An Investigation on Effectiveness of a Comprehensive Child Development Package

Ferdousi Khanom; Sakila Yesmin; Syeda Sazia Zaman, Nishat Fatima Rahman, Roxana Khanom, Md. Shahidullah Sharif, Mahmuda Akther and Manzoor Ahmed[1]

Abstract

The purpose of the investigation was to determine the relative effectiveness of the Comprehensive Child Development Package (CCDP) on maternal, child and environmental components that will improve 3 to 5 year old rural children's cognition, growth, school readiness, general health and hygiene practices. A program delivered to disadvantaged children in three rural areas of Bangladesh during 2009 - 2011 was evaluated using a quasi experimental pre-post design. In total 360 pre-school children, 180 in intervention group and 180 in control group, were assessed on above mentioned outcomes at baseline, midterm (12 months after start) and at the end (22 months after start). But the study could not assess 16.4% children in the final assessment, mostly due to out-migration. The regression analysis showed significant benefit of the CCDP programme on mothers' early childhood development (ECD) and child care related knowledge scores, children's home observation for measurement of environment(HOME) scores, Wechsler Preschool and Primary Scale of Intelligence-III (WPPSI-III) scores (both performance and vocabulary tests, and child's school readiness scores. Among these findings, imp r o v eme n t i n mothers' knowledge, children's WPPSI receptive vocabulary score and WPPSI performance (block design) score remained significant when further adjustment of all possible socio- demographic confounders were done in a multivariate adjusted linear regression analysis. These pilot findings highlight that implementing a comprehensive child development package through preschool infrastructure is beneficial for certain domains of early childhood development and could be a feasible means to make the programme sustainable. However, to get the optimum, sustained benefit in all domains of child development and to improve maternal child rearing practices, further modification of the package is required.

Key words: Comprehensive Child Development Package, Early Childhood Development, Parents' role in ECD, Measurement in ECD

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1. Researchers Associated with ECD Resource center at the Institute of Educational Development, BRAC University.

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Background

Bangladesh is one of the most densely populated countries in the world. The total population is about 160 million i n 20 1 3 and out of this population more than 40 percent are children and 12 percent are under five children (BDHS, 2007). Bangladesh is trying to achieve the millennium development goal of having all eligible children in primary school. It is close to achieving some of the goals like reducing child mortality rate. Still malnutrition is high and school dropout rate is also high. Recently Lancet, in its series on child development reported that over 200 million children under age 5 of the world are not developing to their full potential due to poverty, poor health, malnutrition and lack of stimulation. At the same time there is accumulating evidence that early child development programmmes can have positive effects on child development (Engle, et.al., 2007).

In Bangladesh, child development programmes for 3, 4 and 5 year olds are carried out by various NGOs. Most offer a half-day programme 5 to 6 days a week, with play, instruction, hand-washing, and parenting classes. Outcomes, measured in terms of parenting and nutrition are not generally positive, except parenting knowledge when delivered at the SBK (Shishu Bikash Kendro) for 3-4 years old children (Aboud, 2004). However, child outcomes in terms of school readiness, vocabulary and analytic reasoning are more positive when the programme is of relatively better quality (Aboud, 2004, 2006; Moore, Akhter & Aboud, 2008).

Currently there are very few, "comprehensive" ECD programmes in Bangladesh that focus on all of the child's needs including cognitive and psychosocial development, health, nutrition and hygiene. Experiences in other countries suggest that such programmes can be of great benefit to the children from a disadvantaged background, where quality standards are maintained in the delivery of the services.

The Chicago Child Parent Centre and Expansion Programme (CPC) is a well-known example of a comprehensive early childhood intervention that provides educational and family support services to economically disadvantaged children and their parents. Findings suggest that participation in CPCs enhances children's cognitive and language development such a way that they begin school ready to learn. Parent involvement in the programme helps to foster longer-term child development gains (Reynolds, 1998).

