

Nutritional Status and Cognitive Development of Preschool Children of Selected ECD Programs in Bangladesh

A thesis presented to the
Institute Educational Development, BRAC University

Golam Kibria
gkibria@bracuniversity.ac.bd

Supervisor

Dr. Wahida Khanam, FCPS, MPH
Assistant Professor
Institute of Child and Mother Health (ICMH) Bangladesh

Co-Mentor

Pia Rebello Britto, Ph. D.
Yale University, USA



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EXECUTIVE SUMMARY

Good nutrition is the cornerstone for survival, health and development of young children. Growth and development are complementary process and a unique characteristic of children. Holistic development means optimum growth and optimum development. For holistic development in early childhood, nutrition, stimulation, and safe environment play key role. Preschool is a new initiative in Bangladesh which covered 5-6 years children before starting to primary education; providing early stimulation for comprehensive development. Along with, proper nutrition is very important which has got direct effects on early childhood development and later academic performance. Many studies showed significant association between child's nutritional status and cognitive development.

In Bangladesh, no study was done before to look into the matter of nutritional status and cognitive development and their association among the preschool children. This cross section study was conducted among the preschool children of some selected ECD program of Bangladesh. The study population consisted of urban and rural children in Dhaka and Mathlab (70 Kilometers away from Dhaka), where preschool program exists. This study was aimed to assess the nutritional status of preschool children in selected schools under ECD programs in Bangladesh; to measure cognitive function of those preschool children and to identify the relationship between nutritional status and cognitive development of preschool children in Bangladesh. Total 98 children aged 5-6 years; 49 girls and 49 boys were included in this study purposively. Study was done from September 2009 to January 2010 from selected preschools of Vasantak (slum), Agargoan (non-slum), Mohammadpur at Dhaka urban areas and Dushpara, Babupara, Poypara and Jagorpur at Chandpur rural areas.

In this study nutritional status was assessed by weight for age z score, height for age z score and weight for height z score. Study findings showed that among 98

preschool children, 7.1% has normal nutritional status, 37.8% mild, 51% moderate and 4.1% severely underweight. In height for age z score, it was found 29.6% normal, 30.6% mild, 21.4% moderate and 18.4% severely stunted. And, in weight for height z score, it has found 27.6% normal, 58.2% mild, 13.3% moderate and 1% severely wasted.

Cognitive developments of preschool children were assessed by Wechsler Preschool and Primary-school Scale of Intelligence (WPPSI). WPPSI is composed of 3 sub-scales that covered performance IQ, verbal IQ and Full Scale IQ of the children. This tool was administered to assess the children's vocabulary, matrix reasoning, and comprehension, block designing, information, coding subsets. Among total 98 children, IQ level was found in normal 28.6%, mild 56.1% and moderate 15.3% in full scale IQ. Full scale IQ among urban children found significant difference in which mean $\pm$ SD was 75.42 ± 8.3 in rural children and 82.78 ± 10.6 in urban children. Significant association was found in both stunting and cognitive ability ($P=0.001$), and underweight and cognitive development ($P=0.001$) based on full scale intelligent quotient score. But, wasting was not associated significantly with cognitive status ($P=0.459$).

In conclusion, stunted and underweight preschool children showed poor IQ. So, nutrition program in preschool should be integrated for better future academic achievements. However, further in-depth study with representative sample is necessary.

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GLOSSARY OF TERMS

BBS	Bangladesh Bureau of Statistics
BDHS	Bangladesh Demographic and Health Survey
BINP	Bangladesh Instigated Nutrition Project
ECD	Early Childhood Development
ECDRC	Early Childhood Development Resource Centre
ECERS-R	Early Childhood Environment Rating Scale-Revised
EDI	Early Development Instrument
EFA	Education for All
FSIQ	Full Scale Intellectual Quotient
HOME	Home Observation for Measurement of the Environment
ICDDR,B	International Centre for Diarrhoeal Disease Research, Bangladesh
ICDS	Integrated Child Development Services
IQ	Intelligent Quotient
IED	Institute of Educational Development
NNP	National Nutrition Programme
PIQ	Performance Intellectual Quotient
PSIQ	Processing Speed Intellectual Quotient
SBK	Shishu Bikash Kendra (Child Development Centre/Early Learning Centre)
SD	Standard Deviation
SPSS	Statistical Package for the Social Sciences
SUROVI	A national level education based development organization
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNICEF	United Nations Children's Fund
VIQ	Verbal Intellectual Quotient
WHO	World Health Organization
WPPSI	Wechsler Preschool and Primary-school Scale of Intelligence

CHAPTER- I

Thesis presented to the IED, BRACU./2010

BODY OF THESIS

i. Introduction

Growth and development are complementary process. Growth means specific physical changes and increase in size with age. Development refers to achievement of functional skills according to age. Nutritional status is the indicator of growth. Cognitive development involves expression of a child's intelligent or mental abilities. Holistic development means optimal growth and optimum development.

It is now widely recognized that young children's nutrition and cognitive development both are important for their overall development. From the beginning of child's life, both have significant impact on their future academic development. Preschool education can have significant positive benefits for children's cognitive, language, social and physical development. Several studies found the positive association between child's nutritional status and cognitive development.

Worldwide, over 200 million under <5 children are not developing to their full potential due to poverty, poor health, malnutrition and lack of stimulation (Grantham-McGregor SM, et al., 2007). In Bangladesh, millions of children suffer from one or more form of malnutrition, including: low birth weight, stunting, underweight, iodine deficiency disorders and anemia (State of the World's Children, 2007). Preschool children of 48 to 59 months are found 46.3% underweight, 45.6% stunted and 15.3% wasted (BDHS, 2009). The association of nutrition and cognitive development of preschool children are unknown probably due to inadequate study in Bangladesh. Early childhood undernutrition is associated with poor current and later cognitive development and school achievement (Grantham-McGregor,1995). Many cross sectional studies showed association between poor nutrition, stunting and poor cognitive ability (Nepal,

China, India etc.) (The Lancet, 2007). Malnutrition has a serious consequence on mental growth and development of children (EFA, 2007).

There is a scarcity of adequate study on nutrition and cognitive development of preschool children in Bangladesh. The Government of Bangladesh has undertaken ECD as a major component of pre-primary education currently (EFA Mid-decade Assessment, 2007). The importance of child nutrition and development are now recognized by the Government of Bangladesh with high importance (Operational framework for Pre-Primary Education, 2008).

ii. Background and Literature Review

Malnutrition is one of the most important global health problems, affecting large numbers of children in developing countries (State of the World's Children, 2007). According to Bangladesh Demographic and Health Survey (BDHS, 2009), 48% of children under five are underweight (13% severely underweight), 43% of children are stunted and 13% of children are wasted in Bangladesh. There is enough evidence that development is multidimensional and integral, and it is important to address all the different domains of development including cognitive achievement, health, nutrition (World Bank, 2009). However, few ECD programs in Bangladesh are integrated with health and nutrition (Foysal, M. K., 2006). While there are numerous reports available on the nutritional status of children, very little information is available on preschool children and the relationship between nutritional status and cognitive development. Evidence shows that undernutrition not only affects the growth and cognitive development of children, but it may also contribute to ill health and functional impairment in every stage of the life cycle (WHO, 2008).

At present, about 200 million children in developing countries do not reach their developmental potential and are likely to do poorly in school; documented risk factors for loss of potential include stunting, iodine deficiency, iron-deficiency anemia, and inadequate cognitive stimulation (Hoddinott J. et al., 2008) which are alarming for the

children of Bangladesh as well as in the globe. Appropriate strategy for integrating nutrition components into ECD program should be an opportunity for overcoming this devastating issue. It is mentioned that early malnutrition and stunting can lead to long term damage, including lower cognitive achievement and reduced grade attainment (EFA Global Monitoring Report, 2010)

Malnutrition not only affects individuals but it is passed from one generation to the next as malnourished mothers give birth to infants who struggle to thrive. These children are vulnerable to illness, stunted growth and intellectual impairment (UNICEF Bangladesh, Newsletter, 2009). Both, nutrition and cognitive stimulations are important for young children's development. In Bangladesh, only few initiatives of early childhood development program integrate both the nutrition and cognitive stimulation issues with same importance. Worldwide, a great deal of studies found the association between nutrition and cognitive development in early childhood development intervention.

Evidence suggests improving nutrition in early childhood in developing countries is a long-term economic investment (Hoddinott, J. et. al., 2008). The government of Bangladesh has a well-organized child health system offering preventive services such as immunization and rehabilitation services for severely malnourished children, but little in the way of ECD programme (Aboud, F., 2006). Integrating nutrition into ECD program was not found in the present early childhood development program in Bangladesh (Foysal, M. K., 2006).

Early childhood malnutrition is a major public health problem in developing countries (Black, Morris, & Bryce, 2003). Among preschool children aged 48 to 59 months 46.3% are underweight, 45.6% stunted and 15.3% wasted in Bangladesh (BDHS, 2009). In Bangladesh Aboud (2006) found that due to poor nutritional status, 25% children were sick in the previous week and could not attend their school. Early childhood under-nutrition is associated with poor current and later cognitive development and school achievement (Grantham-McGregor, 2007). Evidences from developing countries showed that pre-primary (3-<6 years) gross enrollment ratio is 36% (EFA,

2009). On average, 21% children attend early childhood programs (EFA, 2006) and most of them do not get any form of nutritional support under ECD program (Hashima & Masud, 2003).

About 200 million children under five fail to reach their cognitive development due to poverty, poor health and nutrition, and deficient care (Engle et al., 2007). Significant associations have been found between stunting and poor psychomotor development in young children in Guatemala (Lasky et al., 1981), Chile (Monckeberg, 1972), Jamaica (Powell & Grantham-McGregor, 1985), and Kenya (Sigman, 1989). The arrangements for cognitive development of preschool children in Bangladesh was not found satisfactory compared to international level on the basis of Early Childhood Environment Rating Scale-Revised (Aboud, 2006). Preschool children at 3 to 5 years of age are especially vulnerable to poor nutrition (Randall, 2008). Compared to the national prevalence of malnutrition, high proportion of BRAC preschool children are found stunted (Tarannum, 1996). At present, 33 million children in Bangladesh, about half of all Bangladeshi children are living in poverty while about one in four children is deprived of at least four basic needs among the following: food, education, health, information, shelter, water and sanitation.

Studies show that children from economically disadvantaged families exhibit lower levels of cognitive functioning, academic achievement, and social development than children from more privileged families (Stephen & Alison, 2001). Research suggests that poor nutrition is a major risk factor affecting proper development of early child development (Larry & Pollitt, 1996). There is a positive correlation of protein-energy malnutrition and micronutrient deficiency with brain development in early years (Robert, 1993).

iii. Rationale

The purpose and significance of this study is very high considering child's nutritional status, cognitive ability as well as holistic development of children that could be discussed in several ways. A great deal of studies support that preschool age is most critical period for formation of cognitive skills as well as holistic development of children's later life. So, preschool is very critical period for children's holistic development. This is the prime time for preparing children for primary education. For preschool aged children, intervention should have comprehensive that encompasses all domains: health, nutrition and socio-economic and cognitive development of young children. The prevalence of malnutrition has declined in some countries throughout the world, but continues to remain high in many developing countries (Nicola, 2003). Worldwide, millions of children are held back due to problems of health and nutrition, and limited and unequal access to preschool opportunities (EFA, 2007). Good nutrition is the cornerstone for survival, health and development (BBS/UNICEF, 2007).

In Bangladesh, at the national level, 48 percent of children under five are underweight and 43 percent of children are stunted, 17 percent severely stunted (BDHS, 2007) and 13 percent of children are wasted. Inadequate food supply, among other factors, often leads to malnutrition, resulting in serious consensus on the physical and mental growth and development of the children. It is recognized that malnutrition passes from one generation to the next because malnourished mothers give birth to infants who struggle to thrive or grow well. Survivors of malnutrition are left vulnerable to illness, stunting and intellectually impairment (BDHS, 2004).

According to the convention on the rights of the child (CRC) the Government should ensure that children survive and develop healthy. In article 24, it has mentioned that children have the right to get quality health care, clean water, nutritious food and a clean environment, so that they will stay healthy (UNICEF, 2006). It found that four key risk factors related to adverse developmental outcomes affects child's overall development which are stunting, inadequate cognitive stimulation, iodine deficiency, and iron deficiency anemia (Walker, et. al., 2005). The Nepal study (Arnold, C, 2003)

suggested that for comprehensive ECD program, nutrition played very critical role for achieving children's optimal development goals. Undernutrition, deprivation of care and poor treatment are particularly damaging the young children, with repercussions often felt into the adult years (EFA, 2007). So, it is highly beneficial for the children of ECD program. Research also suggests that poor nutrition is a major risk factor affecting proper development of early child development (Larry, et. al., 1996).

