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Mental Health of Mothers with Malnourished Children in Nepal: A Prospective Observational Study

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ABSTRACT

Background: Maternal mental health may influence the nutritional status of their children. It was intended to assess the mental health status of the mothers of children admitted to a nutrition rehabilitation center. We specifically explored the relationship between maternal mental health and malnutrition of the child; to observe any change of maternal depressive/anxiety symptoms and weight gain in the child following admission.

Methods: In a prospective observational study, malnutrition of children was assessed based on weight for height z scores using the WHO Anthro-Survey-Analyser. We evaluated anxiety using the Generalized Anxiety Disorder Scale (GAD-7) and depression by Patient Health Questionnaire (PHQ-9). Demographic and clinical variables were collected.

Results: The degree of malnutrition of the children at admission and discharge was: mild (3.6% v 31.7%), moderate (37.7% v 26.3%), severe (58.7% v 8.4%), and no malnutrition (0.0% v 33.5%) ($p < 0.001$) respectively. At admission, 12% of mothers had anxiety, depression, or both, which decreased to 3.0% at the time of discharge. There was no difference in malnutrition scores among children of mothers with or without anxiety/depression at admission or discharge, except that children of depressed mothers continued to have significantly greater levels of malnutrition at discharge compared with the mothers without depression. Maternal anxiety or depression was not associated with the severity of malnutrition.

Conclusions: A proportion of mothers of children with malnutrition had clinical anxiety and depression; and maternal mental health concerns, especially depression may influence the nutrition of children. It is imperative to explore maternal mental health routinely for malnourished children.

Keywords: Anxiety; children; depression; malnutrition; mothers.

INTRODUCTION

Children of depressed mothers are at risk for poor child growth and undernutrition,^{1,2} and other health, developmental, and behavioral problems.³ The risk of having a depressed mother in malnourished children is higher compared to non-malnourished children; although the risk varies.⁴⁻⁶ Possibilities of difficulty establishing a bond with the children, proneness for early interruption of breastfeeding and introduction of complementary feeding have been reported.⁷ Most intervention strategies for childhood malnutrition

have not given adequate attention to maternal mental health,⁸ although the concerns are common and potentially treatable.⁶

In Nepal, almost 25% of children have malnutrition.⁹ Among factors that contribute to malnutrition in children,¹⁰⁻¹² maternal mental health has not been thoroughly studied in Nepal. We intended to explore the relationship between maternal anxiety and depression with the nutritional status of the children admitted to a nutrition rehabilitation center; and to compare the

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changes at discharge.

METHODS

It was a prospective observational study with quantitative measures. The study was conducted in the Nutrition Rehabilitation Center of a 600-bed tertiary level hospital situated in central Nepal. Every month, around 15-20 malnourished children get admitted to the rehabilitation center to improve their nutritional status. Mothers also stay along with their admitted children as caregivers during the whole period of admission.

The study sample consisted of mothers and their malnourished children admitted to the nutrition rehabilitation center. All the consecutive mothers (n=191) of children admitted during one year period from 15 January 2021 to 14 January 2022 in the center were approached for participation in the study. We included all consenting mothers with children who met the criteria for admission to the nutrition rehabilitation center.

We excluded children who were physically very unwell with illnesses needing urgent attention and were transferred to the pediatric ward of the same hospital, to another tertiary or advanced center for further evaluations and treatment. We also excluded children who had other syndromes and congenital health conditions, which could be linked to malnutrition.

Information on malnutrition, and clinical and demographic details of the children were collected through interviews of the mothers and physical examination of the children using a pre-designed questionnaire. Physical examination was conducted by consultant pediatrician supported by the pediatric nurses. The height, weight, and detailed general and systemic examination were assessed. The relevant assessments were repeated at the time of discharge. Socio-demographic variables (gender, age of child in month, number of siblings); and pregnancy related variables (planned pregnancy, number of antenatal checkups, intake of iron and calcium during pregnancy, type of delivery, delivery at home or hospital, term or pre-term) were collected. We also enquired about birth weight in kg, whether breastfed within one hour of birth, and if the child was primarily breastfed in the first six months. The feeding behavior of the child was checked if the child was a fussy eater, which was described subjectively by the mother as a difficult to feed child. Anthropometric measurements, such as height, and weight, were collected at admission and

discharge along with the number of days in hospital.