The Integrated Child Development Services (ICDS) in India is the world's largest integrated early childhood programme started in 1975. The programme offers health, nutrition and hygiene education to mothers, non-formal preschool education to children aged three to six, supplementary feeding for all children and pregnant and nursing mothers, growth monitoring and promotion, and links to primary healthcare services. Evaluation studies have found that despite some unevenness in the quality of services, the ICDS programme has had a positive impact on the survival, growth, and development of young children. A study conducted in rural areas of three southern states (Tamil Nadu, Andhra Pradesh and

Karnataka) found that the programme had a significantly positive impact on the psycho-social development of children. The study also showed that even undernourished ICDS beneficiaries attained higher developmental scores than well-nourished children who were not enrolled in the programme (Vazir & Kashinath, 1999).

On the other hand, an evaluation of the Comprehensive Child Development Programme (CCDP) in USA failed to show significant impact on participating families. This was a two-generation programme aimed at disadvantaged families of 0-5 year olds that utilised case management and home visits to provide access to a range of education, health and social services. An important lesson learnt from the CCDP evaluation is that, although parents are important players in ECD provision, high-quality ECD programmes must be delivered directly to children rather than solely through parents (Gilliam et al., 2000; Goodson et al., 2000).

Considering the evidence, IED, BRAC University planned to develop a comprehensive child development package to see if it benefits children in one or more areas of development.

Objective of the Study

The primary objective of this study was to determine the relative effectiveness of the CCDP on maternal, child and environmental components that will improve 3 to 5 year old rural children's cognition, growth, school readiness, general health and hygiene practices.

The specific objectives of the study were:

(i) to examine the parents' knowledge on ECD and child care.
(ii) to evaluate the home environment of children.
(iii) to assess the cognitive development of children.
(iv) to assess the school readiness of children.
(v) to measure children's growth through height measurement over time,
(vi) to assess the quality of the learning centre.

Methodology

A pre-post quasi-experimental design was followed to assess the intervention effect of the Comprehensive Child Development Package. The study involved two groups; an intervention who received the CCDP intervention and a comparison group of children matched for age and socio economic status from the neighboring villages where there is no learning center. The study was conducted in three upazillas - Haluaghat, Gopalpur and Kaligonj of three districts Mymensigh, Tangail and Lalmonirhat respectively. In general, the population is of relatively low socio-economic condition. They are mostly farmers and do part-time small businesses during non-harvesting seasons.

Sample

In total 360 pairs of mothers and children aged 3-5 years (180 in intervention group and 180 in control group) were enrolled for this study. Five to six randomly selected children from each of the 30 learning centres were selected as intervention group from each of the three upazillas, e.g. Haluaghat; Gopalpur; and Kaligonj.

Age and soci-economic status (SES) matched control children were selected from 30 neighbouring villages that were not participating in the CCDP programme. The calculated sample size of 160 pairs of mothers and children were sufficient to show an improvement of one third standard deviation (3 points) in intelligence quotient (IQ) with 80 percent power and 20% drop rate.

Intervention

CCDP intervention intended to support numerous aspects of children's early childhood development including cognitive development, health, nutrition and hygiene. The CCDP addressed Reynolds (1998) eight principles of high-quality early childhood interventions:

1. Target disadvantaged children
2. Begin participation early, with longer programme duration
3. Provide comprehensive child-development services
4. Encourage active and multi-faceted parent involvement
5. Implement a structured, child-centred curriculum
6. Small teacher/child ratios
7. Deliver regular pre-service and in-service training for teachers
8. Systematic evaluation and monitoring.

CCDP was a centre-based programme that targeted disadvantaged children (Principle I) living in rural areas in Haluaghat, Gopalpur and Kaligonj sub-districts of three districts of Bangladesh- Mymensigh, Tangail and Lalmonirhat respectively. It provided a two-year programme for 3 to 4 year old children, adapted from the Shishu Bikash Kendra (SBK) model, and therefore targeted younger children and extended ECD provision beyond the standard one year of preschool for 5- year olds (Principle II). It provided comprehensive child-development services through a parent and curriculum component, which were intended to support children's cognitive, school readiness, nutritional and health needs (Principle III). Active parental involvement in the learning centre and through parent education sessions was a cornerstone of CCDP (Principle IV), and as such could help strengthen families' knowledge about and ability to support their child's education and development (Arnold et al., 2006).