Although, number of different program models are available (Evans et al., 2000), only few models in Asia use nutrition as a starting point while offering literacy and math teaching (World Bank, 2003). The government of Bangladesh has a well organized child health system offering preventive services such as immunization and rehabilitation services for severely malnourished children, but little in the way of preschool education (Frances. A., 2004). Even, in the Bangladesh government leaded preschool programme, nutrition component was not addressed adequately that would be very important element of preschool program. This study was attempted to assess the nutritional status of preschool children in selected ECD programs, to determine the relationship between children's nutritional status and cognitive development.

Results of this study would provide a picture of nutritional status of preschool children and their cognitive status and association between them which might help the program personals to develop comprehensive intervention strategies meet the gaps. Optimum nutritional and good cognitive skills at preschool level would have scope for good academic achievement in future.

iv. Operational Definitions

Cognitive Development:

Piaget and Vygotsky suggest that cognitive development is the construction of thought processes, including memory, reasoning, problem solving, and decision making skills (Trawick, S. J. 2006). In this study children's cognitive development was measured using the Wechsler Preschool and Primary Scale of Intelligence (WPPSI-III, 2002). Internationally, this tool has been using to assess children's cognitive development appropriately for the children of 2.5 to 7.3 years. The WPPSI is composed of 14-subtests but to assess children's development, only 7-subtests were used. The subtests are: information, vocabulary, comprehension, matrix reasoning, block design, picture completion and coding.

The sub-scales were calculated as follows:

- Information, vocabulary and comprehension= Verbal IQ (VIQ)
- Matrix reasoning, block design and picture completion= Performance IQ (PIQ)
- Coding=Processing Speed IQ (PSIQ)
- All the 3 IQs are summed together to compute the Full Scale IQ (FSIQ).

WPPSI Information: The sub-test information includes crystallized intelligence, long-term memory, and the ability to retain and retrieve knowledge from school and the environment. It is strongly influenced by culture. Sample question: how many legs does a bird have? WPPSI information test was administered with 34 questions. Questions are scored as 0, or 1 on the 34 questions.

WPPSI Vocabulary: The vocabulary subtests assess children's knowledge of words and their ability to express the word's meaning. Word knowledge, verbal concept formation, support of knowledge, learning ability, long-term memory and degree of language development are the major areas measured in this test. Thirty-eight words are spoken aloud and the child is required to point to one of four pictures depicting the word or to explain what s/he understands by the word.

Words become progressively more difficult. Thirteen words have been substituted

for the originals in order to maintain the expected level of difficulty within the Bangladeshi context. Sample question: What is the meaning of 'train'? Answers were scored as 0, 1 or 2, for a maximum of 38. Scores are standardized for age.

WPPSI Comprehension: This subtest measures understanding of social conventions and common sense. It measures verbal reasoning and conceptualization, the ability to evaluate and utilize past experience, verbal comprehension and expressions and the ability to demonstrate practical information. The child answers questions based on his or her understanding of general principles and social situation. Comprehension was assessed with 32 questions. Sample question: Why do we wash our hands before eating food? It scored as 0, 1 or 2 after the child practices on two items. If the child fails to give correct answer to 5 consecutive questions the test will be stopped.

WPPSI Matrix Reasoning: The Matrix Reasoning assesses visual and analytic reasoning in the completion of patterns and analogies. Three practice items provide children the rationale for choosing one out of four or five options. Five items out of 29 were changed, though the analogy was maintained in each case. The maximum score was 29; the age standardized score were analyzed.

WPPSI Block Designing: WPPSI Block Design was used to assess visual-spatial, analytic reasoning in the completion of red and white patterns with the use of small cubes. Twenty items were presented; the first 10 used red and/or white blocks and the last 10 used red/white bicolor blocks where two sides have both red and white divided along the diagonal and the other sides are either red or white. Items are progressively more difficult in the pattern required. On early items the tester makes a model to be copied by the child, and on later items the model is presented as a 2-dimensional picture. Two trials for each of the first 6 items are allowed if the child makes an error on the first. Time limits of 30, 60 and 90 seconds were adhered during the test but if the child showed interest to

complete the pattern even after the time limit was over s/he was allowed but not scored. Items are scored as 0, 1, or 2 on the first 6 items and 0 or 2 on the last 14.

WPPSI Picture Completion: It requires recognition of the missing part in a picture. It measures visual perception, long-term visual memory, and the ability to differentiate essential from nonessential details.

WPPSI Coding: Children ability are measured in this sub-test that are processing speed, short-term memory, learning ability, visual perception, visual-motor coordination, visual scanning ability, cognitive flexibility, attention and motivation. In this test, the child copies symbols that are paired with simple geometric shapes. By using a key, the child draws each symbol in its corresponding shape. Coding skills was not analyzed individually in this study.

Child nutrition indicators and their interpretation:

Anthropometric measurements:

Anthropometric measurements (height, weight, head and mid-upper arm circumference) were recorded and the z-scores were calculated according to WHO's standard (WHO 2006). In children the three most commonly used anthropometric indices to assess their growth status are weight-for-height, height-for-age and weight-for-age. These anthropometric indices can be interpreted as follows:

Height-for-age (stunting): Height for age measures linear growth. It reflects a process of failure to reach linear growth potential as a result of suboptimal health and/or nutritional conditions. On a population basis, high levels of stunting are associated with poor socioeconomic conditions and increased risk of frequent and early exposure to adverse conditions such as illness and/or inappropriate feeding practices. A child who is below minus two standard deviations (-2 SD) from the medium of the WHO references population in terms of height-for-age is considered short for his/her age, or stunted. This condition reflects the cumulative

effects of chronic malnutrition. If a child is below -3SD from the references median, then he/she is considered to be severely stunted.

Weight-for-age (underweight): Weight-for-age is a composite index of weight-for-height and height-for-age. It reflects body mass relative to chronological age. It is influenced by both the height of the child (height-for-age) and his or her weight (weight-for-height), and its composite nature makes interpretation complex. For example, weight-for-age fails to distinguish between short children of adequate body weight and tall, thin children. Thus, it does not distinguish between acute malnutrition (wasting) and chronic malnutrition (stunting). A child can be underweight-for-age because he/she is stunted, wasted, or both. Children whose weight for age is below minus two standard deviations (-2 SD) from the median of the reference population are classified as underweight and those with weight-for-age below three standard deviations (-3 SD) are considered severely underweight.

Weight-for-height (wasting): Weight for height describes current nutritional status. Wasting or thinness indicates in most cases a recent and severe process of weight loss. Typically, the prevalence of low weight-for-height shows a peak in the second year of life. Lack of evidence of wasting in a population does not imply the absence of current nutritional problems: stunting and other deficits may be present. A child who is below minus two standard deviations (-2 SD) from the references median for weight-for-height is considered to be too thin for his/her height, or wasted. This condition reflects acute or recent nutritional deficit.

Statistics of the z-scores:

In this study, the WHO Global Database on Child Growth and Malnutrition uses a z-score cut-off point of <-2 SD to classify low weight-for-age, low height-for-age and low weight-for-height as moderate and <-3 SD to define severe malnutrition.

Normal: >-1 SD

Mild: -1to -2 SD

Moderate: -2 to -3 SD

Severe: <-3 SD

The observed SD value of the Z-score distribution is very useful for assessing data quality. With accurate age assessment and anthropometric measurements, the SDs of the observed height-for-age, weight-for-age, and weight-for-height Z-score distributions should be relatively constant and close to the expected value of 1.0 for the reference distribution.

Socio-demographic status:

In this study children's socio-demographics condition (e.g. household members, their age, gender, educational attainment, and occupation, and the family's religion) are critically analyzed which may or may not be associated with child nutrition. Economic status was assessed with questions about the ownership of assets commonly included in the Bangladesh Health and Demographic Surveys (e.g. radio, television, bi-cycle, latrine, tube well, electricity, house, source of drinking water etc.), ownership of a homestead and of land for production, and household income per month. These variables assessed through interview with the parents at their home with a guided questionnaire. For this study, socio-economic status is defined in terms of family income, assets or wealth, and some other family characteristics and facilities that are related to socio-economic status.

v. Objectives of the Study

General objective-

To determine the nutritional status of preschool children and identify the relationship between nutritional status and cognitive development of preschool children of selected ECD programme of Bangladesh.

Specific objectives-

- ✚ To assess the nutritional status of preschool children in selected schools under ECD program.
- ✚ To identify the cognitive development status of preschoolers in study population.
- ✚ To explore the socio-economic and demographic characteristics of preschool children under study.
- ✚ To identify the relationship between nutritional status and cognitive development of preschool children under study.

CHAPTER- II

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METHODOLOGY

i. Study Design

The design of this study was cross-sectional and the identified information were used to explore associations between cognitive development and nutritional status of preschool children. The preschool children were selected from both rural and urban areas of Bangladesh. The rural sites were chosen where preschool children are available and sufficient number of sample population found. And the urban children were chosen from both slum and non-slum areas where different group of socioeconomic people are available.

All children were included in this study with their parent's consent to allow their children to participate in this study. Only, sick, and mentally retarded/disabled children were excluded from the sample population. No severely or moderately disabled child participated in this study.

ii. Study Population and Sample Size

Study population was preschool aged children from selected community in Bangladesh. Sample was selected purposively. The urban children mostly attended the Government Preprimary class, Private School and NGO (SUROVI) implemented schools. Some of the rural children attended preschools. Finally, 98 children were included (49 girls and 49 boys) under this study in rural and urban setting. The study populations were selected from preschools with equal proportion of boys and girls. The children included in this study were 60 to 74 months of ages attending preschools and under ECD programme. Children's age was determined from the immunization card and birth certificate if possible or from parental report with the help of a Bangla calendar and notable events.

iii. Study Location

Finally, the study was conducted and data was collected from two distinct areas in Bangladesh. First, the rural area was selected in Matlab Upazila, under Chandpur District which is 70 Kilometer far from the capital city of Dhaka. The data was collected in the villages of Dushpara, Babupara, Poinpara, and Jogarpur under Khadergaon union, Matlab. Secondly, in urban site, data was collected from Vasantak (Slum), Agargaon (non-slum) and Mohammadpur (non-slum) areas in Dhaka city, Bangladesh.

iv. Study Period

The proposal was developed in September'09 and approved by the Research Review Committee (IED, BRAC University) by the end of September'09. Data was collected during November to December 2009. All necessary task regarding this study: data-entry, cleaning, editing, data analysis and finally report preparation was completed during December'09 to March 2010.

v. Data Collection Instruments/Measurements

Child related variables:

Anthropometric measurements:

Anthropometric measurements (height, weight, head and mid-upper arm circumference) were recorded on each child and the following z-scores were calculated according to WHO growth standard (WHO 2006). Children weight was measured by Bathroom scale and height was taken by Stadiometer (with a meter stick) from the usual guidelines concerning head angle and body posture. These was converted to height-for-age and weight-for-age z-score using WHO guidelines.

Height-for-age (HAZ, stunting): A child with HAZ < -2 SD was considered as short for his/her age, or stunted. If a child was < -3 SD, then he/she was considered severely stunted.

Weight-for-age (WAZ, underweight): Children with WAZ < -2 SD were classified as underweight and those with WAZ < -3 SD were considered severely underweight.

Weight-for-height (WHZ, wasting): A child with WHZ <-2 SD was considered to be too thin for his/her height, or wasted and those with WHZ <-3 SD were termed as severely wasted.

Children's Cognitive Development:

The WPPSI-III is composed of 14-subtests but to assess children's development only 7-subtests are required, which are translated and adapted by Child Development Unit of ICDDR,B in Bangladesh. The subtests were used information, vocabulary, comprehension, matrix reasoning, block design, picture completion and coding. The first 3 were added up to calculate Verbal IQ (VIQ), the next 3 form the Performance IQ (PIQ) and the last one forms the Processing Speed IQ (PSIQ). All the 3 IQs are summed together to compute the Full Scale IQ (FSIQ). Coding has not been used in most cases as individual score. So, in this study coding was not calculated individually. Classifications of WPPSI cognitive ability are graded according to the following scores-

- Normal grade: 85 to 115
- Mild mental delay: 70 to 84
- Moderate mental delay: 55 to 69
- Severe mental delay: <55

In this study, rural children (43 children) were not assessed with WPPSI and their WPPSI result was collected from ICDDR,B that collected for a previous study where WPPSI tested systematically. Selected data from ICDDR,B was collected on the basis of child's age and their location that is convenient for this study. Important issues about child's cognitive ability measurement are that some factors might affect child's cognitive ability which is: maternal malnutrition, early childhood malnutrition, enabling environment, iodine deficiency, lead poisoning and some micro-nutrient which were not considered in this study.

