban slum in Sao Paulo, Brazil and found that mothers of malnourished children showed a higher rate of mental disturbance as measured by a psychiatric screening instrument, compared to mothers of normal children. However, this study was conducted in a very poor slum population and did not control for concurrent health problems in the children (all of them were attenders at a health centre). In a recent study from Goa, India (Patel *et al.* 2003), infants of 37 depressed mothers were compared with those of 134 non-depressed mothers. Maternal depression was strongly associated with being underweight at 6 months for both weight and height (relative risk 2.3 and 2.9, respectively) and these associations remained statistically significant after adjustment for birthweight and parental education.

Our study aims to determine the association between maternal mental distress with the risk of undernutrition in currently healthy age-matched infants living in a relatively well-off area taking account of other factors such as birthweight and socio-economic status.

Methods

The study area was Banni, an urban locality in Rawalpindi City having a population of approximately 200 000 inhabitants. People are generally well-off and mainly employed locally as small shopkeepers and skilled workers, or own small businesses. The study was carried out in a government-run immunization clinic. This allowed us to recruit healthy age-matched infants from the same locality. While immunization coverage in urban Pakistan is not universal (coverage for measles 75%) (Gwatkin *et al.* 2000), the exclusion of this group is unlikely to bias results in favour of the hypothesis, as the childcare practices of their mothers is unlikely to be better than that of those bringing children for immunization.

Infant attenders at the clinic who fulfilled the inclusion criteria (no obvious physical or mental handicap, well enough to be immunized on the day of assessment, and accompanied by the mother) were assessed for inclusion in the study. Eighty-two infants who had a body weight below the third centile on the National Centre for Health Statistics (NCHS)/World Health Organization (WHO) international reference standards for that age (Dibley 1987) were classified as cases. Ninety infants whose body weight was above the 10th centile on the NCHS/WHO reference range were classified as controls.

The study was designed to detect a 2.5-fold increase in risk with an alpha risk of 0.05 and a beta risk of 0.2 (80% statistical power). Assuming a 25% exposure rate in the control population (i.e. a prevalence of mental disorder among the mothers of normal children of 25%) and a 1 to 1 control to case ratio, this required 95 cases and 95 controls. As the prevalence of mental disorder was higher than 25% the lower sample size was considered adequate. Birthweight data, assessed retrospectively, were only available for 48 cases and 59 controls.

Weighing procedure and assessment of nutritional status of infants

Infants were weighed by a trained research assistant using standard weighing procedures (Cameron 1986). The age of the infants was calculated from the date of birth supplied by the mothers. This date of birth was verified from the infants' health record. The calculation of accurate age can be a problem in some rural areas or urban slums in

Pakistan where literacy rates are low and date of birth does not serve any useful purpose. However, in this relatively developed urban area, the date of birth is an essential requirement for many important functions and all mothers could accurately recall it. The weight for age of the infants was calculated using the NCHS/WHO growth charts.

Assessment of maternal mental distress and other factors

Questionnaires were given to mothers of cases and controls during an interview at the immunization centre, with a trained mental health professional within half an hour of arrival at the clinic, after the infant had been weighed. The interviewer was blind to the case–control status of the infant. Mothers were given the Self-Reporting Questionnaire (SRQ) (World Health Organization 1994), a 20-item questionnaire, with a maximum score of 20, designed to identify 'mental distress' in the community. The reliability and validity of SRQ-20 has been established in Pakistan (Saeed *et al.* 2001). Data were also collected on the biological (parity, maternal age, infant gender, date of birth, birthweight, weight for age that day), social (number of children under 7 years, infant gender), socio-economic (maternal literacy, family address, assets questionnaire), and family environment (marital status, joint or nuclear family) of the infant. Socio-economic status was assessed with the Assets Questionnaire developed by the World Bank for use in developing countries (Gwatkin *et al.* 2000). The questionnaire consists of 35 items inquiring about the presence or absence of household assets and facilities. These include environmental factors of interest such as availability of electricity, source of drinking water, type of toilet facilities, and number of persons sharing a room. The assets approach therefore also serves as a proxy measure for these environmental factors. Each answer is assigned a numerical value based on factor scores calculated for the Pakistani population. Summing up the numerical values produces a total household asset score for the individual. This score is then compared with a table of standardized norms for the Pakistani population in order to identify the wealth quintile to which the individual belongs.

Data analysis

The data were analysed using the STATA 7 statistical package (StataCorp 2001). The six potential confounding variables were dichotomized on the basis of *a priori* criteria. (i) Socio-economic status: according to the Assets Questionnaire wealth quintile index for Pakistan, into above (richer) and below (poorer) the fourth quintile. This separated the relatively well-off from those who were less well-off, but still well to do by Pakistani standards. (ii) Birthweight: ≤2.5 kg, and >2.5 kg. (iii) More than three children under the age of 7 years, yes or no. (iii) Maternal literacy as defined by the ability to read and write a simple text in Urdu, yes or no. (iv) Maternal age, over 30 years or under 30 years. (v) Gender of infant, either male or female. (vi) Nuclear family (husband and children only) vs. joint family (husband, children, and maternal or paternal grandparents).

