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Community Based Psychosocial Intervention in Reducing Maternal Depression and Improving Infant's Development in Bangladesh: A Randomized Control Trial

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Abstract: *The study followed a prospective longitudinal approach with a randomized controlled design. A total 830 pregnant women were screened for depression using BEPDS and enrolled in the third trimester of pregnancy and 299 women with depressive symptom (36%) identified. Out of 299, 250 pregnant women aged between 15 and 40 years were randomly assigned into intervention and control group having 125 women in each arm. Women in the intervention group received the "Thinking Healthy (CBT based) program" at their home setting, from their last month of pregnancy till 10 months after delivery. Their children received psychosocial stimulation from birth till 10 months. Bangla version of Edinburgh Postnatal Depression Scale (BEPDS), Prenatal Attachment Inventory (PAI), Maternal Attachment Inventory (MAI), Bayley Scale of Infant Development-Third version (Bayley–III) and Family Care Indicator (FCI) were applied to get the outcome information. In addition, sever morbidity; breastfeeding, immunization, socio-economic and demographic information were collected. Data were collected at three time points' viz. baseline, midline (6 months after delivery) and endline (12 months after delivery). There was no significant difference between any of the socioeconomic and demographic variables at baseline. EPDS at baseline was not different between the groups (p=0.419), but there was a significant improvement at midline (p=0.027) and at endline (p=0.024) between the groups following the intervention. Home stimulation was significantly different between the groups at 6 month (p=.023) and 12 months (p=0.010). There was no significant effect of the intervention on maternal depression after controlling the confounders. The differences in weight-for-age and height-for-age Z scores for infants in the two groups were not significant at 6 months (-0.84vs-0.99, p=0·4 and -1.4 vs -1.3, p=0·7 respectively) and 12 months (-0.99vs -1.1, p=0·7 and -1·41vs -1·56, p=0·4, respectively). The group difference in developmental outcomes of infants were significant at 6 months (p=.008, p=016, p=.004 for cognitive, motor and language development respectively) and at 12 months (p=0.002, p=0.065, p=0.022, p=0.000 for cognitive, motor, language and socio-emotional development respectively). After controlling the confounders the effect size of the intervention on cognitive and social emotional development were 0.36 and 0.45 respectively.*

Keywords: *Community based, Psychosocial Intervention, Maternal depression, Infant's development*

I. Introduction

Depressive disorders are common mental illness that occurs in people of all ages across the world. It is evident that depressive disorders are among the leading issues in the Global Burden of Disease (GBD) during 1990 and 2000 years (Ferarri, et al.,2013; WHO 2001). Women are especially vulnerable to develop depressive feeling or clinical depression during the postnatal period (Cox et. al., 1993). Depression experienced in the antenatal period is thought to be the best predictor of postnatal depression (Beck, 2001; Lee & Chung, 2007). The prevalence of perinatal mental disorders is 10-15% and 10-41% in high and low income countries respectively (WHO report, 2008).Depressive illness in perinatal period ranges from 16 to 35% in developing countries (Ghubash et al, 1997; Cooper et al, 1999; Patel et al, 2002). The prevalence of common perinatal mental disorders among women in low and lower- middle income countries is 15.9% compared to 10 and 13% in high income countries during pregnancy and postnatal period respectively (Fisher et al, 2012). Postnatal depressive symptoms persisted in about 30% of women for up to a year after delivery (Goodman, 2004) and it was up to 56% in low income countries (Rahman, 2007).The Lancet series on child development identified maternal mental health problem as one of the major determinants of developmental delay in young children in low-income countries (Walker et al, 2007, 2011). Perinatal depression affects infants and children's health and development e.g. birth weight, nutrition, growth, cognitive development, behavior and academic achievement as a result of hampering maternal responsiveness and mother-infant relationship, (Patel et al, 2004; Harpham et al, 2005; Black et al,2007;Wachs et al, 2009; Nasreen et al, 2010, Edbhorg et al, 2011, Rutter& Quinton,

1984; Kaplan, et al 1987; Welner& Rice, 1988; WHO, 2008; Wachs, et al 2009). Mental health problems during pregnancy are rarely reported in Bangladesh. Gausia et al. (2009) found 33% prevalence rate of antepartum depressive symptoms (ADS) in the southwest part of Bangladesh while it was 18% in Northern areaswith 29% antepartum anxiety symptoms (AAS) (Nasreenet al.2011). Both the studies identified the risk factors of ADS and AAS as low education level of the women, poor partner relationship, forced sex, physical violence, previous depression, low SES, lack of support from husband and his family and preference for male child. Maternal depression is associated with poor infant and child development, but we did not find any intervention trial in Bangladesh to address this specific problem. Though it is a public health priority, the Government of Bangladesh has not yet addressed this issue in the health policy. Among the non-government organizations very few have taken limited initiatives to address women's depression i.e. Action for Hunger. Therefore, it is prime time to address this issue to ensure better health and development of the future generation.