Parents/family related variables:

Socio-demographic status:

The demographic questionnaire developed and used for collect data through interview to classify SES regarding their family wealth, income, family type, structure, housing, sanitation, source of drinking water. Asset Index used in this study by HNP/Poverty Thematic Group of The World Bank, Socio-Economic Differences in Health, Nutrition, and Population in Bangladesh.

The parents reported through interview about the family's socio-demographics condition (e.g. household members, their age, gender, educational attainment, and occupation, and the family's religion) and parent's involvement in the school and child nutrition. The socio-economic variables were collected through an interview with the father/mother and used as covariates if it was found to be significantly different in the different groups. It was divided into quintiles, the percentage of the children from poorest SES and middle group comprising third and fourth quintiles and from highest quintiles of children. Wealth asset index quintiles:

<u>Quintiles</u>	<u>Lowest</u>	<u>Highest</u>
Poorest	lowest	-0.56090
Second	-0.56090	-0.47188
Third	-0.47188	-0.24278
Fourth	-0.24278	0.22972
Richest	0.22972	highest

vi. Sampling Technique

Preschool children were selected purposively from both urban and rural areas from two selected areas of Bangladesh. Some potential organizations and institutes were selected those are working with early childhood programme with the targeted age groups. Three experienced research assistants were recruited for data collection. All the research assistants was well experienced to use of WPPSI tools in ICDDR,B. A senior scientist

from ICDDR,B guided and supervised the tools preparation, validation and data collection process intensively as an expert and guide of WPPSI tools.

vii. Data Collection Procedures

Before data collection, Research Assistants were recruited and orientated regarding the population, field, ethical issues, objectives, procedure, data collection, and other related issues in this study. Necessary tools (questionnaire/logistics/other) were developed and adapted according to the procedure (adaptation, field test and training). WPPSI intelligent testing tools were adopted by ICDDR, B previously. So, it was not adopted according to the adaptation procedure but questionnaire of SES information was adopted and tested by field test procedure. After completion of training, the Research Assistant started to collect data and after collection of data it was coded and entered into the computer carefully for processing and further analysis (questionnaire on annex-v-vi). All procedure of data collection was closely supervised by the researcher on regular basis. About, 30 percent of the field activities were directly supervised by the researcher in the fields.

viii. Data Processing and Analysis

After cleaning the data, analysis was conducted using SPSS software program Windows Version 15.0. Data was initially checked for any inconsistencies. Nutritional Indices (WZA, HZA and WZH) were measured by using EPI-info programme. Preliminary tests were conducted to determine association between cognitive development and nutritional status of preschool children on variables related to demographic and socioeconomic status. Frequencies, description and mean scores were therefore calculated for the groups. The major analyses examined association between nutritional status and cognitive development of children on the vocabulary, information, comprehension, matrix, similarities and matrix scores, and on nutrition and different social-economic levels of children by using chi-square and 't' test. $P < 0.05$ was considered as level of significance at 95% confidence level.

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ix. Human Subjects and Ethical Considerations

Approval of the proposal was sought from the Research and Ethical Review Committee of IED, BRAC University before launching the study in the field level. Earlier, in a formal session, this proposal was presented to the expert forum of IED, BRAC University and necessary feedback was incorporated in this proposal. Through a verbal and written informed consent, objectives and detail activities of the study were shared with the parents, caregivers as well and children clearly. They were informed that the researcher will maintain confidentiality of all the collected information and that it will be used for research purpose only. Research Assistant was also oriented on the ethical issues.

CHAPTER- III

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FINDINGS

1. Socio-economic and demographic characteristic:

Characteristic of Children:

Finally, 98 preschool aged children were selected including 43 (44%) from rural and 55 (56%) from urban areas in Bangladesh in this study. Children age covered closely preschool age range which is 60 months to 74 months. The study population consists of children from preschool age in urban and rural areas. The mean ages of the children are 68.6 months (± 5.37 SD) with minimum age 60 months and maximum age 74 months.

Table I: Distribution of demographic characteristics of studied children.

Variables	Number	Percent (%)
Sex: Girls	49	50
Boys	49	50
Residence: Rural	43	43.9
Urban	55	56.1
Age group: 60-72 months	91	92.9
73 months and above	7	7.1
Mean Age $\pm$ SD (in months)	67.69 $\pm$ 4.18	
Child religious:		
Muslim	94	95.9
Hindus	4	04.1
Type of family:		
Single	81	82.7
Joint	17	17.3
Birth order:		
1 st	15	15.3
2 nd	19	19.4
3 rd	32	32.7
4 th and rest of all	32	32.6
No of sibling:		
None	8	8.2
1-2	42	42.8
3-4	44	44.9
5 and above	4	4.1

Table 1 shows the frequency distribution of children characteristics in the study. Preschool children (n-98) were selected including boys (n-49) and girls (n-49) from both rural and urban areas. Proportion of male and female are 50% and 50%, but the male and female ratios were different in rural and urban areas.

Characteristics of the parents of preschool children

Among the parents in this study, mother's education level was found, 30% of illiterate, 23% of primary, 30% of secondary and 18% of SSC and above. Among fathers proportion of illiterate 30%, primary 27%, secondary 17% and SSC and above 26% education.

Table II: Characteristics of parents and studied children.

Variables	Number	Percent
Father's education:		
Illiterate	29	29.6
Primary education	26	26.5
Secondary education	17	17.4
SSC and above	26	26.5
Mother's education:		
Illiterate	29	29.6
Primary education	22	22.4
Secondary education	29	29.6
SSC and above	18	18.4
Father's occupation:		
Business	22	22.4
Services	30	30.6
Factory/Day labor/Farmer	36	36.8
Unemployed	2	2.0
Other	8	8.2
Mother's occupation:		
Housewife	94	95.9
Factory/Day labor/Farmer	4	4.1

In profession, most of the mothers were house wife (94%) and father were found 31% in full time service, 22 % business, 36% worker (day labor), 2% unemployed and 8% in other profession.

Table III: Characteristics of children's family

Variables	Number	Percent (%)
Type of family		
Single	81	82.7
Joint	17	17.3
Religion		
Muslim	94	95.9
Hindus	4	4.1
Number of sibling:		
No siblings	8	8.2
1 Sibling	7	7.1
2 and above	83	84.7
Family income:		
<5000	24	24.5
5001-7000	29	29.6
7001-10000	23	23.5
10001-15000	16	16.3
15001 and above	6	6.1
No of sibling:		
None	8	8.2
1-2	42	42.8
3-4	44	44.9
5 and above	4	4.1

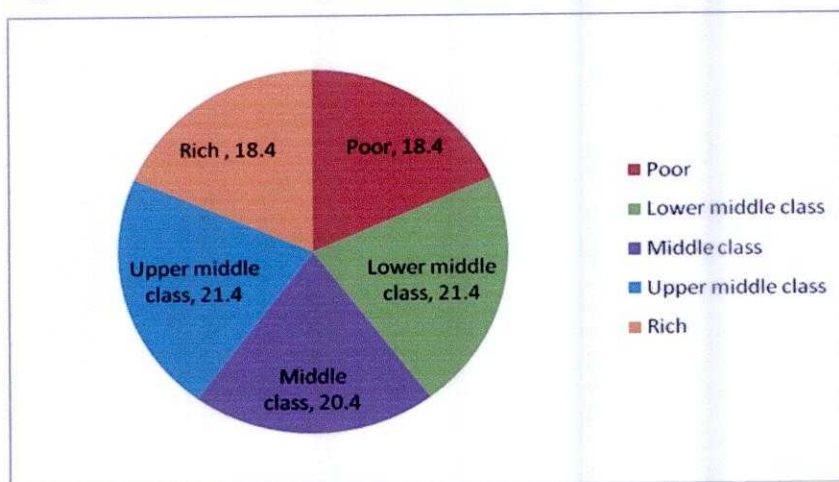
From parents report, the data found regarding their children age, family pattern, educational attainment, occupation, family income, family members, occupation, income, religion and asset of the family. They also reported about their source of drinking water, land family asset, latrine facilities and other family related information in this study. As parents reported that the family pattern of the study children are mostly single family 81 (82.7%) and only 17 (17.3%) are joint type of family. Children's birth order, out of 98 families, 8.2% were no sibling, 7.1% were 1st child, 35.7% were second, 32% were 3rd child, 12.2% were 4th child and 4.1% were found 4th child in their family in this study. In religion, 95.9% were found Muslim and 4.1% were found Hindus in this study.

Among the families, average family income was found 8357.00 per month. Minimum income per family was 1500.00 and maximum income 30000.00 (Mean $\pm$ SD= 8357+-5350). Most of the family has single room-houses (85.7%), 9.2% had two rooms,

3.1% had 3 rooms and 2.0% had 4 rooms. In this study, 46.9% used ponds water, 23.5% used supply water (in urban areas) and 29.6% used tube-well water as their source of drinking water. Most of the families had sanitary latrine facilities (86.7% used safety tank, pit and slab latrine) and 13.3% used hang latrine.

SES status of the children's family:

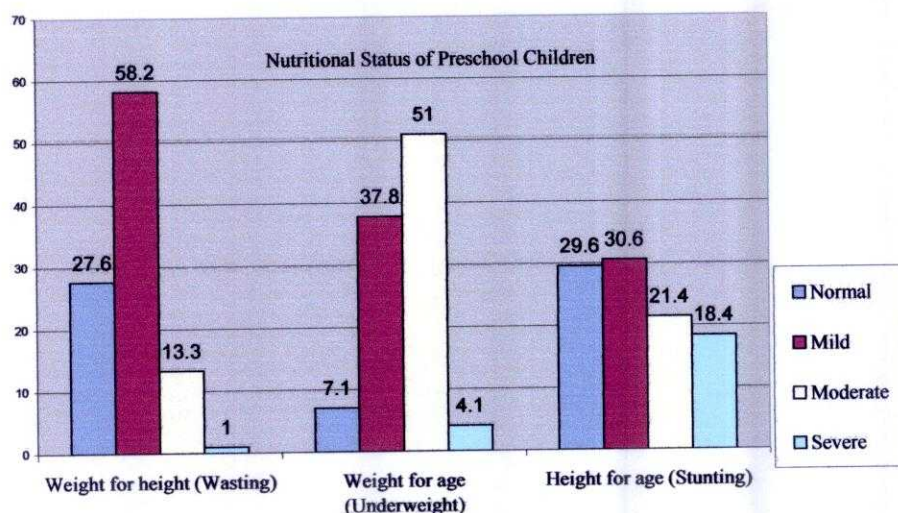
Figure I: Socio-Economic Status (SES) of family



As shown in the above graph, study children were classified in to 5 socio-economic statuses. Socio-economic status was divided into quintiles, the percentage of the children from poorest SES were 18%, and middle group comprising third and fourth quintile were another 20% and from highest quintiles were 20 percent children. Finally, the sample populations were selected for this, from 18.4% of poor class, 21.4% of lower middle class, 20.4% of middle class, 21.4% percent upper middle class, and 18.4% of rich family.

ii. Nutritional status of children:

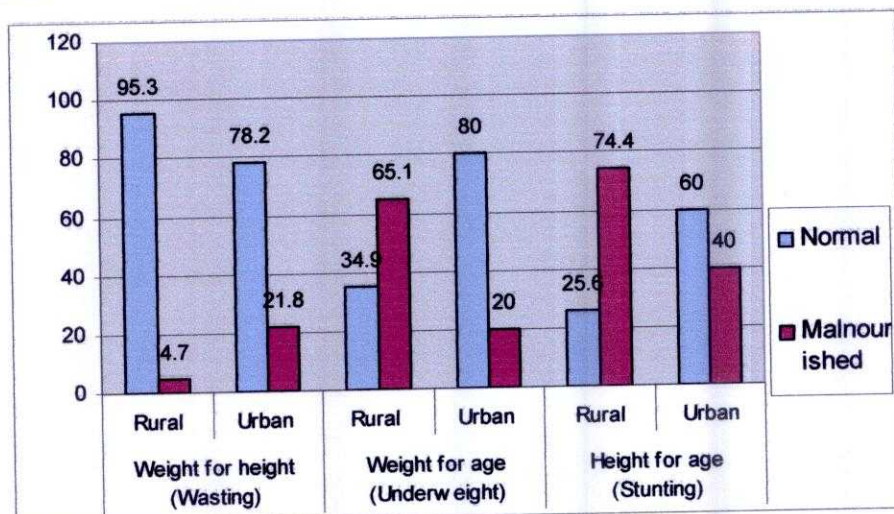
Figure II: Nutritional status of preschool children under study.