CCDP implemented a child-centred, structured curriculum (Principle V) developed by ECD Resource Centre (ECDRC) at BRAC University in 2007 in collaboration with individuals from

numerous organizations working in the field of ECD. The curriculum encourages developmentally appropriate practices and behaviours for 3 to 5 year-old children including language and vocabulary development, pre-math, free play, interactive and cooperative peer activities. The curriculum was implemented by trained paraprofessionals, who were local women who had a minimum 5 grade of education. Classes took place for two hours a day, five days per week. In each centre there were 8-15 children and one paraprofessional (Principle VI).

Photo: Shishu Bikash Kendro

Measurement

Various measurements were used to assess parenting scores, child-surrounding environmental scores, children's developmental outcomes and quality of the programme after an intervention period of 22 months.

Parenting Knowledge Outcomes:

A comprehensive set of open and closed ended questions were used to assess mothers' ECD and child care based knowledge in this study. The items were particularly focused on ECD (e.g. children's play activities, toy making etc), preventive health behaviors (e.g. hand-washing, injury prevention, providing safe drinking water etc) and children's common illness related management (e.g. diarrhea management, care seeking behavior, etc). This tool has been developed by the Research Team at the institute of Educational Development-BRAC University (IED-BRACU).

Children's Surrounding Environmental Outcomes:

To assess the amount of stimulation children received at home and from surrounding environment the data were collected using a modified and adapted (Yesmin, 2005) version of Home Observation for Measurement Environment (HOME) inventory. It was originally developed in 1965, by Betty Caldwell to measure the amount and quality of stimulation and support provided to a child in the family setting. HOME inventory is designed for children between 3 and 6 years of age. It contains 55 items clustered into 7 subscales: 1) Learning Materials, 2) Language Stimulation, 3) Physical Environment, 4) Parental Responsively, 5) Learning Stimulation, 6) Modeling, and 7) Variability.

Children's Developmental and Nutritional Outcomes:

The following measurements were used for all children at different time points:

a) Wechsler Preschool and Primary Scale of Intelligence-III (WPPSI-III):

The field research assistants (FRAs) assessed vocabulary and visual-spatial reasoning of the children using adapted version of WPPSI-III (originally developed by David Wechsler) at household level twice. The third version of WPPSI was revised in 2003. We used two subtests (Receptive Vocabulary and Block Design) and both measures have been translated into Bangla and validated for use in Bangladesh (Aboud, 2004; 2006).

b) Anthropometry:
The FRAs also measured children's height using standard methods twice at the mid-point and end-point of the study (Frisancho, 1990; WHO, 1983).

School Readiness Test:
Children's readiness to learn in school environment, according to developmental benchmarks, rather than curriculum-based ones, was assessed using "School Readiness Test". This measure has been developed by Aga Khan Foundation Bangladesh ECD Support Programme (AKFB-ECDSP), using Bangladesh draft of Early Learning and Development Standards (ELDS) and was previously used in Bangladesh.

Quality of the CCDP Program:
The Early Childhood Environment Rating Scale (Harms, Clifford, & Cryer, 1998) was used as an observational tool to assess the quality of each learning centre. The ECERS consists of 43 items that assess 7 aspects of centre-based care for children aged 2.5 to 5-years. The subscales measure the following: *Space and Furnishing Personal Care, Language-Reasoning, Activities, Interaction, Program Structure and Parents and Staff interaction.* A modified version of the scale with total 32 items in 7 subscales as per the structure of the programme was used. Test-retest reliability score of the modified version was good.

Other Relevant Measurements:
These include general information about the socio economic status of the families, parental information and gross dietary assessments of the children which includes weekly dietary recall and food frequency.