II. Hypothesis

A program of psychosocial intervention on mothers with mild to moderate depressive illness during perinatal period will have positive effects on their depressive illness and their infants' growth and development.

III. Objectives

The purpose of the present study is to examine the efficacy of a community based psychosocial intervention on women with depressive symptoms during the perinatal period on their mental status and their infants' growth and development. The specific objectives are:

1. To determine the prevalence of perinatal depressive illness among per-urban women in Dhaka
2. To assess the association of maternal depression on children's growth, cognitive development and attachment with mothers at 6 and 12 months.
3. To determine the effect of the psychosocial intervention on maternal mental health.
4. To examine the effect of intervention on infants' growth and development.

IV. Methods

4.1 Study Design

The study followed a prospective longitudinal approach with a randomized controlled design. Pregnant women in their last trimester of pregnancy were screened for depressive symptoms and were randomly assigned to either intervention or control groups.

Figure 1: Kamrangirchor Map

4.2 Study Area and Population

The study was located in Kamrangir Char, 14 km of Dhaka city. The total area is 3.63 km² and comprises approximately 1,43,208 population. The study was nested into BRAC health program which was operating i) preventive health and nutrition education e.g. immunization, family planning, pregnancy and reproductive health care and ii) basic curative services through MANOSHI project.

The study population was pregnant women aged between 15- 40 years with mild to moderate depression who were in their third trimesters and were receiving MANOSHI health services.

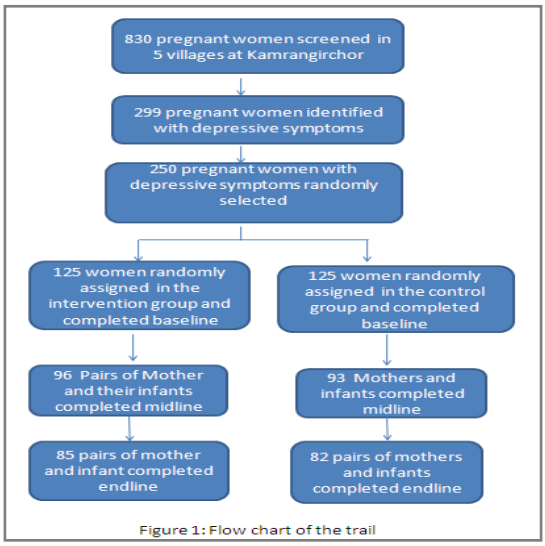


Figure 1: Flow chart of the trail

4.3 Sample

The pregnant women were registered in MANOSHI project from March to May, 2013. The local office had the data base of all pregnant mothers which were used as sampling frame. A total of 830 pregnant women were screened to diagnose depressive illness and 299 women (36%) were identified. Out of them 250 pregnant women with mild to moderate depressive symptoms were selected randomly and assigned to intervention and control groups. The sample size was estimated according to expected effect size of 0.4 SD,

alpha= 0.05, the power=80% and accounting for 25% drop out. We required to enroll 125 mothers in each arm to detect a mean difference of 0.4 SD between intervention and control groups. All women were followed up from third trimester to 10 months postpartum (figure 1).

4.4 Intervention and control groups

Pregnant women in both intervention and control groups received the MANOSHI health intervention as regular health service. Women in the intervention group received the Thinking Healthy program during individual session at home by one of the 4 trained community health workers (CHWs) along with routine MANOSHI program. At the same time 2 trained community health workers visited the control mothers. All CHWs received five days basic and one-day refresher training twice during the study period. They were closely supervised and monitored by the program coordinators to ensure the quality of the program.