The most critical independent variables in this study are nutritional status of the children. For nutritional status, children's height, weight and age were calculated carefully and were converted to weight-for height, height-for-age and weight-for-age z-scores using WHO guidelines. Z-scores were classified as normal: +2 to -1, mild: -1 to -1.99, moderate: -2 to -2.99 and severe: <-3 malnutrition. Based on height for age z score, 60.2% normal (normal and mild) and 39.8% (moderate and severe) were found stunted. Based on weight for age z score, 44.9% normal and 55.1% were underweight. According to weight for height z-score, 85.7% were normal and 14.3% were found wasted.

Overall, in wasting state 85.8% were normal (midland normal) and 14.2% malnourished (moderate and severe), in underweight 44.9% normal and 55.1% malnourished, and in stunting 60.2% normal and 39.8% found malnourished.

Figure III: Nutritional Status Urban versus Rural.



Distribution of nutritional status in urban versus rural children were found quite different in this study. Rural children were found more malnourished (74.4%) than urban children (40%) according to height for age (stunting) measurement, whereas, less normal children were found in rural (25.6%) than in urban (60%) children. In underweight category, malnourished children were found 65.1% in rural and 20% in urban, whereas, normal children were found 34.9% in rural and 80% in urban areas.

iii. Cognitive development status:

Table IV: Status of cognitive development (IQ) of preschool children under study.

Cognitive development status	Number	Percent	Mean $\pm$ SD
Performance IQ:			
Normal (85-115)	25	25.5	80.13 $\pm$ 10.55
Mild (70-84)	60	61.2	
Moderate (55-69)	13	13.3	
Severe (<55)	0	0	
Verbal IQ:			
Normal (85-115)	40	40.8	82.83 $\pm$ 8.85
Mild (70-84)	53	54.1	
Moderate (55-69)	5	5.1	
Severe (<55)	0	0	
Full Scale IQ:			
Normal (85-115)	24	28.6	79.55 $\pm$ 10.34
Mild (70-84)	55	56.1	
Moderate (55-69)	15	15.3	
Severe (<55)	0	0	

Children's full scale intelligence quotients (FSIQ) consists three major categories which are: performance IQ, verbal IQ, and processing speed IQ. The cognitive score are categorized into three groups, which is normal, mild, moderate and severe. In the performance sub-scale; 26% were normal, 61% and 13% had mild and moderate impairment in cognitive abilities respectively. According to Verbal IQ score; 41% of normal, 54% of mild and 5% of moderate impairment in cognition ability found in this study. Finally, according to the full scale score; 29% of normal, 56% of mild, 15% of moderate level of cognition ability found in this study. There was not any severe case found in cognition under the study.

iv. Association between nutrition status and cognitive scores

Cognitive scores of different nutritional status:

Nutritional status of the study population was calculated according to z-score in the two major groups which is normal (normal and mild) and malnourished (moderate and severe) based on WHO status. In this study, the stunted children had significantly lower scores of VIQ ($p=0.001$), PIQ ($p=0.014$), and FSIQ ($p=0.001$). The details are shown in the table- VI.

Table V: Cognitive scores of different nutritional status

Nutritional Measures	Cognitive Measures					
	Verbal IQ		Performance IQ		Full Scale IQ	
	Mean $\pm$ SD	p value	Mean $\pm$ SD	p value	Mean $\pm$ SD	p value
Height for age: • Normal • Malnourished (stunted)	85.14 $\pm$ 8.88 79.36 $\pm$ 7.69	0.001	82.25 $\pm$ 11.52 76.92 $\pm$ 8.0	0.014	82.24 $\pm$ 10.61 75.49 $\pm$ 8.56	0.001
Weight for age: • Normal • Malnourished (Underweight)	85.18 $\pm$ 9.17 80.93 $\pm$ 8.18	0.017	83.36 $\pm$ 11.35 77.50 $\pm$ 9.14	0.006	83.20 $\pm$ 10.09 76.57 $\pm$ 9.65	0.001
Weight for height: • Normal • Malnourished (wasted)	82.83 $\pm$ 9.07 82.86 $\pm$ 7.74	0.993	80.49 $\pm$ 10.52 78.00 $\pm$ 10.86	0.417	79.87 $\pm$ 10.43 77.64 $\pm$ 9.97	0.459

The relation between nutritional status of weight for age z score (underweight) also found significant with cognitive development. In this study, the findings of Verbal IQ ($p=0.017$), Performance IQ ($p=0.006$), and for Full Scale IQ ($p=0.001$) indicated very significant association between underweight and cognition. The associations between nutritional status weights for height (wasting) were not found significant in this study. The significant level between wasting and cognitive ability found, $p=0.993$ in VIQ, $p=0.417$ in PIQ and $p=0.459$ in FSIQ.

Table VI: Differences of cognitive development according to sex and place of residence

Child measure	Full Scale IQ		Verbal IQ		Performance IQ	
	Mean $\pm$ SD	p value	Mean $\pm$ SD	p value	Mean $\pm$ SD	p value
Child's sex status: Boys Girls	77.61 $\pm$ 9.91 81.49 $\pm$ 10.51	0.063	81.76 $\pm$ 8.26 83.92 $\pm$ 9.37	0.228	78.71 $\pm$ 10.41 81.55 $\pm$ 10.61	0.185
Child's residence: Rural Urban	75.42 $\pm$ 8.38 82.78 $\pm$ 10.65	0.0003	79.37 $\pm$ 7.58 85.55 $\pm$ 8.89	0.0004	76.72 $\pm$ 8.92 82.80 $\pm$ 11.02	0.04

As shown in the table VII, there was no difference in IQ of boys and girls but the girls had slightly higher FSIQ ($p=0.063$) than boys in this study. The urban children had significantly higher scores than the rural children. It has identified based on FSIQ ($p=0.0003$), VIQ (0.0004) and PIQ (0.04). The mean FSIQ was found among rural children 75.42 $\pm$ 8.3, and among urban children 82.78 $\pm$ 10.6. There was significant difference of mean FSIQ ($p=0.0003$) in both rural and urban children in this study.

Children's IQs (Intelligence Quotient) in different SES groups:

Table VII: Children's IQs in different SES groups.

SES groups	Performance IQ (Mean $\pm$ SD)	Verbal IQ (Mean $\pm$ SD)	Full Scale IQ (Mean $\pm$ SD)
Poor	73.67 $\pm$ 8.98	78.06 $\pm$ 5.53	72.56 $\pm$ 7.06
Lower middle	76.86 $\pm$ 12.80	79.48 $\pm$ 7.61	75.57 $\pm$ 11.54
Middle	81.10 $\pm$ 6.88	83.05 $\pm$ 8.21	80.35 $\pm$ 8.62
Upper middle	83.10 $\pm$ 10.51	88.52 $\pm$ 10.00	84.43 $\pm$ 10.33
Rich	85.89 $\pm$ 8.62	84.67 $\pm$ 8.58	84.61 $\pm$ 8.16

The above table (table-VII) shows the IQs in different SES groups. It has found that the IQ of the children of rich SES group is higher scored (mean $\pm$ SD=84.61 $\pm$ 8.16) than the children of lower middle (mean $\pm$ SD=75.57 $\pm$ 11.54) and poor SES groups (mean $\pm$ SD=72.56 $\pm$ 7.06).

CHAPTER- IV

DISCUSSION

The study was conducted among preschool aged children to determine the cognitive development in relation to their nutritional status and socio-economic condition in rural and urban contexts in Bangladesh. Analyses described below address the questions: 1) is there any association of nutritional status on cognitive outcome measures? What is the present socio-economic status of preschoolers? What is the nutritional status of preschoolers in Bangladesh? To answer these questions, this study looked for investigating with the children from different groups that would show up as different nutritional and socio-economic status.

This study examined the association between nutrition and cognitive measures with the preschoolers aged 60 to 74 months in the different nutrition status and socio-economic groups. The influence of parent's education, income and profession, children's living status and sex our results suggested that child's nutrition has significant association with cognitive development. However, parent's education, income, living status, gender, and profession are important confounder in the association between nutrition and cognition.

First, in this study finding came up with the socio-economic status of preschool aged children. For this study children were selected from both urban and rural area with equal sex distribution. Children were found five major socio-economic categories. The socio economic status of this study population found mostly similar to the status of Bangladesh socio-economic status. 33 million children in Bangladesh, about half of all Bangladeshi children are living in poverty while about one in four children is deprived of at least four basic needs among the following: food, education, health, information, shelter, water and sanitation. At present, about 36 per cent of the population lives on less than \$1 a day in Bangladesh (UNICEF, 2009). Parents income, living status, family type,

source of drinking water, land, opportunity of electricity are found all most similar to national figures.

Nutritional status of preschool aged children is very similar the figure of national statistics of demographic result of Bangladesh. According to the Bangladesh Development and Health Survey 2007, the national stunting rate of 48 to 59 months aged children, severe (-3 SD) 16% and moderate (-2 SD) 45.6%. In underweight category it was found severe (-3 SD) 10.9% and moderate (-2 SD) 46.3%. In wasting categories, severe (-3 SD) 1.4% and moderate (-2SD) 15.3%. It also found that (BDHS, 2007), rural children are more likely to be stunted than urban children (45% compare with 36%). The rate of malnourished children is very high in the children of preschool children especially in stunting and underweight measures.

In this study, it has found that 14.3% wasted, 55.1% underweight, 39.8% stunted. These findings are slightly different from the BDHS data among underfive children (60 to 74 months). But this study covered only the preschool aged children. So, there might be difference in the two age categories. Nutritional status of preschool children assessed in several studies with high importance; such as Senegal (Nicola, 2003), Chippewa Head Starts (Horner, 1977), Palestine (Abdeen, 2003), Bangladesh (Akther, 2000 & Kiess, 1996) in which child's height, weight, length, and head circumferences are measured.

The current study findings regarding cognitive development of preschool children found among 98 preschool children, 56% of mild and 15% of moderate level cognitive ability and there was none in severe level of cognitive ability according to full scale of IQ. According to the sub-scale of verbal IQ, it has found 54% of mild and 5% of moderate type of cognitive ability. It also found according to subscale of performance IQ, 61% of mild and 13% of moderate type of cognitive ability.

The association between nutritional measures and cognitive measures found significant relation in terms of height for age z score ($p=0.001$) and weight for age ($p=0.001$). But, there was no relation found significantly with weight for height z score of

wasted ($p=0.456$). In a study of Bangladesh in 2004, it has found almost half of the preschool children were underweight and 22% were stunted. It also found that children who were taller had better vocabularies, better verbal and non-verbal reasoning, better school readiness skills, more groups and constructive play, and less onlooker behaviour (Aboud, F. 2006). Though, in Bangladesh, cognitive development of preschool children measured by very few studies, it has found very similar result. In Aboud study, most of the preschool children (45%) found less cognitive ability based on international standard and maximum children (67%) were found average cognitive ability based on South Asian Standard (ECERS Tamil Nadu Version). The study was done very comprehensively using Early Childhood Environmental Rating Scale (ECERS), and WPPSI cognitive rating scale. In a study with Vietnamese children (Hall, A. et al., 2001), after controlling for age, sex, district, and school the results of test scores of height-for-age ($p=0.001$) and weight-for-age ($p=0.001$), but not with weight for height ($p=0.75$). Findings indicated that better nourished children performed better in schools (Glewwe, H. G., et al., 2001). These studies also found similar findings with this study.