About the family, we checked for type: joint or nuclear, whether they had any economic problems, and dietary habits: vegetarian or non-vegetarian. Demographic details of the parents included age of mother, education, job of both parents and parenting responsibilities (single or both).

Malnutrition was considered based on weight for height Z-scores; which were calculated using the World Health Organization (WHO) Anthro app.¹³ Later the scores were categorized with the degree of malnutrition: -1 to -1.9 z score as mild, -2 to -2.9 z score as moderate, and -3 or lower Z-score as severe malnutrition.¹⁴

Generalized Anxiety Disorder scale (GAD-7) was used to measure anxiety.¹⁵ The GAD-7 score was calculated by assigning scores of 0, 1, 2, and 3, to the response categories of 'not at all', 'several days', 'more than half the days', and 'nearly every day', respectively. Based on total anxiety was categorized as 0-4: minimal anxiety; score 5-9: mild anxiety; score 10-14: moderate anxiety; score greater than 15: severe anxiety. A score of 10 or more has been reported as a reasonable cut-off for being in the clinical range.¹⁵

Depression was measured using the Patient Health Questionnaire (PHQ-9).¹⁶ It has 9 items which were scored from 0 (not at all) to 3 (nearly every day). Based on the PHQ-9 score the categories of increasing severity were: 0-4: none or minimal, 5-9: mild, 10-14: moderate, 15-19 moderately severe, and 20 or greater: severe. A cut-off score of 10 or above has been reported to have maximum overall sensitivity and specificity for detecting major depression.¹⁷

The project was approved by the institutional review committee of the Bharatpur Hospital, Bharatpur, Chitwan (Reference: 077/78-005A, Jan 12, 2021). The study was described to the mothers and factors such as anonymity, voluntariness, withdrawal from study without assigning any reason were explained. It was highlighted that there was no impact on the child's treatment whether mothers participate in the study or not. Following this, written informed consent was obtained from the mothers who agreed to participate in the study.

The data was entered, in Microsoft Excel; and checked for completeness and accuracy. It was analyzed using SPSS (Version 28, IBM, NY). Results were presented using descriptive statistical methods such as frequency, percentage, mean, and standard deviation. The

association of categorical variables was studied with the chi-square (χ^2) test; and the means were compared using t-test. We analysed correlation by the Pearson's test. We used linear regression to study the contribution of variables towards the malnutrition. The statistical significance was considered at the standard 0.05 level.

RESULTS

There were a total of 191 admissions during the study period; out of which 167 were recruited; two mothers did not agree to participate, and all others were transferred to other hospital units for acute care. All recruited participants were re-evaluated at the discharge from hospital and there were no drop outs. The study sample included 79 (47.3%) female and 88 (52.7%) male children with a mean age of 23.7 ± 20.7 and 23.6 ± 15.4 months respectively (not significant, NS). Most of the children were single child (67.1%), firstborn (68.3%), had a gap of more than 5 years between sibs (77.2%), belonged to joint family (73.7%), and mentioned as non-vegetarian in diet (95.2%). More than one-third (36.5%) of the sample reported financial problems.

Only a little over half (58.1%) of the sample were planned pregnancies; 95.2% of mothers had four or more antenatal checkups during pregnancy, and 100% had taken iron and calcium. Most deliveries (80.8%) were vaginal, in a hospital (96.4%), at term (94.0%) and the average birth weight was 2.7 ± 0.4 kg. Most babies were breast-fed within one hour of birth (73.1%). More than half of the babies (62.9%) were primarily breastfed for six months; however, 86.2% had complementary feed between 5-6 months. Almost half (48.5%) of the children were described as fussy eaters.