4.5 Intervention

The intervention group received Thinking Healthy program which was developed by Dr. Atif Raman, Professor, Liverpool University (Rahman et al. 2008) using Cognitive Behavior Therapy (CBT) approach and we modified it for use in Bangladesh following a systematic process.It has five modules covering the period from third pregnancy trimester to first year of infant's life. It consists of 16 sessions with 4 sessions in the last month of pregnancy, 3 sessions in the first postnatal month, 3 in early infancy, 4 in middle infancy and 5 in late infancy. Trained female community health workers (CHWs) delivered the sessions at home . The length of each session was 30-45 minutes. In each session, mothers learned to identify the unhealthy thinking and practiced and replaced negative or unhealthy thinking with positive or healthy thinking styles. The CHWs also took session on stimulation for children.

4.6 Instruments

The following instruments were applied;

1. Bangla Edinburgh Postnatal Depression Scale (BEPDS). The original EPDS was developed by Cox (Cox, et al. 1987) to screen for postpartum depressive symptoms. It is self rating questionnaire consisting of 10 items and rated 0-3 on each item. The range of total scale score is from 0 to 30. The higher score indicates more depressive symptoms. The Bangla version of EPDS was validated in Bangladesh by Gausia et al. (2007) for postpartum mothers. The sensitivity and specificity were 89% and 87% respectively at the cutoff of 9 out of 10. This cutoff point will be used in the study to categories mothers with depressive symptoms (10 or more) and without symptoms (<10). The scale demonstrates relatively good reliability with a Cronbach's alpha of 0.70.
2. Bayley Scale of Infant and Toddler Development, Third edition (Bayley-III) was developed to assess the developmental functioning of infants and young children 1 to 42 months of age (Albers et al., 2007). The Bayley-III measures cognitive, language, motor, socio-emotional development and adaptive behavior of the children. The earlier version of this test (BSID-II) has been used previously in Bangladesh when the mean scores of urban (Hamadani et al., 2001) and rural (Black, et al., 2004) children were within the normal range and good test-retest reliabilities were achieved (Hamadani et, al.,2006).
3. Prenatal Attachment Inventory (PAI) was developed by Muller (Muller, 1993) to assess the mother's feelings, thoughts and relationship to fetus during last trimester of the pregnancy. It consists of 21 item rated from 1 to 4 and high score indicates high emotional relationship to the fetus. It has been translated from English to Bangla. The Cronbach's alpha for the Bangla version was 0.95 and the test-retest reliability was 0.90 ($p<.01$).
4. Maternal Attachment Inventory (MAI) was developed by Muller to assess the mothers' feelings, thought and relationship to the infants (Muller, 1993& 94). The scale consists of 26 items rated from 1 to 4 and high scores indicate high emotional relationship to infants. It has been translated from English to Bangla. The Cronbach's alpha for the Bangla version was 0.78 and the test-retest reliability was 0.64 ($p<.01$).
5. Family Care Indicators (FCI) was used to assess home environment which was developed by a group of experts organized by UNICEF (Frongillo, et al., 2003). The tool has been validated in Bangladesh (Hamadani et al,. 2010). It consists of five subscales: 'play activities' (PA), 'varieties of play materials' (VP), 'sources of play materials', 'household books', and 'magazines and newspapers' (MN).
6. Anthropometry: Weight, Height, mid-upper arm (MUAC) of all study mothers and weight, length, MUAC and head circumferences of all study infants were measured using standard techniques.
7. SES information: All study households will be visited during baseline to collect socio-economic information i.e. parental education and occupation, family assets, family structure, household structure and utility facilities, etc.

4.7 Data Collection procedure

The duration of the study was 24 months. A total 830 pregnant women were screened for depression using BEPDS and enrolled in the third trimester of pregnancy and 299 women with depressive symptom identified. Out of them 250 were randomly assigned into intervention and control groups. Baseline and end line data were collected from mothers and children at 6 month and 12months after birth (figure 1). Six testers with psychology background were recruited to collect data and one field supervisor coordinated and monitored data collection in both pre and post test. All testers received three to four weeks of training on administration of psychological measurement tools including filed practice. To ensure the quality of the data and minimize errors, we conducted inter-observer reliabilities and started tests after an overall agreement of >80% is achieved between each tester and the trainer. Reliability scores of the testers ranged from 0.95 to 0.99. We also continued ongoing reliability assessment during the test on at least 10% of the population.