In the study of early malnutrition, it has found that malnourished children had poorer cognition at age 3 and 11 both (Liu. J. et al., 2003). A great deal of cross-sectional and longitudinal studies has demonstrated an association between early childhood malnutrition and later cognitive developments and school achievement (Hamadani, J. D., et al., 2003). Worldwide, malnutrition has treats as great epidemic of child cognitive ability especially for the case of young children. For the reason of strong relation issue, in many countries ECD programme has been implemented with strong integration and linkage of health and nutrition programme. It has been found in the ECD Service programme in India that health and nutrition component were strongly integrated in ECD. A number of studies in Latin America, Africa and the U S reported that on intelligence tests children with a history of malnutrition attained lower scores than children of smaller social and economic status who were properly nourished (Action for Healthy Kids, 2004). It has been identified through different studies that malnutrition is a common issue which hamper child intellectual development. New findings with important policy implications have revealed that malnutrition in early childhood impairs intellectual

function in more ways than was previously recognized. The effect of malnutrition leads to extreme weight loss, stunted growth, weakened resistant to infection and in the worst cases, early death. Inadequate nutrition can also disrupt cognition in different ways. Many cross-sectional and longitudinal studies have demonstrated an association between early childhood malnutrition and later cognitive development and school achievement (Hamadani et al., 2004).

Many studies indicate that poor nutritional status has been associated with lower cognitive scores (Morley & Lucas, 1997). Research indicates that nutrition and health affect children's cognitive, motor, and behavioural development, both pre- and postnatally (Grantham-McGregor, Lia, Fernald, & Kavita, 1999). Adequate nutrition is a basic human right and essential for the development of an individual's full physical and intellectual potential (Jooste, 2006). In many studies found that number of factors, socio-demographic, health behaviour, and chronic diseases, are associated both nutrition and cognition (Hamadani, J. D. et al, 2006). Several studies findings suggested in earlier period that children who are undernourished score lower on cognitive tests when they miss breakfast (Watanabe, K., et al.2005). A growing consensus indicates that meeting nutritional requirements throughout childhood is essential for full intellectual development. Providing adequate nutrition throughout childhood is important for cognitive development. There is no significant association found between cognitive developments in the group of wasted children.

Improving nutrition situation, particularly in the early years is crucial towards meeting the Millennium Development Goals (BBS/UNICEF, 2007). Good nutrition is the foundation for child development (UNSCN, 2005). Research suggests that over 200 millions children under five years of age worldwide are not developing their full potential due to poverty, poor health and nutrition (Engle, et. al., 2007). For the significance of integrating nutrition in ECD, the author found that the most effective early child development programme provide direct learning experiences to children and families, are integrated with family support, health, nutrition, or education systems and services (Engle et. al., 2007). Earlier it was found from the results of many studies that early childhood

undernutrition is associated with poor current and later cognitive development and school achievement. So, nutrition component in preschool children might be important to incorporate in preschool programme in Bangladesh.

CHAPTER- V

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i. Limitation

This study has several limitations. First, due to time and resource constrain, the sample was selected very limited in number and purposeful sampling method that may not represent all preschool children in Bangladesh. Second: the cross-sectional framework makes it impossible to draw causal inferences on the association between nutrition and cognition. Third, the study population was selected only from two specific areas, the randomized sampling with divergent community might be offered more authentic finding regarding child's nutrition and cognitive outcome. Fourth, all required analysis for control the confounders were not conducted in this study due to limited resource and time period. Finally, some other factors that may influences child cognitive ability which was not control in this study in systematic ways such as maternal malnutrition, parents education-income, enabling environment, iodine deficiency, lead poisoning and some micro-nutrient deficiency.

ii. Conclusion

This cross-sectional study was conducted to determine the association between nutritional status and cognitive development of preschool children in selected preschools in Bangladesh. Nutritional status of preschool children aged 5-6 years, 55.1% underweight (44.9% normal), 39.8% stunted (50.2% normal), and 14.2% wasted (85.8% normal). Cognitive ability (mean $\pm$ SD full scale IQ) was 79.55 $\pm$ 10.3 which was in mild impaired state. Normal IQ found in 28.6%, 56.1% mild and 15.3% were moderate impaired state. It has found that urban children had more IQ than rural children (82.78 vs. 75.42). Height for age (stunting) and weight for age (under nutrition) had significant association with full scale IQ score ($p=0.001$). That is stunted and underweight children had less IQ than well nourished preschool children. In this study it was found that well nourished preschool children had better cognitive development.

iii. Recommendations

The findings of this study suggested that nutrition affects children's cognitive development. The following recommendations are made in the spirit of improving the overall situation of children's nutritional status as well as cognitive ability.

As association between nutrition and cognition found significantly, it should be suggested to give importance to the nutritional component in the preschool intervention in both rural and urban areas. Integration between preschool programme and nutritional programme is essential to meet children's nutritional needs for the optimum development of preschool children. People awareness is very important for ensuring children's nutritional requirement in early years. Based on the finding, it has been recommended that an awareness based education programme for the parents, programme peoples, and policy makers. Children's parents and family education may be one important task for improving children nutrition status and as well as cognitive ability. It has identified that children's nutritional requirement is essential for ensuring child's optimum cognitive development. The researcher recommend that a further nationwide study with large number and randomized sampling procedure is required for investigating more authentic finding and suggestions in this regards.

iv. Acknowledgement

The researcher would like to acknowledge to the Director and the Management team of IED, BRAC U, and Head of ECD Resource Centre for their enormous support providing fund and allocate time for conducting this study perfectly. It seems that apart from the office support, it was very difficult to conduct the study in the time. The researcher expresses his gratitude to his supervisors whose continuous supervision and support made this research successful. The Researcher express very thanks to the research assistants: Ms. Asma, Ms. Rony and Ms. Mita whose outstanding supports make this study very easy especially in the field work. Researcher also express his highest gratitude to the concern organizations and institutes: Plan Bangladesh, SUROVI, ICDDR,B, Agargaon Government (Registered) Primary School and Mohammadpur (Registered) Primary School authority for their great support for selecting sample population and data collection. Finally, the researcher expresses his heartfelt gratitude to the participants, including, children, parents, teachers, supervisors and community people.

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REFERENCES

- Abedeen, Z., Greenough, P. G., Chandran, A. & Qasrawi, R., (2003). Assessment of the nutritional status of preschool-age children during the second Intifada in Palestine. *Al-Quds Nutrition and Health Research Institute*, Palestine.
- Aboud, F. E., (2006). Evaluation of early childhood preschool programme in rural Bangladesh, *Early Childhood Research Quarterly*, ELSEVIER, 21. Pp 46-60.
- Action for Healthy Kids, (2004). The role of sound nutrition and Physical Activity in Academic Achievement, www.ActionForHealthyKids.org
- Agarwal, D. K., Upadhyay, S. K., Tripathi, A. M., & Agarwal, K. N., (1987). Nutritional status, physical work capacity and mental function in school children. *Scientific Report* No. 6. New Delhi: Nutrition Foundation of India.
- Akhter, N., Torlesse, H., Pee, S. D., Ibrahim, Q. I. U., Stallkamp, G., Panagides, D., & Bloem, M. W., (2000). Nutritional status of young children and their mothers in Chittagong Hill Tracts, Bangladesh. *Helen Keller International*, Bangladesh. Dhaka
- Arnold, C, & Gopini, P., (2003). *The importance of Early Childhood Development programme in improving key education indicators and the quality of education*. Paper for Quality in Education Save the Children International Education Conference, 11-13th June, Oslo, Save the Children Norway.
- Bangladesh Demographic and Health Survey. (2004), (2007), (2009). Dhaka, Bangladesh and Calverton, Maryland, USA: National Institute of Population Research and Training, Mitra and Associates, and Macro International.
- BBS/UNICEF (2007). Child and Mother Nutrition Survey 2005, Bangladesh Bureau of Statistics and UNICEF, Dhaka.
- Black, R. E., Morris, S. S., & Bryce, J., (2003). Where and why are 10 millions children dying every year? *The Lancet*. 361, 2226-2234.

- Bryce, J., Coitinho, D., Darnton-Hill, I., Pelletier, D., Pinstup-Andersen, P., (2008). Maternal and child undernutrition: effective action at national level, *The Lancet*, Volume-371, Issue-9611, Pages- 510-126.
- Clarke, N., Grantham-McGregor, S. M., & Powell, C., (1991) Nutrition and health predictors of school failure in Jamaican children. *Ecology of Food and Nutrition*: 26:1-11.
- Duffield, A. Harun, A. A., Kaziba, R., Mursal, H., Rahman, M., Tafera, M., Taylor, A., & Yimmer, K., (2003). Thin on the Ground. *Questioning the evidence between World Bank- funded community nutrition projects in Bangladesh, Ethiopia and Uganda*. Save the Children U K, London, U K.
- Education for All Global Monitoring Report. (2006). *Literacy for life*, UNESCO, Paris, France.
- Education for All Global Monitoring Report. (2007). *Strong foundations: Early Childhood Care and Development*, UNESCO, Paris, France.
- Education for All Global Monitoring Report. (2009). *Overcoming inequality: why governance matters*, UNESCO, Paris, France.
- Engle, P. L. et. Al., (2007). Strategies to avoid the loss of developmental potential among over 200 million children in the developing world, *The Lancet*, Volume- 369, Issue- 9557, Pages- 229-242.
- Evans, J. L., Myers, R. G., & Ilfeld, E. M., (2000). *Early Childhood Counts: A programming guide on early childhood care for development*. Washington D. C.: The World Bank.
- Florencio, C., (1988). Nutrition, health and other determinants of academic achievement and school-related behavior of grades one to six pupils. Quezon City, Philippines: University of the Philippines.
- Foysal, M. K., (2006). Extent of ECD Programmes in Bangladesh: An Activities and Resources Map: ECDRC, IED, Dhaka, Bangladesh.
- Grantham-McGregor, S. M., Fernald, L. C., & Sethuraman, K., (1999). (Grantham-McGregor SM, et al. Effects of health and nutrition on cognitive and behavioural development in children in the first three years of life. Part 2: Infections and micronutrient deficiencies: iodine, iron, and zinc. *Food Nutr Bull* 1999;20:76-99)

- Grantham-McGregor, S. M., (1995). A review of studies of the effect of severe malnutrition on mental development. *J Nutr.* 1995; 125: 2233S-8S
- Grantham-McGregor, S. M. et. al., (2007). Developmental potential in the first 5 years for children in developing countries, *The Lancet*, Volume- 369, pages: 60-70.
- Glewwe, H. G., et al. (2001). Early childhood nutrition and academic achievement: a longitudinal analysis.
- Hall, A. et al., (2001). An association between chronic undernutrition and educational test scores in Vietnamese children, *European Journal of Clinical Nutrition*, 56(9): 801-4.
- Hamadani, J. D., et al., (2003) Effect of Psychological Stimulation on mental development and behaviour of malnutrition children: a randomized control trial. *The Journal of Nutrition*, 126:2644-265.
- Hamadani, J. D., Sayed, N., Duda, Famida Khatun, & Granham-Magregor, S. M., (2006). Psychological Stimulation Improved the Development of Undernourished Children in Rural Bangladesh, *The Journal of Nutrition*, 126:2645-2652.
- Hannan, A., Hassan, M.Q., Rahman, F. A. K. M., Rahman, A., & Talukder, M. Q. K., (2001). Nutritional Status of children and mother s in Bangladesh. 10th ASCON, ICDDR'B, Bangladesh.
- Hashima-e-Nasreen, & Masud, S. A., (2003). *Early Childhood Development: Child-to-child approach*, Baseline Survey 2003, BRAC, Dhaka, Bangladesh.
- Hoddinott, J., Maluccio, J. A., Rehrma, J. R., Flores, R., & Martorell, R., (2008). Effect of a nutrition intervention during early childhood on economic productivity in Guatemalan adult, *The Lancet* ; Volume 371, Issue 9610, Pages 411-416.
- Horner, M., Olson, C., & Pringle, D., (1977). Nutritional Status of Chippewa Head Start Children in Wisconsin. *American Journal of Public Health*, 67(2), 185. Retrieved August 26, 2009, from Academic Source Premier database.
- Hossain, S. M. M., Duffield, A., & Taylor, A., (2005). An evaluation of the impact of a US\$ 60 million nutrition project in Bangladesh, *Health policy and planning*; 20(1): 35-40, Oxford University Press.
- Jooste, P. L., (2006). South African Medical Research Council, Nutritional Intervention Research Unit. <http://www.mrc.ac.za/nutrition/nutrition.htm>

- Kabir, R., (2001). Baseline survey of caregivers' KAP on early childhood development in Bangladesh, *Research Associates for Development*: UNICEF: Dhaka, Bangladesh.
- Kiess, L., (1996). Comparison of Nutritional status among preschool children living in rural, slum and urban Dhaka. Hillen Killer International, Dhaka.
- Larry, J. L., & Pollitt, E., (1996). *Malnutrition, poverty and Intellectual Development: Research into childhood nutrition reveals that a poor diet influences mental development in more ways than expected*, Scientific American.
- Lasky, R. E., Klein, R. E., Yarbrough, C., Engle, P. L., Lechtig, A., & Martorell, R., (1981). The relationship between physical growth and infant behavioral development in rural Guatemala. *Child Development*; 52:219-26.
- Liu. J. et al., 2003 malnutrition at age 3 years and lower cognitive ability at age 11 years: independence from psychosocial adversity, *Achieves of Pediatrics and Adolescent Medicine*, 157 (6): 593-600.
- Mckay, H. E., Mckay, A>C., and Sinistera, L. (1969). Behavioral Effects of nutritional Malnutrition on and programmed Stimulation of moderately Malnourished Preschool Age Children. Paper presented at the Meeting of American Association for the Advancement of Science Symposium, 1969.
- Monckeberg, P., (1972). Malnutrition and mental capacity. In: Nutrition, the nervous system and behaviour. Scientific Publication No. 251. Washington, DC: *Pan American Health Organization*, :48-54.
- Morley, R. & Lucas, A., (1997). Nutrition and cognitive development. *British Medical Bulletin* 53 (No 1). 123-134.
- Nath, S. R., & Sylva, K., (2007). Children's Access to Preschool Education in Bangladesh. *International Journal of Early Years Education*. 15 (3), 275-295. <http://dx.doi.org/10.1080/0966976071516967>
- Nicola, I. D., Wade, S., et. al., (2003). Nutritional status of preschool Senegalese children: Long-term effects of early severe malnutrition. *British Journal of Nutrition*, 90, 1123-1132. Retrieved August 26, 2009, from Academic Source Premier database.