The average number of days in hospital was 18.2 ± 11.3 (range 4-57) days. The weight of the children changed from 7.9 ± 2.5 kg at admission to 8.9 ± 2.7 at discharge ($t: -21.6$, $p < 0.001$) and the WHO Z-score changed from -3.1 ± 0.8 at admission to -1.7 ± 0.9 at discharge ($t: -21.2$, $p < 0.001$). Based on the WHO Z-score the degree of malnutrition of the children at admission and discharge was: mild (3.6% v 31.7%), moderate (37.7% v 26.3%), severe (58.7% v 8.4%) and no malnutrition (0.0% v 33.5%) ($p < 0.001$) respectively. Considering the changes in the status of malnutrition for children with severe malnutrition at admission ($n=98$), it decreased significantly to 14 ($\chi^2: 8.9$, $p < 0.01$).

Malnutrition was not associated with birth order, planned or unplanned pregnancy, number of antenatal checkups, type of delivery, term or preterm delivery, place of birth:

hospital or home, breast feeding within a hour of birth, or being primarily breast fed in the first six months. Around half (49.4%) of children described as difficult to feed had malnutrition compared to 67.4% who had no problem eating ($\chi^2: 5.6$, $p < 0.05$). Severe malnutrition in children was not associated with parenting style, job or education of parents, type of family, dietary pattern or presence of economic problem in the family,

The mean age of mothers was 25.4 ± 3.5 (range: 18-40) years. There were 3.6% who had no formal education; most (76.6%) had secondary school or above education. Most (76.0%) were homemakers and 15.6% were working outside. Parenting was done by both parents in 98.8%.

At admission, clinical depression (PHQ-9 score 10 or more) was present in 16 (9.6%), which decreased to 3 (1.8%) at discharge ($\chi^2: 19.2$, $p < 0.001$). Thoughts of being better off dead or of hurting self in some way were present in 10.2% on several days and 0.6% had nearly every day at admission, which decreased to 3.6% on several days and 0.6% on more than half the days on discharge. Clinical anxiety was observed in 6.0% ($n=10$) at admission, and 2.4% ($n=4$) at discharge ($\chi^2: 23.2$, $p < 0.001$).

Considering comorbidity, six mothers had both depression and anxiety at the clinical level at admission; 10 mothers had only depression and 4 only anxiety; suggesting in total 20 (12.0%) mothers had either anxiety, depression, or both; which constituted the group with mental health problem, that would warrant attention. There was a significant association ($\chi^2: 31.2$, $p < 0.001$) between anxiety and depression status of mothers. The proportion of mothers having mental health problems at discharge decreased to 5 (3.0%); only two of them had both anxiety and depression ($\chi^2: 29.6$, $p < 0.001$). Only two mothers were referred to psychiatry for mental health reasons and prescribed antidepressant medications. Mothers received counseling by the nurse (first author), but there was no formal psychotherapy.

Table 1. Malnutrition of children and mental health of mother at admission.

	No Depression	Depression	t, p	No anxiety	Anxiety	t, p
WHO Z-score admission	151 -3.1 ± 0.8	16 -3.2 ± 0.9	0.547, 0.585	157 -3.2±0.8	10 -2.8 ± 0.8	-1.151, 0.251
WHO Z-score discharge	-1.6 ± 0.9	-2.2 ± 1.4	2.347, 0.020	-1.7±0.9	-1.5 ± 0.9	-.964, 0.336
Weight at admission	7.9±2.5	8.1±3.1	-.173, 0.863	7.9±2.4	8.7±3.7	-1.002, 0.318
Weight at discharge	8.9 ± 2.6	8.8 ± 3.3	0.191, 0.849	8.9±2.6	9.7 ± 3.8	-.639, 0.524
Hospital days	18.7 ± 11.5	13.3 ± 7.9	1.845, 0.067	18.3±11.5	16.3 ± 9.1	.543, 0.588

Table 2. Degree of malnutrition and maternal mental health.