Odds ratios (OR) were used to compare differences between cases and controls. Stratified analysis to test for individual confounders was performed using the Mantel-Haenszel Chi-square test (Fleiss 1986). Results from different strata are combined in a Mantel Haenszel adjusted OR, by calculating a pooled summary estimate, to remove confounding caused by variables used for stratification. The simultaneous effects of maternal mental distress, birthweight, number of children, and socio-economic status on the nutritional status of the infant were analysed using logistic regression analysis. Cases with missing birthweight values were excluded from multivariate analysis. A comparison, by univariate analysis, of the data sets with and without the excluded cases showed no change in results, indicating that the missing birthweight values were random. A *P*-value of less than 0.05 or an OR with a 95% confidence interval (CI) that did not include 1 was considered significant.

Results

Population characteristics

A total of 172 subjects (82 cases and 90 controls) were identified in the study. The mean age of the cases (9.69 months, SD = 0.87) and controls

(9.66 months, SD = 0.93) was similar. The gender distribution was uniform, with 51% of cases and controls male. Eighty-six per cent of the mothers could read and write.

Forty-eight per cent of the infants attending the clinic were below the third centile weight for age. This corresponds closely with figures of undernutrition for South Asia (UNICEF 2002) reporting 38% of Pakistani and 47% of Indian children under the age of 5 years to be underweight. The prevalence of mental distress (SRQ score of 10 or more) in the current sample of mothers was high (40%), even though a high cut-off point was used. At this cut-off score, the SRQ has a positive predictive value of 98% (Saeed *et al.* 2001) meaning that a high proportion of these mothers suffered from clinically significant mental distress. This concurs with other studies from Pakistan that have suggested point prevalence rates of depression ranging from 45 to 57% (Mumford *et al.* 1997; Husain *et al.* 2000).

Associations with undernutrition

Table 1 shows that 57% of mothers of underweight cases had poor mental health as measured by the SRQ, compared to only 25% of controls: OR = 3.9 (95% CI = 1.9–7.8). Out of the 107 subjects for whom data were available, 25% of cases had birth-

weight below 2.5 kg, while 7% of controls were below 2.5 kg: OR = 4.6 (95% CI = 1.2–20.7). Mothers of cases had more young children (41% had three or more children under 7 years) compared to mothers of controls (20% had three or more children under 7 years): OR = 2.8 (95% CI = 1.4–5.9). The association between being underweight and the remaining variables was not significant.

Table 2 gives the OR of the mental health score of mothers of undernourished infants stratified by selected variables and the corresponding adjusted OR (Mantel-Haenszel pooled OR). From comparison of the unadjusted and the Mantel-Haenszel adjusted OR, there is little evidence of confounding. Although the stratum-specific OR appear to differ, these differences (i.e. as an indicator of effect modification or interaction) are not statistically significant. However, this may result from the small numbers in some of the strata.

To study the combined effects of these variables on the risk of being an undernourished infant, a logistic regression model was constructed. In this analysis, only those variables that had a significant effect in the univariate analysis were included in the model. These include maternal mental health, birthweight, and number of young children. Socioeconomic status was also included because an association was present, although not statistically

Table 1. Crude odds ratio (OR) of the association between undernutrition in infants and risk factors

	Category	Cases (*n* = 82) n (%)	Controls (*n* = 90) n (%)	OR	95% CI
Mother's mental health (SRQ score)	≥10	47 (57)	23 (26)	3.9	1.9–7.8
	<10	35 (43)	67 (74)		
Birthweight*	<2500 g	12 (25)	4 (7)	4.6	1.2–20.7
	≥2500 g	36 (44)	55 (93)		
Number of children under 7 years	≥3	34 (41)	18 (37)	2.8	1.4–5.9
	<3	48 (59)	72 (63)		
Socio-economic status (Asset score)	Fourth quintile (poorer)	13 (16)	7 (8)	2.2	0.7–6.9
	Fifth quintile (richer)	69 (84)	83 (92)		
Mother's age	≥30 years	19 (23)	26 (29)	0.7	0.3–1.5
	<30 years	63 (77)	64 (71)		
Maternal literacy	Cannot read	13 (16)	11 (12)	0.7	0.3–1.9
	Can read	69 (84)	79 (88)		
Gender of infant	Female	40 (49)	44 (49)	1.0	0.5–1.9
	Male	42 (51)	46 (51)		
Family structure	Joint	54 (66)	63 (70)	0.8	0.4–1.6
	Nuclear	28 (44)	27 (30)		

*Data not available on full sample (*n* = 107; 48 cases and 59 controls).
CI, confidence interval.