- Operational Framework for Pre-Primary Education, (2008). Government of the People's Republic of Bangladesh, Ministry of Primary and Mass Education. Dhaka, Bangladesh.
- Owen, G. M., Kram, K. M., Garry, P. J., Lowe, J. E., & Lubin, A. H., (1974). A study of Nutritional Status of preschool children in the United States, 1968-1970. *Pediatrics*, Vol. 53, No. 4, Part 2
- Powell, C. A., Grantham-McGregor, S. M., (1985). The ecology of nutritional status and development in young children in Kingston, *Jamaica. Am J Clin Nutr*;41:1322-31.
- Pollitt E. "Does Breakfast Make a Difference in Schools." *Journal of The American Dietetic Association* 1995.; 95(10):1134-39.
- Randall Simpson, J., Keller, H., Rysdale, L., & Beyers, J., (2008). Nutrition Screening Tools for Every Preschooler (NutriSTEP): validation and test-retest reliability of a parent-administered questionnaire assessing nutrition risk of preschoolers. *European Journal Of Clinical Nutrition*, 62(6), 770-780. Retrieved August 26, 2009, from MEDILINE database.
- Robert, G.D., (1993). Effect of nutrition on brain development in humans. *The American Journal of Clinical Nutrition*. 1993;57:286S-90S.
- Sigman, M, Neumann, C., Baksh, M., Bwibo, N., & McDonald, M. A., (1989). Relationship between nutrition and development in Kenyan toddlers. *J Pediatr*;115:357-64.
- Sirajuddin, M., (2007). Education for All: EFA Mid-Decade Assessment. Early Childhood Care and Education in Bangladesh. UNESCO, Dhaka Office
- State of the World's Children, (2007). *Women and Children: The double dividend of gender equality*, UNICEF.
- Simon DT, Grantham-McGregor S. "Effects of missing breakfast on the cognitive function of school children differing nutritional status". *American Journal of Clinical Nutrition* 1989;49:656-53.
- Stephen, M. P., & Alison, B. A., (2001). Effect of poverty and maternal depression on early childhood development. *Child Development*, Vol. 72, No. 6 (Nov.-Dec., 2001). Pp. 1794-1813.

- Talukder, M. Q. K., & Hassan, M. Q., (2002). *Nutrition and Early Childhood Development*, Annual Scientific Conference, 10th ASCON, ICDDR'B, Dhaka.
- Tarannum, S., & Hyder, Z. S. M., (1996). Determinants of Nutritional Status of preschool children in BRAC eligible households. BRAC, Dhaka
- Trawick, S. J. (2006). *Early Childhood Development-A Multicultural Perspective*. Pearson Education Ltd. Singapore. pp, 48-58.
- United Nations Educational, Scientific and Cultural Organization (UNESCO)
International Bureau of Education. (2006). Bangladesh: early childhood care and education (ECCE) programme. Country profile commissioned for the EFA Global Monitoring Report 2007, *Strong Foundation: early childhood care and education*. UNESCO. <http://unesdoc.unesco.org/images/0014/001471/147156e.pdf>
- UNICEF Bangladesh, Newsletter, Issue 13, September 2009.
- UNICEF Bangladesh, (2009)
http://www.unicef.org/infobycountry/bangladesh_bangladesh_background.html
- United Nations Educational, Scientific and Cultural Organization, (2008). Data Centre.
(data file) UNESCO. <http://stats.uis.unesco.org>
- Walker, SP., Cheng, SM., Powell, CA., and Grantham-McGregor, SM., (2005) Effect of early childhood psychosocial stimulation and nutrition supplementation on cognitive and education in growth-stunted Jamaican Children, Perspective Cohort-study, *Lancet*, Volume: 366:1804-07.
- Watanabe, K., Flores, R., Fujiwara, J., & Tran, L. T. H., (2005). Early childhood development interventions and cognitive development of young children in rural Vietnam. *The Journal of Nutrition*, pp. 1918-1925.
- World Bank (2009), NOTES: Child & Youth Development, *Supplementing Nutrition in the Early Years: The role of early stimulation to maximize nutritional inputs*, Human Development Network, The World Bank, Volume III, Number 1.
- World Health Organization's Commission on Social Determinants of Health. (2008). *Closing the gap in a generation: Health equity through action on the social determinants of health*

CHAPTER- VII

Thesis presented to the IED, BRACU./2010

ANNEXURES

Annex: I

Institute of Educational Development Master's Thesis Programme

Parent's Consent Form (English)

Institute of Educational Development (IED), BRAC University has taken a research initiative as part of Master's course in early childhood development in your area. The research will focus on your children health, nutrition and your family related information under the study of Nutritional Status and cognitive development of preschool children under ECD programs in Bangladesh. The aim of this research is to explore the relationship between nutritional status and cognitive development of preschool children in Bangladesh. The study will also try to determine how these relationship happened by their socioeconomic status and family conditions.

If you want to take part and/or allow your children to participate in this research, please sign the form below after you read [or listen to] this form telling you what the study is about. Your participation is totally voluntary, and you may change your mind and withdraw at any time before and during the study. If you agree to participate, we will ask or determine your child and you some specific areas about information on the issues mentioned above such as nutritional status of the children, family related data and other child related information under age 5 years and mother. Height/length and weight of the participant/children will be measured using standard scales and digital weighing scales. In addition, we will also collect information about socio-economic status of your household, social problems that you may experience by family member or others. Experienced female research assistants will be involved in collecting information from you. It will take approximately an hour and a half to complete the total process of data collection.

We will maintain your privacy and confidentiality about any information (sensitive information). Your child and your family members' names will not be written on any of the material, and only the researchers will have access to your information. All materials with your information in it will be stored in a safe, locked location. The researchers named below will be responsible to ensure the protection of the information. The research will not benefit you personally. The information you provide will however, have significant contribution in learning and improving IED's development programs and may benefit you in the long run.

If you are willing to participate in this research or disclose information about yourself, we would request you to sign this consent form. Directly or indirectly, you will not be deprived of any of the services or benefits that you are currently receiving or are likely to receive in the future from IED if you do not participate or withdraw from the study.

If you want to know more about this research and/or your participation rights, or if there is pertinent clarification that you may require, please contact the following persons.

Mahmuda Akhter <i>HEAD, ECD Resource Centre (ECDRC)</i> Institute of Educational Development (IED) House-113, Road- 2/A, Niketon Gulshan-1, Dhaka 1212	Golam Kibria <i>Principal Investigator</i> ECD Resource Centre (ECDRC) Institute of Educational Development (IED) House-113, Road- 2/A, Niketon, Gulshan-1,
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Thesis presented to the IED, BRACU./2010

Phone: 9881265, Ext: 2112

Dhaka 1212, Phone: 9881265, Ext: 2137,
Mob:01712-564423

I have read the consent form or my acquaintance read the consent form to me. I completely understand my rights about participation and I am willing to participate in this research.

Name (Please print): _____ Signature: _____

Date _____

Name of child 1 _____

Name of child 2 _____

I have read the consent form or my acquaintance read the consent form to me. I completely understand the rights about my child/children's participation and I am willing to let him/her as a subject of this research.

Name (Please print): _____ Signature: _____

Date: _____

Annex: ii

সম্মতিপত্র

ব্র্যাক বিশ্ববিদ্যালয়ের শিক্ষা উন্নয়ন ইনস্টিটিউটের পক্ষ থেকে আপনার এলাকায় একটি নতুন গবেষণা কর্মের উদ্যোগ নেওয়া হয়েছে। এই গবেষণা কর্মের উদ্দেশ্য হলো, ৪ বছর ৬মাস হতে ৫ বছর ৬মাস বয়সী শিশুর পুষ্টি ও স্বাস্থ্যগত অবস্থান, শিশুর বৌদ্ধিক বিকাশের স্তর, শিশুর মৌখিক ভাষা এবং শিশুর ভবিষ্যৎ অর্জন নিয়ে বাবা-মায়ের প্রত্যাশা কি তা জানা। পাশাপাশি শিশুর পারিবারিক অবস্থা ও ছেলে-মেয়েভেদে শিশুর পুষ্টি ও স্বাস্থ্যগত অবস্থান এবং মৌখিক ভাষা, বৌদ্ধিক বিকাশ ও ভবিষ্যৎ অর্জন নিয়ে কেনো পার্থক্য রয়েছে কি না তা চিহ্নিত করা। সেই সাথে, শহরের শিশুদের সাথে গ্রামের শিশুদের বিকাশের মধ্যে কোন পার্থক্য আছে কিনা তা যাচাই করাও এই গবেষণা কর্মের উদ্দেশ্য।

যদি আপনি এই গবেষণা কর্মে অংশগ্রহণ করতে চান এবং আপনার শিশুদের অংশগ্রহণের অনুমতি প্রদান করেন তবে অনুগ্রহ করে সম্মতিপত্রটি পড়ার পর অথবা গবেষণা কর্মটি কী বিষয়ে তা শোনার পর নিচের ফর্মে স্বাক্ষর করুন। গবেষণার প্রয়োজনে আপনার শিশুকে কিছু প্রশ্ন করা হবে এবং তাকে কিছু কাজে অংশগ্রহণ করতে হবে। এছাড়া আপনার কাছ থেকে পরিবারের আয়, পেশা, মায়ের শিক্ষা স্তর, পরিবারের সম্পদ ইত্যাদি সম্পর্কে তথ্য জানতে চাওয়া হবে। দুইজন সুপ্রশিক্ষিত ও অভিজ্ঞ নারী গবেষণা সহকারী এসকল তথ্য সংগ্রহে নিযুক্ত থাকবে। মৌখিক সাক্ষাতকার ও প্রশ্নপত্র অনুযায়ী তথ্য সংগ্রহের কাজে প্রায় দেড় ঘন্টা সময় ব্যয় হবে।

আপনার প্রদত্ত তথ্যের বিষয়ে গোপনীয়তা রক্ষার জন্য কোথাও আপনার বা আপনার পরিবারের সদস্যদের নাম লেখা হবে না এবং শুধুমাত্র গবেষকের এই তথ্য ব্যবহারের অধিকার থাকবে। সকল তথ্য ও এ সংক্রান্ত দলিলাদির নিরাপত্তা ও গোপনীয়তা রক্ষা করা হবে এবং নিচে নাম উল্লেখকারী গবেষক এই তথ্যের নিরাপত্তার ব্যাপারে দায়ী থাকবেন। আপনি এই গবেষণা কর্মে অংশগ্রহণে আগ্রহ থাকলে এবং তথ্য প্রদানে সম্মত হলে আপনাকে নিচে স্বাক্ষর করার জন্য সবিনয় অনুরোধ করা হলো।

এই গবেষণায় অংশগ্রহণ সম্পূর্ণরূপে স্বেচ্ছাসেবামূলক বিধায় আপনি যেকোন সময় গবেষণায় অংশগ্রহণ হতে বিরত হতে পারবেন এবং তথ্য সংগ্রহ ও বিশ্লেষণ চলাকালীন নিজেকে সরিয়ে নিতে পারবেন। আপনাকে একাজে অংশগ্রহণের জন্য কোনো প্রকার আর্থিক বা অন্যান্য সুবিধা প্রদান করা হবে না।

শিশুর নাম ১ :

শিশুর নাম ২ :

আমি এই সম্মতিপত্রটি পড়েছি বা আমাকে পড়ে শোনানো হয়েছে। আমি আমার সন্তান/সন্তানদের অংশগ্রহণের অধিকার সম্পর্কে সম্পূর্ণরূপে সচেতন এবং আমি এই গবেষণায় তাদের এবং আমার নিজের অংশগ্রহণ নিশ্চিত করতে ইচ্ছুক।

নাম: (দয়া করে ছাপ দিন)..... স্বাক্ষরঃ.....