After enrollment, information on mother's feelings, thoughts and relationship to fetus during last trimester of pregnancy, socio-economic status and demographic information were collected as baseline information. Anthropometry of infants in both groups was taken at birth, 6 and 12 months of age. Cognitive development of infants was assessed by using Bayley Scales of Infant and Toddler Development–III at 6 and 12 months of age. Mothers were re-assessed for depressive symptoms using EPDS at 1, 6 and 12 months post-partum. Maternal attachment was assessed using MAI during postnatal period. Home stimulation of all infants was assessed with FCI at, 6 and 12months postpartum.

Screening and baseline data was collected between March-June 2013. Measurement at different time points was taken as mentioned above. Endline data was collected during March2015. All measurement tools were applied at home.

4.8 Statistical Analysis

Before entering into computer, data were checked and cleaned in the data sheet manually. All data were entered into computer using SPSS 16 and checked for normality. Preliminary analyses was conducted to determine differences between intervention and control mother -child dyads on variables related to demographic, economic and nutritional status. Frequencies and mean scores were calculated for each group. To compare the groups Independent sample t-test and Chi-square test were applied for continuous and dichotomous variables respectively. Correlation analysis was used to see the relationship between maternal depression and other variables e.g. SES and nutritional status. To examine the intervention effect, multiple linear regressions analyses was conducted to control for baseline measures, differences between lost and tested and any confounding variables.

V. Ethical Consideration

The study drew on ethical guidelines developed by James P. Grant School of Public Health, BRAC University. The most important principle that guided the implementation and evaluation of the study was that the mothers and their infants must be protected from harm. Mothers were informed of the study procedures, risks and benefits, protection of the infant's privacy, and the infants' and mothers' freedom to discontinue participation through written informed consent. They were allowed to ask questions and to make a voluntary decision about their infant's. They were also informed that they meight refuse to participate without incurring any penalty to them or to the infant. Women who were identified as sever depressed were referred to mental health specialist or counselor. All information about study participants were kept in strict confidence and their identities were anonymised by using identifier codes on data files and storing the lists of participants and their identifier codes separately in a locked cabinet. The names of participants and any other personal means of identification were not used in the data analysis and dissemination, thereby ensuring that personal identities were kept anonymous.

VI. Results

A total of 830 pregnant women were screened to diagnose depressive illness in the second trimester and 299 women (36%) were identified. Out of them 250 pregnant women with mild to moderate depressive symptoms were selected randomly and assigned to intervention and control groups.

Of the total 250 pregnant women, 25%were lost in the midline assessments (n=63) due to out-migration (n=44),abortion (n=3), still birth (n=4), and refusal to continue the study (n=2). Only 167 mothers were available at the end of the study i.e. one year post delivery because further losses occurred due to 25% migration (n=63) and 1.2% refusal (n=3).

Table 1shows characteristics of children and their families in all tested children. The mean age of mothers and fathers were 22 and 29 years respectively. The average BMI of mothers was 22.3 kg/m^2 and gestational age was 36.8 weeks. The mean (SD) depression score of pregnant women was 14.3 (4.28). Forty seven percent of infants were girls. The groups were similar in family and socioeconomic characteristics and

depression level. There was no significant difference in any of the socioeconomic and demographic variables at baseline between the groups. The lost to follow-up participants had less number of assets (p=0.01), were less vaccinated (p<0.001), received less colostrum (p=0.003) and lower income father's measured at baseline compared to the tested participants. We therefore controlled for these differences in the multiple regression analysis.

Table 1: Characteristics of children and their families in intervention and control groups

Variables	**Whole Sample (n=250)**	**Intervention (n=121)**	**Control(n=125)**	***p*-value**
		Mean± SD or %	Mean ± SD/%	
Family characteristics				
Housing index	5.10±0.88	5.15±0.87	5.06±0.88	.408
Asset index	9.28±5.88	9.36±5.538	9.22±6.217	.853
Parental Characteristics				
Mother's age	22.26±4.99	22.69±5.11	21.84(4.86)	.578
Mother's education (less than 5 grade)	38.0%	38.0%	48.0%	.114
Mothers not employed	86.2%	84.3%	88.0%	.400
Mother's BMI (kg/m^2)	22.29±4.11	22.36±3.96 (n=95)	22.24±4.3(n=93)	.841
Depression level (EPDS score)	14.31±4.28	14.10±4.00	14.53±5.55	.419
Father's age	29.13±6.57	29.36±6.07	28.90±7.04	.856
Father's education (less than 5 grade)	29.8%	29.8%	41.6%	.053
Father with no regular employment (%)	50.4%	51.2%	49.6%	.596
Child characteristics				
Female	47.3%	43.0%	51.8%	.185
Gestational age	36.77 ± 2.10	37.13±2.05	36.42 ±2.10	.016