Data Collection procedure
Data were collected at three different time points. Baseline data collection started in April 2010. Midline data collection started in March 2011 and end line data collection was conducted in December 2011 using the same procedure.

Ten to fifteen field research assistants (FRAs) with university degrees were recruited and trained on administering all measurement tools. Seven to fifteen days o f training was given at different time points depending on the number of measurement tools used to collect information by the research team members. The cognitive, school readiness, nutritional, and ECERS-R measures were practiced at nearby Shishu Bikash Kendras (SBKs) and HOME was practiced at nearby villages until satisfactory agreement was achieved between the interviewers and trainers. The inter-observer reliability scores for all measurements were >0.85. The FRAs were observed by the trainers during their first few days of data collection.

Reliabilities of Tests and Quality Assurance
Inter-observer reliabilities were assessed on all measurements before the study began. During the study period on-going reliability of approximately 10% of all the measurements were assessed.

Statistical Analysis

All data were checked for normality. Spearman's correlation and Mann-Whitney U test were used for variables which are not normally distributed. Information about owning land, house, household furniture (chair, table, bed, sofa, closet, and showcase), electrical goods (television, fan, radio, mobile and clock/watch) and cycle, was collected as indicators of possessions and summed to create an "asset index" (range 1-15). Higher scores indicated better assets. Pearson's bivariate correlation was conducted to explore associations between the age of the child and each developmental measure.

Loss to follow-up was 16.4% and there was no difference between baseline characteristics of the lost to follow-up and tested children except in age of enrolment and height-for-age Z score.

The baseline socio-demographic characteristics of the intervened and control group were compared using independent sample-t tests or ANOVA for continuous variables and $\chi 2$ for categorical variables. Partial correlation, controlling for children's initial age, showed significant association of asset scores, family size, parental educations and parental ages with one or more of the child developmental outcomes. So we adjusted for all the variables which were different between groups (tested/non tested and intervention/control) and showed significant correlations with child developmental outcomes (mainly WPPSI). To avoid high co-linearity and over adjustment, we selected family size, maternal education and maternal age due to their stronger correlation with developmental outcomes. For final analysis, we adjusted all models for 2 sets of covariates, firstly a 'simple set', consisting of child's age at enrolment only and secondly a 'full set of covariates' consisting of child's age at enrolment, asset score, family size, mother's education and age, and HAZ at baseline.

To see group differences and changes of outcome scores over the study period, we conducted two- way-ANCOVA for repeated measures for maternal ECD and child care related knowledge, HOME scores, children's intelligence scores and HAZ.

Finally, the intervention effect was examined with intention to treat analyses using multiple linear regression analyses for children's 5 main outcome measures. These include- maternal knowledge about ECD and childcare, HOME, children's intelligence using one verbal score (receptive vocabulary) and one performance score (block design) of WPPSI, children's school readiness scores (direct test on child, observation on child's behavior and maternal report) and anthropometric measurement (only height-for-age Z score). For each outcome variable two separate regressions, one (Model 1) adjusted for age only and the other (Model 2) adjusted for all possible confounders (mentioned above), were conducted. We also conducted crude analysis of food intake frequency report to get an idea about the dietary pattern of the children in general and by groups. We looked for the association of individual food items with children's intelligence scores at both time periods.

Findings

In three study areas, around a half (55.3%) of the sample owned land and almost all of them (96.5%) owned houses. The main economy was agrarian and 40% of the men were farmers. Majority of the women were involved in household work and childcare. Around 44% of women were involved with some type of small job like making handicrafts (mat, utensils, poultry etc), tailoring, working as day labourer or doing petty business. Literacy rate was relatively higher among women (60%) than men (46%). Majority (91%) of the population were Muslim. About 16.4% children were not assessed in the final assessment due to the families migrating away from the area.

Although the study aimed to enroll age and SES matched control group at baseline, the groups significantly varied in several baseline characteristics including age and SES. Table 1 displays the baseline characteristics of the population by groups. The CCDP intervention group had significantly better SES, bigger families and extended families.