তারিখঃ.....

Annex: iii

Budget
Masters Thesis
Golam Kibria

ECD Resource Centre, IED, BRAC University

SL	Head of expenditures	Unit(s)	Unit cost (Taka)	Total amount (Taka)
1	Training: For the Research Assistants (2)			
1.1	5 days training for 2 persons	10 pers/days	500	5,000/-
	Total of # 1			5,000/-
2	Material collection/development and pilot test			
2.1	Material collection/ purchase	2 sets	1,000	2,000/-
2.2	Photocopy of questionnaire/data/ document/others	160 sets materials	15	2,400/-
2.3	Conveyance, and snacks for RA	20 pers/days	250	5,000/-
	Total of # 2			9,400/-
3	Payment for Research Assistant			
3.1	Communication with parents and community	80 mothers	50	4,000/-
3.2	Sample selection	6 sites	300	1,800/-
3.3	Data collection in urban area	40 pers.	125	5,000/-
3.4	Data collection in rural area	40 pers.	150	6,000/-
	Total of # 3			16,800/-
4	Food and Rent for Research Assistant in rural area			
4.1	Food	10 times	300	3,000/-
4.2	Accessories	3 sets	500	1,500/-
4.3	Gift (teaching aids) for children	80 sets	15	1,200/-
	Total of # 4			5,700/-
5	Data processing			
5.1	Data processing and analysis	1 person	5,000	5,000/-
	Total of # 5			5,000/-
6	Report preparation and documentation			
6.1	Printing/photocopy	5 sets	300	1,500/-
	Total of # 6			1,500/-
7	Administrative cost			
7.1	Administrative cost	1 no	2000	2,000/-
	Total of # 7			2,000/-
	GRAND TOTAL COST			45,400/-

Total cost in words: Forty Five Thousand Four Hundred Taka Only

Annex: iv**Plan of Action**

Period: August 2009 to April 2010
ECDC, IED, BRAC University

S L	Major activities	Time period (2009-2010)																															
		Aug'09				Sept'09				Oct'09				Nov'09				Dec'09				Jan'10				Feb'10				Mar'10			
		W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W		
		1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
1	Literatures review																																
2	Mentor meeting, review and editing work																																
3	Proposal development																																
4	Proposal finalization and approval																																
5	Recruitment: Research Assistants																																
6	Training for Research Assistants																																
7	Questionnaire development																																
8	Materials preparation																																
9	Population/Sample selection																																
10	Data collection/field work																																
11	Data processing																																
12	Data cleaning, analyze and tabulation																																
13	Report writing and correction																																
14	Report finalization																																
15	Presentation																																
16	Report submission																																
* W- Week																																	

* W- Week

.....
ঠিকানাঃ বাড়ি নংঃ, রাস্তাঃ, পাড়া/গ্রামঃ, পোষ্টঃ, জেলাঃ

১. শিশুর বয়সঃ বছর..... মাস ২. লিঙ্গঃ ☐ ছেলে । মেয়ে ☐

৩. শিশুর ধর্মঃ মুসলিম । হিন্দু । বৌদ্ধ । খৃষ্টান । অন্যান্য। ৪. শিশু প্রিন্সুলে কতদিন পড়েছেঃ বছর..... মাস

৫. শিশুর মায়ের পেশাঃ গৃহকর্মী । চাকুরী । শিক্ষিকতা । কারখানা শ্রমিক । ব্যবসায়ী । দিনমজুর । অন্যের বাড়িতে কাজ করে অন্যান্যঃ

৬. মায়ের শিক্ষাগত যোগ্যতাঃ নিরক্ষর । স্কুলে পড়ে নাই । প্রাইমারী । সেকেন্ডারি । এসএসসি পাশ । এইচএসসি পাশ । স্নাতক পাশ অন্যান্যঃ

৭. শিশুর বাবার পেশাঃ গৃহকর্মী । চাকুরী । শিক্ষিকতা । কারখানা শ্রমিক । ব্যবসায়ী । দিনমজুর । বর্গাচারী । অন্যান্যঃ

৮. বাবার শিক্ষাগত যোগ্যতাঃ নিরক্ষর । স্কুলে পড়ে নাই । প্রাইমারী । সেকেন্ডারি । এসএসসি পাশ । এইচএসসি পাশ । স্নাতক পাশ । অন্যান্যঃ

পরিবারের তথ্যঃ

৯. শিশুর পরিবারের সদস্য সংখ্যাঃ ১০. ভাই-বোনের সংখ্যাঃ

১১. শিশু পরিবারের কততম সদস্যঃ ১২. পরিবারের ধরণঃ ☐ একক । যৌথ ☐

১৩. শিশু কোথায় বসবাস করেঃ ☐ গ্রাম । শহর ☐

আর্থ-সামাজিক অবস্থাঃ

১৪. পরিবারের মোট মাসিক আয়ঃ টাকা (কথায়ঃ

১৫. পরিবারের ব্যবহৃত ঘর/কক্ষ কয়টিঃ ১৬. ঘরের চাল বা ছাদ কিসের তৈরিঃ

১৭. পরিবারের সম্পদের তথ্যাবলীঃ ক) বাড়িতে বিদ্যুতের ব্যবস্থাঃ ☐ না ☐
খ) বাড়িতে কি কি আছেঃ রেডিও । টেলিভিশন । বাইসাইকেল ।
গ) পরিবারের নিজস্ব জমি কতটা আছেঃ বসবাসের-..... শতাংশ । চাষাবাদের-... শতাংশ ।

ঘ) পরিবার নিজের জমিতে চাষ করে ☐ অন্যের জমিতে চাষ করে ☐

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জ) পরিবারের সদস্যদের ব্যবহৃত টয়লেট-এর ধরনঃ সেপটিক ট্যাংক । পিট ল্যাট্রিন ।
স্ল্যাভ ল্যাট্রিন । বুলন্ড ল্যাট্রিন । খোলা জায়গা । ঝোপ-ঝাড় । অন্যান্য।

তথ্য সংগ্রহকারীর নাম, স্বাক্ষর ও তথ্য সংগ্রহের তারিখঃ

....

পরীক্ষক/তত্ত্বাবধায়কের নাম, স্বাক্ষর ও তারিখঃ

.....

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Date of birth: | _ | _ | _ | _ | _ | _ |

Date of test: | _ | _ | _ | _ | _ | _ |

Address: House-....., Post:.....Village/Para:.....Thana:.....Dist:.....

Sex: 1=Male, 2=Female | _ | Name of school:Class:.....

Duration of schooling including preschool: Years | _ | Months | _ |

===== X =====

Anthropometry:

Weight (Kg.) : | _ | _ | . | _ | _ |

Height (Cm.) : | _ | _ | . | _ | _ |

MUAC (Cm.): | _ | _ | . | _ | _ |

Head Circumference (Cm.): | _ | _ | . | _ | _ |

WPPSI :

Sub Scales	Test Raw Score	Scaled Score
Block Design		
Information		
Matrix Reasoning		
Vocabulary		
Coding		
Comprehension		
Picture Completion		

Sum of verbal score	VIQ	Sum of Performance score	PIQ	Coding scaled score	Sum of Scaled score	FSIQ

Performance Subtests = Block Design, Matrix reasoning, Picture Completion, Verbal Subtests = Information, Vocabulary, Comprehension, FSIQ= sum of verbal, performance and coding

Name of Data Collector:

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Part A		Design	Blocks Needed	Presentation Method	Time Limit	Completion Time	Correct Design	Incorrect Design		Score	
4-7	1.	Child Examiner	4 Red	Model	30"		Y N	Trial 1 	Trial 2 	Trial 2 0	Trial 1 1 2
	2.		6 Red	Model	30"		Y N	Trial 1 	Trial 2 	Trial 2 0	Trial 1 1 2
	3.		6 Red	Model	30"		Y N	Trial 1 	Trial 2 	Trial 2 0	Trial 1 1 2
	4.		4 Red	Model	30"		Y N	Trial 1 	Trial 2 	Trial 2 0	Trial 1 1 2
	5.		2 Red, 2 White	Model	30"		Y N	Trial 1 	Trial 2 	Trial 2 0	Trial 1 1 2
	6.		4 Red, 2 White	Model	30"		Y N	Trial 1 	Trial 2 	Trial 2 0	Trial 1 1 2
	7.		2 Red, 2 White	Model	30"		Y N			0	2
	8.		6 Red	Model	60"		Y N			0	2
	9.		4 Red, 4 White	Model	60"		Y N			0	2
	10.		4 Red, 4 White	Model	60"		Y N			0	2
Part B	Sample A		If the child does not pass Sample A, administer Sample B.				Sample B				
	11.		4 two-colour	Model	60"		Y N			0	2
	12.		4 two-colour	Model	60"		Y N			0	2
	13.		4 two-colour	Model and Picture	60"		Y N			0	2
	14.		4 two-colour	Picture	90"		Y N			0	2
	15.		4 two-colour	Picture	90"		Y N			0	2
	16.		4 two-colour	Picture	90"		Y N			0	2
	17.		4 two-colour	Picture	90"		Y N			0	2
	18.		4 two-colour	Picture	90"		Y N			0	2
	19.		4 two-colour	Picture	90"		Y N			0	2
20.		4 two-colour	Picture	90"		Y N			0	2	
Total Raw Score (Maximum = 40)											

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৩) আমাকে দেখাও এখানে কোনটা পানিতে চলে?	1	2	3	4	DK	0	1
৪) আমাকে দেখাও এখানে কোনটা পানিতে চলে?	1	2	3	4	DK	0	1
৫) আমাকে দেখাও এখানে ছোট বাচ্চারা কোনটা দিয়ে খেতে পারে?	1	2	3	4	DK	0	1
৬) দেখাও এখানে কোনটা ভূমি খেতে পার?	1	2	3	4	DK	0	1
৭) তোমার নাক দেখাও?						0	1
৮) মানুষ কি দিয়ে লিখে?						0	1
৯) মানুষ কি দিয়ে কাগজ কাটে?						0	1
১০) পাখির কয়টি পা থাকে?						0	1
১১) তোমার কান কয়টি?						0	1
১২) তোমার হাটু দেখাও?						0	1
১৩) বোতলের মধ্যে কি থাকে?						0	1
১৪) একটি তরিতরকারী নাম বল?						0	1
১৫) মানুষ খাবার কি কি দিয়ে চাবায়?						0	1
১৬) মানুষ বৃষ্টিতে ভিজে না যাওয়ার জন্য কি ব্যবহার করে?						0	1
১৭) রাতে আকাশে কি জলে?						0	1
১৮) এই আঙ্গুরের (বৃদ্ধাঙ্গুর) নাম কি?						0	1
১৯) দুধ দিয়ে কি বানানো যায়?						0	1
২০) কোন পশু বা প্রাণী দুধ দেয়?						0	1
২১) দুটি জিনিসের নাম বল যেগুলোতে চাকা থাকে?						0	1
২২) রুটি কি দিয়ে বানায়						0	1
২৩) আমাকে কয়েকটি পশুপাখির নাম বল?						0	1
২৪) বৃহস্পতিবারের পর কি বার আসে?						0	1
২৫) জুতা কি দিয়ে বানায়?						0	1
২৬) তোমার বয়স কত?						0	1
২৭) পোস্ট করার আগে চিঠিতে কি থাকে?						0	1
২৮) ঘাসের রং কি?						0	1
২৯) রংধনুর সবকয়টি রংয়ের নাম বল?						0	1
৩০) কয় দিনে এক সপ্তাহ হয়?						0	1
৩১) দক্ষিণের উল্টাদিক কোনটি?/পশ্চিমের উল্টাদিক কোনটি?						0	1
৩২) বছরের ছয়টি ঋতুর নাম বল?						0	1
৩৩) পৃথিবীর সবচেয়ে বড় সমুদ্রের নাম কি?						0	1
৩৪) সূর্য কোন দিকে অস্ত/ভবে যায়?						0	1
মোট স্কোর							