		Up to moderate degree of malnutrition	Severe degree of malnutrition	Total		
		n (%)	n (%)	n (%)	x2	p
Depression						
Admission	Absent	65 (94.2)	86 (87.8)	151 (90.4)	1.94	0.163
	Present	4 (5.8)	12 (12.2)	16 (9.6)		
Discharge	Absent	139 (90.8)	12 (85.7)	151 (90.4)	0.39	0.532
	Present	14 (9.2)	2 (14.3)	16 (9.6)		
Anxiety						
Admission	Absent	64 (92.8)	93 (94.9)	157 (94.0)	0.33	0.565
	Present	5 (7.2)	5 (5.1)	10 (6.0)		
Discharge	Absent	143 (93.5)	14 (100.0)	157 (94.0)	0.973	0.324
	Present	10 (6.5)	0 (0.0)	10 (6.0)		

We compared the WHO Z-score for children of mothers with or without clinical depression (PHQ 9 score 10 or more) and anxiety (GAD-7 score 10 or more), along with weight at admission and discharge (Table 1). We analyzed the association of clinical depression or anxiety of mothers (identified at admission) with the malnutrition severity (severe: z score -3.0 or more with lower levels of malnutrition) in children at admission and discharge (Table 2).

Table 3. Correlation of WHO Z scores for children with anxiety and depression of mothers at admission and discharge.

	WHO Z admission	WHO Z discharge	Depression admission	Anxiety admission	Depression discharge	Anxiety discharge
WHO Z admission	--					
WHO Z discharge	.500**	--				
Depression admission	.004	-.126	--			
Anxiety admission	.009	-.061	.789**	--		
Depression discharge	.010	-.174*	.766**	.616**	--	
Anxiety discharge	.030	-.195	.663**	.737**	.751**	--

** . Correlation is significant at the 0.01 level (2-tailed).; * . Correlation is significant at the 0.05 level (2-tailed).

We explored the correlation of malnutrition (WHO Z-score) of children with depression (PHQ-9) and anxiety (GAD-7) score of the mother at admission and discharge (Table 3).

Table 4. Regression table for contributing factors (at admission).

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
1 (Constant)	-3.782	.399		-9.468	<.001
Age (month)	.014	.004	.247	3.247	.001
Birth weight (kg)	.121	.145	.064	.835	.405
2 (Constant)	-3.791	.416		-9.119	<.001
Age (month)	.014	.004	.249	3.240	.001
Birth weight (kg)	.123	.147	.064	.837	.404
Depression	-.009	.028	-.041	-.331	.741
Anxiety	.011	.031	.043	.346	.730

a. Dependent variable: WHO Z-score at admission

We used linear regression to assess the contribution of anxiety and depression towards malnutrition at admission, controlling for variables such as age in months and birth weight (Table 4). While the age of children contributed significantly towards malnutrition, depression and anxiety scores of mothers did not.

The weight at admission and discharge, number of days in the centre, maternal depression, and anxiety scores at admission and discharge were comparable between male and female children. Although higher proportions of mothers of female children were depressed and anxious, both at admission and discharge, these were not statistically significant. While the average WHO Z-scores of male and female children were comparable at admission (-3.2 ± 0.8 v -3.1 ± 0.8 , $t:-0.943$, $p: 0.347$); these were significantly lower for female children at discharge (-1.5 ± 0.8 v -1.8 ± 1.1 , respectively, $t=1.99$, $p:0.048$). Similarly, the proportions of male and female children with severe malnutrition at admission were comparable; but the difference approached significance at discharge (4, 4.5% v 10, 12.7%, $\chi^2: 3.57$, $p: 0.059$).

DISCUSSION

This study explored the relationship between maternal mental health and the poor nutritional status of children attending a nutritional rehabilitation center in Nepal. The findings indicated that at admission more than half of the children had severe malnutrition, and 12.0% of mothers had clinical level of anxiety or depression; however, the malnutrition scores of children did not differ between the mothers with or without mental health problem. At discharge, while there was no difference in malnutrition scores for mothers with or without anxiety; children of depressed mothers continued to have a significantly greater level of malnutrition compared with the mothers

without depression. The results highlighted that the process of recovery from malnutrition in children may be compromised in mothers with depression. This would probably require attention to maternal depression while treating malnutrition of the children.