Table 1: Baseline characteristics of enrolled 360 mother-child pairs by groups

Variables	CCDP Group Mean (SD) or % N=160	Control Group Mean (SD) or % N=160	P value
Asset index (range 0-15)	6.3(3.0)	5.3(2.8)	0.002
Family size	5.4(2.5)	4.8(1.7)	0.009
Nuclear family	78.2%	86.3%	0.03
Father's education	2.3(1.7)	2.3(1.7)	ns
Fathers with no job	1.7%	0.6%	ns
Father's age in years	37.4(8.2)	38.42(10.4)	ns
Mother's education	2.67(1.3)	2.55 (1.33)	ns
Mothers with no job	59.8%	62.9%	ns
Mother's age in years	28.5(5.71)	28.9(5.4)	ns
Age of the child in year	3.5(0.5)	3.41(0.5)	0.02
Girl child	52%	48.6%	ns
Height-for–age Z (HAZ) Score	-1.8(1.1)	-2.0(1.1)	ns

To observe the improvement of outcome measures over time by groups, we conducted two-way analysis of covariance (ANCOVA) for repeated measures (Table 2). The findings showed that all outcome measures, except HAZ of children were significantly higher in intervened group in initial measurements. However, it is interesting to note that rate of improvement between 1st and 2nd measurement of HOME (intervened vs control group: 27.3 vs 25.1 at baseline and 31.7 vs 29.7 at the end) and parental ECD and child care knowledge (intervened vs control group: 70.5 vs 67.1 at baseline and 79.5 vs 75.3 at the end) was similar over time and maintained a consistent gap between both the intervened and control group showing no

Group x Test interactions (Table 3). WPPSI receptive vocabulary (intervened group=5.2; control group=3.3) showed significantly higher improvement in intervened group over time compared to control group and showed Group x Test interaction in positive direction.

Table 2: Distribution and comparison of initial and final developmental measures by CCDP Intervention and Control groups

Variables	Assessment	CCDP Intervention Group	Control Group	Two-way ANCOVA for repeated measures[1] P values		
Main outcome variables	Test sessions	Mean ±SD 1st measure (n=180) Final measure (n=144)	Mean ±SD 1st measure (n=180) Final measure (n=157)	Test effect	Inter-vention and Control group effect	Inter-vention/ Control group x Test
Parents knowledge effect on ECD and child care	1st measurement	70.5(9.7)	67.1(8.8)	0.003	0.001	0.29
	Final measurement	79.5(10.29)	75.3(8.5)			
HOME scorers	1st measurement	27.3(5.7)	25.1(6.4)	0.007	0.004	0.89
	Final measurement	31.7(6.1)	29.7(7.4)			
WPPSI receptive language score[2]	1st measurement	13.4(6.5)	10.0(5.8)	0.96	<0.001	0.06
	Final measurement	18.6(5.7)	13.3(6.2)			
WPPSI block design score[2]	1st measurement	12.4(6.5)	7.7(6.4)	<0.001	<0.001	0.01
	Final measurement	19.8(4.4)	16.9(5.3)			
Children's HAZ[2]	1st measurement	-1.9(1.1)	-2.0 (1.0)	0.91	0.19	0.97
	Final measurement	-1.8(1.1)	-1.9 (1.0)			

1. ANCOVA for repeated measures, within subject variables: Tests (outcome variables of time1 and time 2); between subject factors: intervention & control groups; covariate: age of children at baseline
2.1st measurement (time 1) done 12 months after start of intervention.

Independent sample t-test was done to see the distribution of children's mean school readiness scores by group (Table 3). School readiness direct test on child showed significantly (p=0.03) higher score in the intervention group (60.4± 23.8) compared to control group (53.04±24.3). However, there was no significant difference between intervention and control group for maternal report (28.6±5.7 vs 27.6±5.5) and child behavioral observation score (16.2±3.6 vs 16.2±3.5).