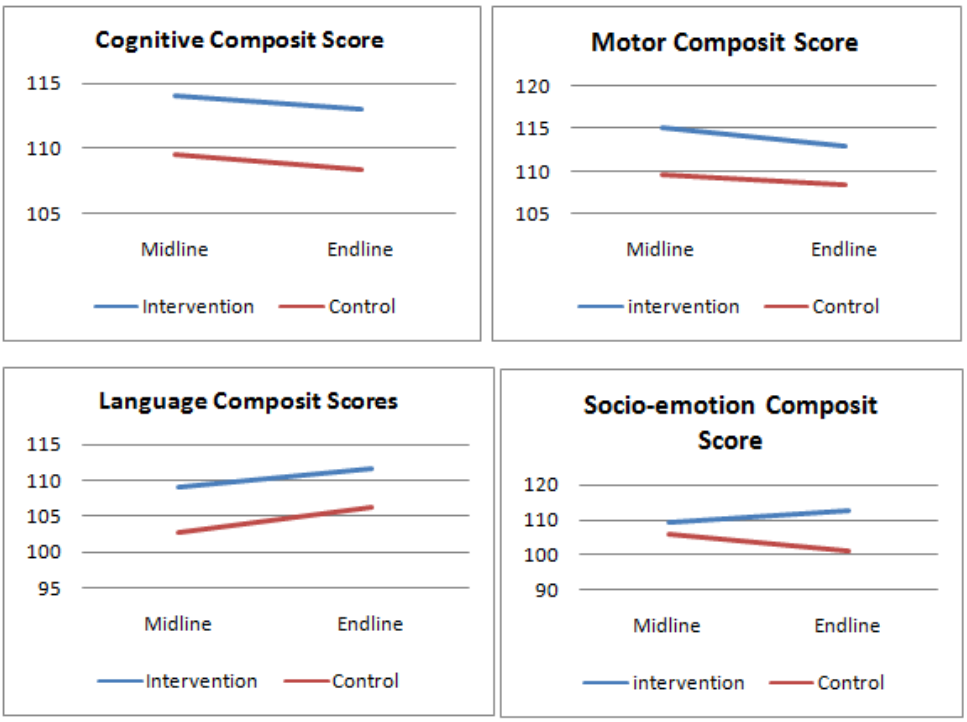
Table 2shows age, anthropometry and developmental outcomes of infants. There were no significant group differences in anthropometric measurements at 6months and 12 months after birth, however, there were significant differences in maternal depression scores and children's developmental outcomes of the groups (Table 2).

Table 2: Characteristics of mothers and children in intervention and control groups at 6 and 12 months

	Midline			**End line**		
Variables	**Intervention**	**Control**	**p-value**	**Intervention**	**Control**	**p-value**
	(n=95)	**(n=93)**		**(n= 85)**	**(n= 82)**	
EPDS score	6.11±5.4	8.02±.6.3	.027	6.52±6.3	8.95±7.4	.024
Age	6.03±0.9	6.18±0.5	.011	12.034±0.3	12.107±0.3	.152
HAZ	-1.4±1.2	-1.3±1.1	.722	-1.408±1.2	-1.563±1.1	.407
WAZ	-0.84±1.4	-0.99±1.3	.441	-0.999±1.4	-1.079±1.3	.702
WHZ	-0.79±1.5	-0.99±1.3	.327	-0.987±1.4	-1.078±1.3	.655
Developmental Outcomes						
Cognitive Composite score	114.05±10.373	109.52±12.770	.008	113.04±8.884	108.41±10.2	.002
Motor Composite score	115.09±15.185	109.57±16.066	.016	106.51±11.718	102.99±12.7	.065
Language Composite score	109.21±13.1	102.85±16.7	.004	111.63±13.9	106.34±15.6	0.022
Socio-emotional Composite score	109.32±21.4	105.70±21.4	.249	112.56±18.4	100.79±20.8	0.000
FCI	18.54±9.6	15.58±7.9	0.023	20.52±9.7	16.73±9.1	0.010

Cognitive, language and motor composite scores at midline and cognitive, languages, motor and social-emotional composite scores at endline were significantly higher in the intervention group compared to the control group (Table 2and Figure 2).