Table 2. Odds ratio (OR) for association between mental health of mothers and undernutrition in infants, unadjusted and individually adjusted by selected risk factors ($n = 172$)

	Category	OR	95% CI	Chi-square test for interaction
Unadjusted OR		3.9	1.9–7.8	
Birthweight*	<2500 g	Inestimable	–	0.24
	≥2500 g	2.6	1.1–3.1	
Adjusted OR		3.1		
Number of children under 7 years	≥3	7.3	1.7–36.3	0.21
	<3	2.8	1.2–6.5	
Adjusted OR		3.6		
Socio-economic status (asset score)	Fourth quintile (poorer)	13.7	1.1–214.8	0.20
	Fifth quintile (richer)	3.1	1.5–6.5	
Adjusted OR		3.5		
Maternal literacy	Cannot read	6.6	0.7–82.2	0.50
	Can read	3.7	1.7–8.0	
Adjusted OR		3.9		
Gender of infant	Female	3.6	1.2–9	0.80
	Male	4.2	1.5–11.8	
Adjusted OR		3.9		

*Data not available on full sample ($n = 107$; 48 cases and 59 controls).
CI, confidence interval.

Table 3. Estimates of simultaneous effect of mother's mental health, birthweight, number of children, and socio-economic status on the nutritional status of the infant through logistic regression ($n = 107$)

	Odds ratio	SD	95% CI	*P*-value
Mother's mental health	2.8	1.26	1.2–6.8	<0.05
Birthweight	4.2	2.77	1.2–15.2	<0.05
Number of children	1.5	0.74	0.6–3.9	0.374
Socio-economic status	2.1	1.67	0.4–10.0	0.359

CI, confidence interval.

significant. Table 3 shows that the fully adjusted OR of 2.8 (95% CI = 1.2–6.8) for mother's mental health (although less than the crude OR of 3.9 calculated by univariate analysis) was still statistically significant ($P < 0.05$), which supports our hypothesis. The only other factor that was statistically significant at 95% level was birthweight (OR 4.2, 95% CI = 1.2–15.2).

Discussion

The main finding of this study is that high levels of maternal mental distress (SRQ > 10) are associated with the risk of undernutrition (less than third centile weight for age) in 9-month infants in urban Pakistan. When interpreting these results, however, it must be borne in mind that this study is cross-sectional in nature. It is therefore not possible to establish a straightforward cause–effect relationship or direction of the association. Other limitations are the small sample size, and the fact that the cases and controls came from just one immunization centre. Further population-based studies of a longitudinal nature are required to clarify the precise nature of this potentially important association.

Undernutrition was not found to be significantly associated with the wealth quintile. However, the study was restricted to a homogenous well-off population (most subjects belonged to the top wealth quintile for Pakistan). The impact of this variable could not therefore be usefully examined. It does show, however, that in places where food is sufficient but indicators of infant nutrition still poor, psychosocial factors such as maternal mental health could be important risk factors that need further exploration.

A number of possible mechanisms for this association have been postulated (Rahman *et al.* 2002). These include risks that maternal behaviour in antepartum depression could pose to the unborn infant, the direct impact that depressive symptoms have on parenting, and the links of maternal depression with negative life events and chronic psychosocial difficulties. There are likely to be complex interactions between factors in the child's social and economic environment, home environment, mother and the child. While the interaction between these factors may be more important than any one individual risk factor, poor maternal mental health may be a common denominator and thus an important indicator of risk to the child.

The findings of this study have implications concerning the effectiveness of public health programmes in developing countries. The impact of these programmes is related to the functional capacity of mothers, their receptivity to the message, and uptake of the intervention offered. Their psychological well-being is likely to be key to the success of these programmes, but many women in developing world communities have poor mental health. These women may represent a group whose children are at higher risk of ill health, and potentially be a specific target for advice on infant care. It might be feasible, for example, to include the assessment of maternal mental health, or maternal abilities to appropriately institute care (potentially a proxy for mental health), into the WHO's Integrated Management of Childhood Illness strategy. There is already advice to check mothers' understanding of home-based interventions, and to observe her practice, but in the section on maternal health, mental state is not addressed (Child and Adolescent Health and Development Division 1998). Also, highlighting this association could draw the attention of policy makers to the relatively ignored area of women's mental health in developing countries. Addressing the mental health needs of these women, which has been shown to be possible in the primary care setting (World Health Organization 1981; De Jong 1996), could not only reduce the burden of disease in these women but also impact upon morbidity and mortality rates in their children.

Acknowledgements

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