Table 3: Distribution of children's mean school readiness scores by groups

Variables	CCDP Group Mean (SD) or % N=160	Control Group Mean (SD) or % N=160	P value
Direct test on children	60.4(23.8)	53.04(24.3)	0.03
Maternal report	28.6(5.7)	27.6(5.5)	ns
Child behavioral observation	16.2(3.6)	16.2(3.5)	ns

No difference in any outcome measures by children's sex was observed when assessed by student's t-test.

The asset index score and maternal education was significantly associated with most of the developmental outcomes in a positive direction (Table4). Higher paternal education positively influenced stimulating environment at home and maternal ECD and child care related knowledge. Higher paternal age showed negative association with school readiness scores of children. Similarly, higher maternal age showed association with lower stimulatory environment at home, lower intelligence scores of children along with lower performance in school readiness tests. Family size showed positive correlation with WPPSI performance scores.

Table 4: Correlation of baseline socio economic and parental measures with developmental measures[1]

Variables	HOME	WPPSI block design	WPPSI receptive vocabulary	Maternal ECD and child care knowledge	Child's behavioral observation for school readiness	Child's school readiness scores	Mother's report on child's school readiness	Child's Height for age Z score
Asset index	0.41***	0.24***	0.42***	0.30***	0.24***	0.32***	0.14*	0.22***
Family size	ns	0.13*	n	ns	n	ns	ns	ns
Family type	ns	ns	n	ns	n	ns	ns	ns
Father's education	0.26**	0.13*	0.16**	0.21***	ns	0.12#	ns	0.12*
Father's job	ns	ns	n	ns	n	ns	ns	ns
Father's age (year)	-0.19**	ns	-0.16**	-0.12*	ns	-0.14*	ns	ns
Mother's education	0.38***	0.13*	0.24***	0.31***	0.12*	0.28***	0.12*	0.15**
Mothers job	ns	ns	0.10#	ns	0.14*	0.11#	ns	ns
Mother's age (year)	-0.15**	ns	-0.12*	ns	ns	-0.16**	ns	ns

1. Partial Correlation: Controlling for baseline age of the child ***p<0.001: **P<0.01;* p<0.05; # p<0.1

Finally, multiple linear regression analyses was conducted to see the intervention effect on five main outcome measures (maternal knowledge about ECD and child care, HOME, WPPSI - receptive vocabulary and block design, HAZ of children and school readiness) related to child development, with or without controlling for all potential confounders. For each outcome measure we used two models as mentioned in table 5. We found children who received 22 months intervention had significantly improved scores in receptive vocabulary, block design and school readiness (direct test on children) when only adjusted for their initial age. This model also showed higher scores in maternal ECD and child care related knowledge gain and HOME (Model 1, Table 5).

Table 5: Regression coefficients and standard errors (SE) from multiple linear regression analyses[1] of children for all outcome measures showing intervention effect (CCDP intervention group=1; control group= 2) in both age adjusted and all adjusted models[1]

Dependant Variable	Models	Adjusted variables in the model	Baseline measure B±SE (95%CI)	P-Value
ECD and child care Knowledge of mothers	Model 1 R^2=6%, F=11.1	Only age	-4.4±1.1 (-6.5,-2.2)	<0.001
	Model 2 R^2=30%, F=18.6	ECD and child care Knowledge of mothers 1st measurement, age and HAZ of the child at baseline, asset score at baseline, family size, mother's age and education	-2.4 ±1.0 (-4.4, -0.4)	0.02
HOME	Model 1 R^2=3%, F=5.02	Only age	-2.3±0. 8 (-3.8, -0.7)	0.004
	Model 2 R^2=25%, F=11.2	HOME 1st measurement, age and HAZ of the child at baseline asset score at baseline, family size, mother's age and education	-0.6±0.8 (-2.1, 1.0)	0.47
WPPSI block design	Model 1 R^2=16%, F=28.9	Only age	-2.8±0.56 (-3.9,-1.7)	<0.001
	Model 2 R^2=29%, F=18.0	WPPSI Block Design 1st measurement, age and HAZ of the child at baseline, asset score at baseline, family size, mother's age and education	-2.4±1.0 (-4.4, -0.4)	0.02