The children in the intervention group also received better home stimulation (FCI score) and their mothers had lower depressive symptoms (Figure 3) at both midline and endline (Table 2).



Figures 2: Child developmental scores at midline and end line

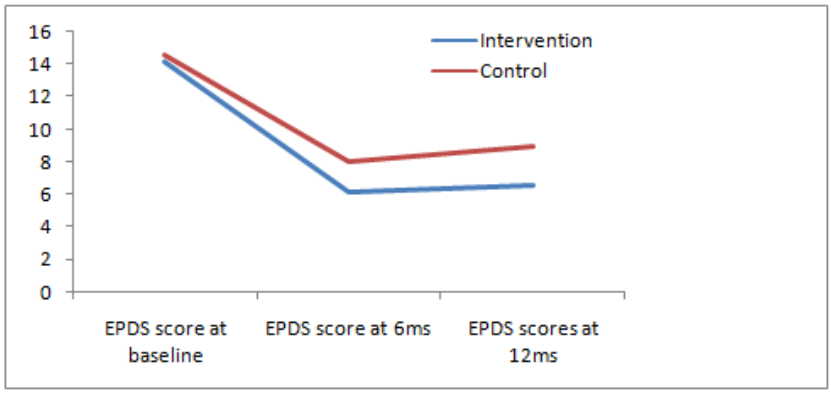


Figure 3: Maternal depression level at different time.

Correlation with outcome variables

Bivariate correlations were determined between outcome variables and socioeconomic variables. Cognitive, motor, language and socio-emotional composite scores were significantly correlated with colostrum intake, psychosocial stimulation (FCI), mother's attachment, HAZ ,WAZ,WHZ (Table 3). Maternal depression at 6 and 12 months post-partum was negatively associated with children's developmental scores. Older children had lower developmental scores and asset index was only related to final language composite scores.

Table 3: Bivariate correlation of composite scores of developmental variables with EPDS, SES, nutritional status and home stimulation

	At midline				At endline			
Variables	**cognitive**	**language**	**motor**	**socio emotional**	**cognitive**	**language**	**motor**	**socio emotional**
Asset index	-.006	-.007	.099	-.003	.165*	.231**	.177*	-.041
Mother's Age	-.030	.047	.031	-.047	.139	.148	.060	.163*
Mother's BMI at midline	.030	.009	.095	-.069	.095	.204**	.161*	.023
Mother's education	.093	.114	.149*	.115	.169*	.088	.170*	.094
Father's education	.158*	.066	.202**	.106	.285**	.158*	.248**	.110
Child's age	-.060	-.019	-.072	-.033	-.122	-.160*	-.105	-.138

Birth weight	.024	.047	.140	.073	.172*	.028	.184*	.056
Colostrum given to child	.148*	.191**	.150*	.097	-.113	-.094	.068	-.012
FCI	.234**	.300**	.285**	.246**	.332**	.405**	.293**	.314**
PAI	.071	.128	.185*	.295**	.106	.097	.075	.026
MAI	.360**	.331**	.262**	.499**	.348**	.527**	.052	.532**
HAZ	.273**	.256**	.300**	.144*	.263**	.069	.190*	.039
WAZ	.247**	.250**	.389**	.139	.143	.130	.113	.016
WHZ	.241**	.256**	.385**	.139	.143	.135	.112	.022
EPDS	-.193**	-.188**	-.128	-.164*	-.215**	-.302**	.041	-.124

. Correlation is significant at the 0.05 level (2-tailed).. Correlation is significant at the 0.01 level (2-tailed).*
FCI=Family care indicator, PAI=Parental Attachment Scale, MAI= Maternal Attachment scale, HAZ=Height-for-age, WAZ= weight-for-age, WHZ= Weight-for –height, EPDS=Edinburg postpartum depression scale

Intervention effect

After controlling for covariates that were associated with developmental outcomes or significantly different between the lost and tested participants, the results showed a beneficial effect of intervention on cognitive development (p=0.013) and socio-emotional behavior (p=.001) of children (Table 4). Children's attachment with mothers and HAZ were significant predictors of cognitive development while assets, attachment and psychosocial stimulation at home significantly predicted socio-emotional development.