The high prevalence of malnutrition in our study, compared to general population figures in Nepal,^{9,18} is probably because it was a hospital-based sample, where children needed admission for treatment of their malnutrition. However rural mountainous areas of Nepal also had a higher prevalence of underweight, stunting, and wasting.¹⁰ The malnutrition figures did come down after an average admission period of 18 days in the rehabilitation center, which was expected, with many children recovering from malnutrition.

It was observed that while there was no gender difference regarding malnutrition at admission; but at discharge, female children had significantly a higher degree of malnutrition; although both groups improved significantly from their admission state of malnutrition. Previous studies have reported comparatively higher prevalence in both boys,¹⁹ and girls.²⁰ In our study, although girls improved in their nutritional status, it remained significantly lower at the end of the intervention period compared to boys. The reasons behind this may need further exploration.

It was interesting to note that significantly lower proportion of children who were considered as difficult to feed by their mothers had malnutrition, compared to those who had no such problem. It is reported that fussy eating leads to restricted dietary variety and unhealthy eating habits;²¹ which may be linked to malnutrition. Similarly, maternal depression has been linked to lack of variety in children's food.²² It is possible that in our

study, mothers provided more attention to the children who were fussy eaters. However the factors about eating behavior and malnutrition may be specifically studied.

Considerable proportions of mothers had depression and anxiety at admission in our study. The reported prevalence figures of maternal depression (4.2%-21%),²²⁻²⁴, or anxiety (16.1%-18.7%)^{23,24} or comorbidity of both (5.9 %)²⁴ in Nepal have been variable; however higher burden of anxiety and depression in women in Nepal has been reported.²⁵

There was an improvement in the mental state of most of the mothers while their children were treated at the centre, although only two mothers received antidepressants. There could be various reasons for this improvement in mental health of mothers. Malnutrition of children requiring admission could have been a stress factor for mothers; and being at the rehabilitation center, enabling them to concentrate only on child care might have some contribution. Besides, mothers also had counseling from the nurses. However, factors related to improvement in mental state of the mothers would need further study. Nonetheless, there were still mothers with mental health problems at discharge who would need professional support, possibly through psychological or pharmacological intervention.

It is reported that poor mental health of mothers affects upbringing and caring for children; and negatively influences the nutritional status of children.²⁶⁻²⁸ A study estimated that a decrease in the prevalence of maternal depression could lead to a reduction in impaired child growth of up to 30 %.²⁹ In our study, although the malnutrition status of children of depressed mothers improved following treatment, it still remained significantly higher at discharge; and the depression score was negatively correlated with WHO Z-score. This meant higher the depression score lower the Z-score, i.e. more malnutrition. In addition to this negative correlation, it is possible that maternal depression could be a factor in comparatively poorer improvement in childhood malnutrition; as observed in our study. This suggests that in case of malnutrition in children, clinicians should remain alert regarding maternal depression, and arrange for assessment and intervention appropriately. Effectiveness of these interventions for depression of mothers on malnutrition of children may be studied further.

There are a few limitations of this study. Data was collected from only one center so generalizability may be limited to centers with similar facilities, rather than

all clinical setups. As the number of the mothers with anxiety and depression was low, statistical comparison or association analyses were not possible for many variables, suggesting larger sample sizes in future studies.

CONCLUSIONS

In a prospective observational study, the association of malnutrition of children admitted to nutritional rehabilitation center along with anxiety and depression of mothers was studied. A considerable proportion of children had moderate to severe malnutrition with more than half the children having severe malnutrition. The prevalence figures decreased significantly following inpatient treatment. Similarly, a proportion of mothers had anxiety and depression at admission, which decreased considerably at the time of discharge; which could be due to the improvement of children's health, support and counseling of mothers from nurses. The children of depressed mothers continued to have significantly greater levels of malnutrition at discharge compared with the mothers without depression; which highlighted the need for mental health assessment of mothers and the need for support.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

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