Dependant Variable	Models	Adjusted variables in the model	Baseline measure B±SE (95%CI)	P-Value
WPPSI Receptive vocabulary	Model 1 R^2=18%, F=38.25	Only age	-5.04±0.69 (-6.4, -3.7)	<0.001
	Model 2 R^2=39%, F=23.5	WPPSI Receptive vocabulary 1st measurement, age and HAZ of the child at baseline, asset score at baseline, family size, mother's age and education	-3.1±0.6 (-4.3,-1.8)	<0.001
Child's school readiness score	Model 1 R^2=9%, F=13.3	Only age	-6.07±2.8 (-11.5, -0.6)	0.03
	Model 2 R^2=31%, F=18.0	Age and HAZ of the child at baseline, asset score at baseline, family size, mother's age and education	-2.8±2.6 (-7.8, 2.2)	0.27
Mothers' report about child's school readiness	Model 1 R^2=2%, F=3.5	Only age	-0.7±0. 7 (-2.02,0.6)	0.23
	Model 2 R^2=4%, F=2.6	Age and HAZ of the child at baseline, asset score at baseline, family size, mother's age and education	-0.5±0.7 (-1.9, 0.9)	0.46
Observed behavior of children for school readiness	Model 1 R^2=2%, F=4.2	Only age	0.1±0.4 (-0.7,0.9)	0.79
	Model 2 R^2=8%, F=4.9	Age of child, asset score at baseline, family size, mother's age and education	0.5±0.4 (-0.3, 1.3)	0.23
HAZ of child	Model 1 R^2=2%, F=3.7	Only age	-0.1±0.1 (-0.4,0.1)	0.28
	Model 2 R^2=54%, F=49.1	HAZ of child 1st measurement, age of child, asset score at baseline, family size, mother's age and education	-0.004±0.09 (-0.2, 0.2)	1.0

1.Regression Model 1: Predicting final HOME, WPPSI Block design, WPPSI Receptive vocabulary, Mother's ECD and child care rela ted knowledge and school readiness information after adjustment of

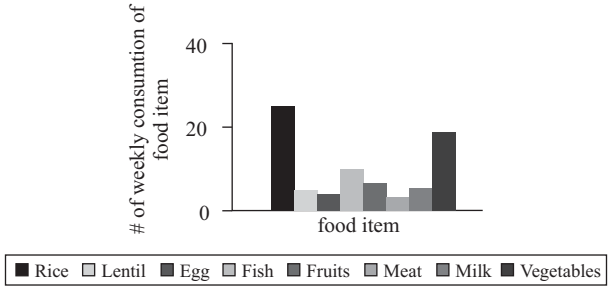
children's initial age Regression Model 2: Predicting final HOME, WPPSI Block design, WPPSI Receptive vocabulary, Mother's ECD and child care relat ed knowledge and school readiness information after adjustment of all possible confounder in addition to children's initial age

However, after adjustment of all possible confounders and relevant covariates, the scores remained significant for children's receptive vocabulary (B±se -3.1 ±0.6; 95% CI -4.3, -1.8; p<0.001), WPPSI performance (Block design) score (B±SE -2.4±1.0; 95%CI -4.4,-0.4; p=0.02) and maternal ECD and child care related knowledge gain (-2.4±i.0; 95% CI -4.4, -0.4; p=0.021) (Table 5).

In a separate analysis we conducted Pearson's correlation to assess the association of school environment (measured by 7 subscales of ECERS-R) with children's intelligence. Total ECERS score showed no association with any of the WPPSI scores but its subscales, *Activity* total scores (focused on facilities in the centre for fine motor activities, play and art) and *Language-Reasoning* total scores showed significant association with WPPSI-receptive vocabulary of children.