Table 4: Regression coefficients (95% CI) of significant independent variables from multiple regression analyses predicting final child development outcomes by intervention and control groups

Variables	**Cognitive**		**Language**		**Motor**		**Socio-emotional**	
	B(95% CI)	*P value*	*B(95% CI)*	*P value*	*B(95% CI)*	*P value*	*B(95% CI)*	*P value*
Asset	-0.03 (-0.281, 0.214)	0.743	0.25 (-0.11, 0.61)	0.250	0.03 (-0.30, 0.35)	0.876	-0.56 (-1.029, -.100)	0.018
EPDS at endline	0.016 (-0.204, .236)	0.887	-0.12 (-.435 , .197)	-0.119	0.371 (.081 ,0.661)	0.013	0.53 (.120, .947)	0.012
MAI at endline	0.29 (0.121, .449)	0.001	0.67 (.433, 0.905)	0.669	-.033 (-.249 , 0.183)	0.764	1.16 (.854, 1.470)	0.000
Father's Employment	3.01 (0.032- .994)	0.048	0.49 (-3.798,4.771)	0.486	3.6 (-.323,-.529)	0.072	-2.54 (-8.130, 3.059)	0.372
FCI at endline	0.10 (-0.078,0.282)	0.265	0.22 (-0.038, .479)	0.220	0.36 (.126, .600)	0.003	0.41 (.068 , 0.743)	0.019
Child's HAZ at endline	1.63 (0.466, 2.802)	0.006	-0.25 (-1.927, .430)	-0.248	1.4 (-.126, 2.951)	0.072	1.02 (-1.169, 3.216)	0.358
Group	-3.49 (-6.240,-0.753)	0.013	- 2.99 (-6.932, .956)	-2.988	-2.89 (-6.504, .723)	0.116	-9.2 (-14.346, -.047)	0.001
R^2	0.255		0.337		0.174		0.394	

Abbreviations: B, regression coefficient; EPDS, Edinburgh Postnatal Depression Scale; MAI, Maternal Attachment Inventory; HAZ, Height-for-age z score
Model for Cognitive score : Asset ,EPDS at endline, MAI at endline, father's occupation,FCI at endline,child's HAZ at endline, group entered,
Model for Language score: step 1: Asset EPDS at endline, MAI at endline, father's occupation,FCI at endline,child's HAZ at endline, group entered.
Model for Motor score: Asset, EPDS at endline, MAI at endline, father's occupation, FCI at endline, child's HAZ at endline, group entered
Model for Socio-emotional score: Asset ,EPDS at endline, MAI at endline, father's occupation, FCI at endline, child's HAZ at endline, group entered
**P<0.05, **P<0.01, ***P<0.001*

However, there was no intervention effecton maternal depression (Table 5). Mothers who provided better psychosocial stimulation for their children, had good relationship with husband and had close attachment with their children had lower depressive scores.

Table 5: Regression coefficients (95% CI) of significant independent variables from multiple regression analyses predicting final maternal depression by intervention and control groups

Variables	EPDS midline		EPDS endline	
	B(95% CI)	*P value*	*B(95% CI)*	*P value*
FCI	-.14(-.23,-.05)	.004	-.19(-.30, -.09)	.000
Relationship with husband	-2.47(-3.75, -1.12)	.000	-3.16(-4.63, -1.70)	.000
MAI	-.16 (-.26, -.05)	.003	-.16 (-.26, -.05)	.005
Group	1.04(-.55, 2.62)	.198	1.14(-.70, 2.97)	.222
R^2	.207		.304	

Abbreviation: B, regression coefficient; EPDS, Edinburgh Postnatal Depression Scale; MAI, Maternal Attachment Inventory; FCI, Family care indicator
Model for EPDS midline : Occupation, FCI, relationship with husband, MAI, group entered,
Model for EPDS endline : Occupation, FCI, relationship with husband, MAI, group entered,

VII. Discussion

Psychosocial intervention during the last trimester of pregnancy benefited cognitive and socio-emotional development of infants of depressed mothers, but did not affect infants' growth nor reduced maternal depressive symptoms. The study was a community based randomized trial and the risk of contamination was negligible. We suffered a great loss of 33.7% from the original sample and the loss was higher in the control group, however, we controlled for these differences in our analysis. The intervention was started at last trimester and was continued until 10 months after birth. The intervened mothers received psychosocial session on positive thinking and child stimulation. The psychosocial sessions were provided by trained and experienced community health workers who were from the same area and had similar background. All the assessments were done by trained and experienced research assistants with a Masters degree in Psychology or the related field. Reliability scores of the testers ranged from 0.95 to 0.99and all instruments were culturally adapted. To assess depressive illness of women in both pre and postnatal period we used EPDS, which is validated (Gousia, et al. 2007) and used in several studies in Bangladesh. Bayley Scales of Infant and Toddler Development (Bayley-III) was used to assess development of infants. Though it has not been standardized in Bangladesh, it was modified to make it culturally suitable for Bangladeshi children and has been used in many studies in this country. To the best of our knowledge, Bayley is the only test available for this age-group in Bangladesh and has been frequently used in research and clinical settings where sensible and predictable correlations were found with socio-economic condition, parental education, stimulation at home and nutritional status of children (e.g. Hamadani et al., 2001& 2014;Black, et al., 2004). Moreover, Bayley-III was able to pick up differences due to interventions (Hamadani et al. 2006, 2013; Nahar et al. 2012) or maternal anemia (Hamadani et al. 2012) in Bangladeshi children. In the study we controlled for variables that were associated with the outcomes and were different between the lost and tested participants. The effect size for cognitive composite score was 0.36 which is close to those found in other similar studies (Hamadani et al. 2006; Nahar et al. 2012).There was even higher effect size of 0.45 for socio-emotional scores which shows the greater effect of intervention on children's socio-emotional behaviour that is supported by other studies (Jacobson 1991, Gelfand,1996). It is possible that this intervention improved mothers' mental health and mother- infant attachment which led to better mother-infant interaction and engagement resulting in higher cognitive and socio-emotional development of infants. It is therefore highly likely that the group differences at follow up were due to the intervention. The baseline characteristics in the two groups were not significantly different and the research assistants remained unaware of the study group. Though the level of depression was reduced in intervened mothers (figure 5), the intervention effect was not significant after controlling for confounders (Table 5). There are several possibilities for lacking a benefit in the study. We had suffered a loss of 33.7 % from the original randomized sample and the loss was higher in the intervention group compared to the control group. A good number of mothers were dropped due to unemployment and poverty for which they left the study area and returned to their villages. Therefore, the intervention effect may have been diluted due to small sample size. Another possibility is short duration of intervention. The total duration of intervention was 11 months starting from last month of pregnancy to 10 months after childbirth. Though 11 months may seem to be long enough for an intervention, but in reality the mothers did not get enough time to practice the behavior they learnt from the intervention and did not get time to take care of themselves because most of them were working and in addition they were solely responsible for the household chores. The overall economic, social and family environment may have contributed to lack of any benefit demonstrated from the intervention. The intervention was not solely focused on maternal depression or mental health disorders. It is an integrated cognitive behavior therapy approach with child development that eases with routine work of health workers under mother and child health program (MCH). MCH programs usually focus on mothers' and children's physical health, immunization and family planning, while mothers' mental health and children's development are totally ignored. This intervention shows that integration of maternal mental health programs with early childhood development (ECD) activities can results in improvement of children's development and their mothers' mental health at the community level. Most of mental health

services are hospital based, located in urban areas and are scarce as well as costly in Bangladesh. Therefore, such programs can be used for mental health support for poor women who have limited access to health facilities. Depression will be the second leading cause of global burden of disease by 2020 (WHO,2001)and it was also mentioned in the Lancet series on child development (Walker et al. 2011) that maternal depression is a major risk factor of delayed child development. The world leaders recognize the importance of maternal mental health and well being and it is therefore included in the Sustainable Development Goals (SDG). Based on our experience we would like to suggest considering maternal mental health as an important public health concern and incorporating it in the general health programs because there is no health without mental health. We believe women's mental health should get the priority for themselves and their children's development.

VIII. Conclusion

Psychosocial intervention is found effective in reducing women's low and moderate depressive illness to cope with mental health problem and improving development of young children in Bangladesh.

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