Food frequency information was analyzed separately to observe the dietary habit of the study children irrespective of groups. Findings show that rice, fish and vegetable comprised the main menu of these children (Figure 1).

Figure 1: Weekly consumption chart of different food items



The dietary measure was very crude and did not pick up the amount taken by the child. When assessed by group, the intervened group found to have higher intake of lentil, meat, milk and fruits.

Discussion

This pilot study evaluated the Comprehensive Child Development Package (CCDP) for preschool children and their parents. The intervention showed several success of the programme in this population when delivered through early learning- centre. We will discuss the effect of CCDP on each outcome separately in the following sections.

Effect of CCDP on Maternal Outcome

We used a structured questionnaire to assess maternal ECD and child care based knowledge at two time points- at baseline and at the end of the study. Maternal total knowledge score was significantly higher in the intervened group at both the baseline and final time point. The overall finding indicates that the child care service of CCDP programme through parental involvement and monthly parental session had a significant improvement in mothers' ECD and child care related knowledge.

Effect of CCDP on Home Observation for Measurement of the Environment (HOME)

In terms of home observation measurement the finding indicates more attention need to be given to improve the parental programme of CCDP so that it can bring positive change in home environment to make it more stimulating.

Effect of CCDP on Children's Intelligence/Cognitive Outcome

The overall findings of WPPSI vocabulary and performance scores indicate that the existing CCDP programme has a positive impact on children's language development. Apparent lack of benefit in performance scores of intervened children indicates further exploration and revision of the program for performance items. It is also necessary to review how the existing eye-hand coordination items of CCDP program are practiced by the children.

Effect of CCDP on School Readiness

The initial benefit of school readiness scores in intervention group was lost in the adjusted model. It is possible that the study could not pick–up real benefit from it as the children were of slightly younger age and the scale was originally designed for 60-72 months. So, getting no effect of CCDP intervention on school readiness scores of children highlights the necessity of further evaluation of the programme.

Effect of CCDP on children's Nutritional Status (height-for-age)

Depending on dietary (although very crude assessment) and growth findings we can assume that dietary advice in CCDP intervention became helpful to change dietary behavior of the intervened children but did not help in achieving their optimum growth. Underlying poverty might have played an important role on nutritional status of these children. Addition of some nutritional intervention (school feeding, micronutrient supplementation through food etc) or income generation component in CCDP programme might ensure better nutritional status among these children during this period of rapid physical and brain growth.

Conclusion

In general, the CCDP intervention showed around half of a standard score improvement in children's verbal item scores (receptive vocabulary) and a third of a standard score improvement in children's performance score (block design) when compared with control children who received no intervention. However, benefit on many other domains of development also needs to be addressed to make a firm conclusion. Future follow up of these

children at school age is essential to see the predictive value of this early intervention benefit. The findings also showed overall improvement in mothers' knowledge gain about ECD and child care but there remained a gap between these knowledge gain and practice. Effect of the programme on school readiness is also inconclusive and needs further evaluations. Children's dietary habit also improved in the intervened group, but the assessment was crude and showed no significant effect on nutritional status. It also did not show any change in stimulating home environment of children and neither showed positive impact.

Challenges:

We consider the following to be the challenges faced in this study:

As per design the study is non-randomized and not the best design. We would have done cluster randomization but it was not possible in our setting. We addressed this limitation by adjusting all the variables which were different between intervention and control groups at baseline.

Our other limitation was to conduct some baseline assessments (WPPSI, HAZ) one year after the start of programme due to field constraints. As a result, the intervened and control group both had a significant initial difference in scores and that gap remained the same in the final assessment. To minimize this limitation to some extent we conducted regression analysis by adjusting initial scores.

Despite all these limitations our findings indicate that the CCDP approach is feasible, could be sustainable and reasonably effective for important domains of young child development. However, it needs to be tested and possibly revised further to ensure optimum child development in an ECD friendly environment which could be demonstrated by intelligence tests and school readiness scores.

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