= 03 =

C	<u>1</u>	2	3	4	DK	0	1	
1	1	<u>2</u>	3	4	DK	0	1	
2	<u>1</u>	2	3	4	DK	0	1	
3	1	2	3	<u>4</u>	DK	0	1	
4	1	2	<u>3</u>	4	DK	0	1	
5	<u>1</u>	2	3	4	DK	0	1	
6	1	<u>2</u>	3	4	DK	0	1	
7	1	<u>2</u>	3	4	DK	0	1	
8	1	2	3	<u>4</u>	DK	0	1	
9	1	<u>2</u>	3	4	DK	0	1	
10	1	2	<u>3</u>	4	DK	0	1	
11	1	<u>2</u>	3	4	DK	0	1	
12	1	2	<u>3</u>	4	DK	0	1	
13	1	2	<u>3</u>	4	DK	0	1	
14	1	2	3	<u>4</u>	DK	0	1	
15	1	2	<u>3</u>	4	DK	0	1	
16	1	<u>2</u>	3	4	DK	0	1	
17	1	2	3	<u>4</u>	DK	0	1	
18	1	2	<u>3</u>	4	5	DK	0	1
19	1	2	3	<u>4</u>	5	DK	0	1
20	1	2	3	4	<u>5</u>	DK	0	1
21	<u>1</u>	2	3	4	5	DK	0	1
22	1	<u>2</u>	3	4	5	DK	0	1
23	1	2	3	<u>4</u>	5	DK	0	1
24	1	2	3	<u>4</u>	5	DK	0	1
25	1	2	<u>3</u>	4	5	DK	0	1
26	1	2	<u>3</u>	4	5	DK	0	1
27	1	2	3	4	<u>5</u>	DK	0	1
28	<u>1</u>	2	3	4	5	DK	0	1
29	1	<u>2</u>	3	4	5	DK	0	1
মোট স্কোর								

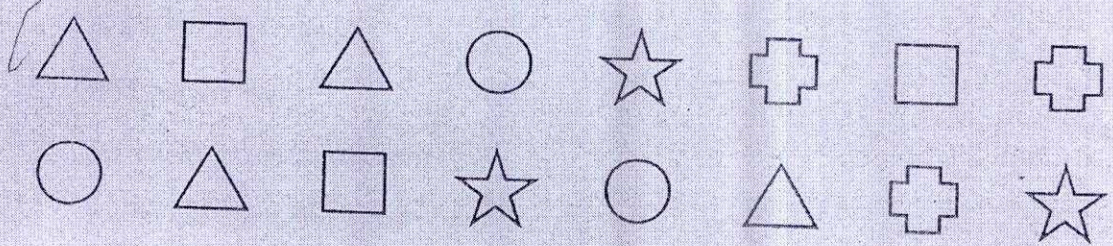
= 04 =

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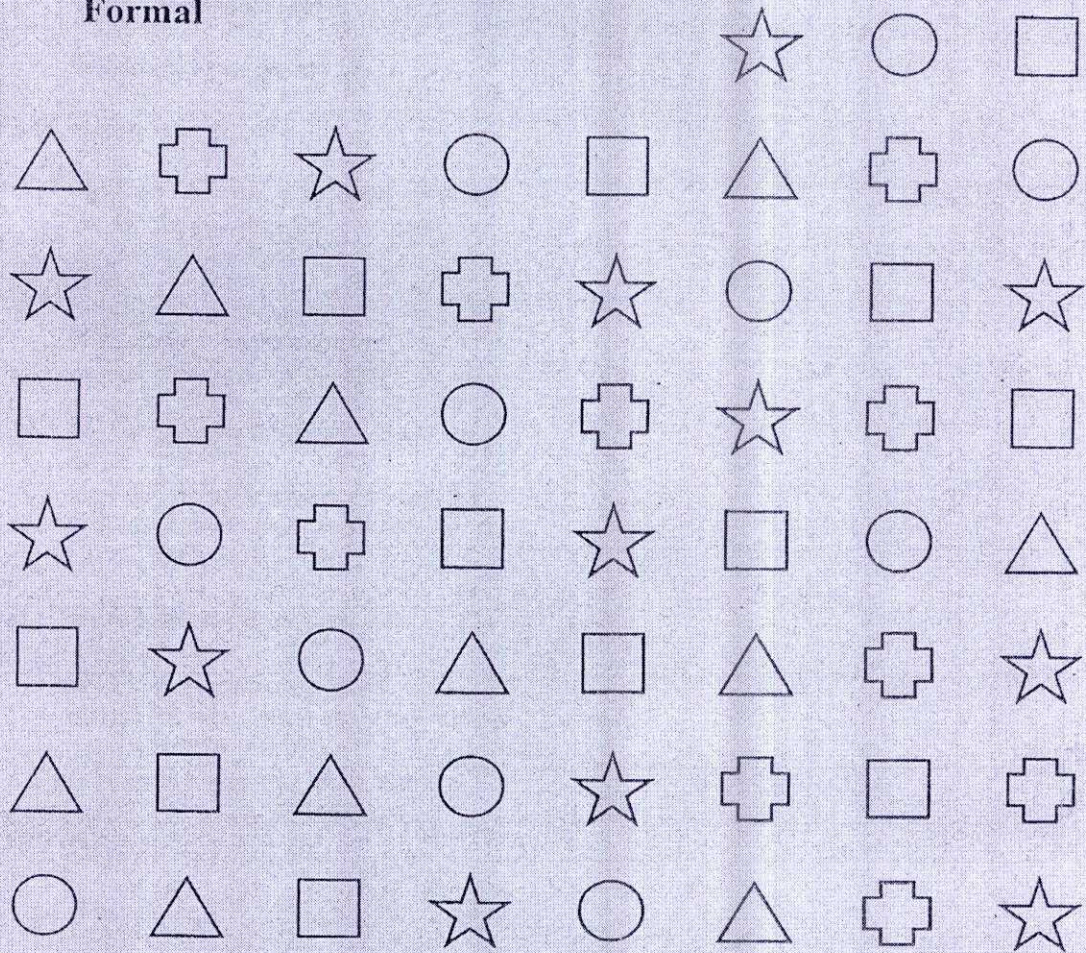
৩) ঘড়া: এটা কি?	0	1
৪) বেগুন: এটা কি	0	1
৫) ব্যাঙ: এটা কি?	0	1
৬) জুতা কি? বা বলতে কি বুঝ?	0	1 2
৭) মোবাইলফোন কি? বা বলতে কি বুঝ?	0	1 2
৮) মিষ্টি কি? বা বলতে কি বুঝ?	0	1 2
৯) ছাতা কি? বা বলতে কি বুঝ?	0	1 2
১০) পাতা কি? বা বলতে কি বুঝ?	0	1 2
১১) কুকুর কি ? বা বলতে কি বুঝ?	0	1 2
১২) দোলনা মানে কি? বা বলতে কি বুঝ?	0	1 2
১৩) ভদ্রতা কি? বা বলতে কি বুঝ?	0	1 2
১৪) চিঠি কি? বা বলতে কি বুঝ?	0	1 2
১৫) ঝামেলা বা জালাতন কি? বা বলতে কি বুঝ?	0	1 2
১৬) ছুটির দিন কি? বা বলতে কি বুঝ?	0	1 2
১৭) সাইকেল কি? বা বলতে কি বুঝ?	0	1 2
১৮) ট্রেন কি? বা বলতে কি বুঝ?	0	1 2
১৯) রাজা কি? বা বলতে কি বুঝ?	0	1 2
২০) দূরবীন কি? বা বলতে কি বুঝ?	0	1 2
২১) রাজবাড়ী কি? বা বলতে কি বুঝ?	0	1 2
২২) জল জল কি? বা বলতে কি বুঝ?	0	1 2
২৩) সাহস কি? বা বলতে কি বুঝ?	0	1 2
২৪) দুইগুন কি? বা বলতে কি বুঝ?	0	1 2
২৫) প্রাচীনকাল বা আদিকাল কি? বা বলতে কি বুঝ?	0	1 2
মোট স্কোর		

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Formal



Time:

Total Correct =



			0	1	2
৪.	আমরা কেন জুতা পরি?		0	1	2
৫.	ছোট বাচ্চাদের কে কেন ঘরে একা রাখা ঠিক না		0	1	2
৬.	রাস্তা পার হওয়ার আগে আমরা কেন এদিক ওদিক খেয়াল করি?		0	1	2
৭.	বাসে বা লঞ্চ উঠার সময় আমরা কেন লাইনে দাড়াই?		0	1	2
৮.	আমরা কেন ধন্যবাদ বলি/দেই?		0	1	2
৯.	খাওয়ার আগে আমরা কেন হাত ধুই?		0	1	2
১০.	আমাদের নাম থাকে কেন?		0	1	2
১১.	গল্প বা কথা বলার সময় আমরা একজন একজন করে কথা বলি কেন?/ একসাথে কথা বলি না কেন?		0	1	2
১২.	অসুখ হলে তুমি বাসায় থাক কেন?		0	1	2
১৩.	কোথাও যেতে হলে বা কোন কাজ করতে হলে কেন সময়মত করতে হয়?		0	1	2
১৪.	কোন কোন শহরে কেন বাস ট্রেন থাকে		0	1	2
১৫.	মানুষ কেন জিনিসপত্র মিলেঝিলে বা বাটাবাটি করে নেয়?		0	1	2
১৬.	বাইরে কোথাও যাওয়ার জন্যে বা অচেনা কেউ কিছু দিলে বাচ্চারা কেন বাবা মাকে জিজ্ঞাসা করে?		0	1	2
১৭.	কেন গাছ কাটা উচিত না?		0	1	2
১৮.	ছোট বাচ্চাদের কেন সুই দিতে হয়?		0	1	2
১৯.	অচেনা মানুষের সাথে কথা বলা ঠিক না কেন? যাদেরকে তুমি অথবা তোমার বাবা মা চিনে না তাদের সাথে কথা বলা ঠিক না কেন?		0	1	2
২০.	ভোট দেওয়ার জন্য কেন ১৮ বছরের হতে হয়?		0	1	2
মোট স্কোর					

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7. Picture Completion Sample আইটেমে পরপর দুটি না পারা পর্যন্ত প্র্যাকটিস করাতে হবে, সর্বোচ্চ প্রতিটি আইটেমে দুইবার করে প্র্যাকটিস কারানো যাবে। যদি ২য় প্র্যাকটিসে পরপর দুটি আইটেমে স্কোর না পায় তবে টেস্ট শুরু করে দিতে হবে। পরপর পাঁচটি না পারলে এই সাবটেস্টটি বন্ধ করে দিতে হবে,

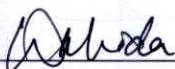
	Item	Response	Com. time	Scoring
A	গরু			0 1
B	রিকসা			0 1
C	চিরুনি			0 1
D	ভাল্লুক			0 1
১.	পুতুল			0 1
২.	জ্যাকেট			0 1
৩.	চেয়ার			0 1
৪.	গোলাপ			0 1
৫.	ছেলে			0 1
৬.	ইট			0 1
৭.	আপেল			0 1
৮.	সাইকেল			0 1
৯.	হাঁস			0 1
১০.	গ্লাভস			0 1
১১.	হাসি			0 1
১২.	স্কেল			0 1
১৩.	ঘুড়ী			0 1
১৪.	নৌকা			0 1
১৫.	দরজা			0 1
১৬.	দোলনা			0 1
১৭.	জু			0 1
১৮.	ডেস্ক			0 1
১৯.	কারেন্টের তার			0 1
২০.	কাপড় মেলার তার			0 1
২১.	ঘড়ি			0 1
২২.	মুরগীর পা			0 1
২৩.	ঝুটি			0 1
২৪.	বাক্স			0 1
২৫.	মাছ ধরা			0 1
২৬.	কোট			0 1
২৭.	জোকার			0 1
২৮.	বাড়ী			0 1
২৯.	রিবন			0 1
৩০.	স্কেটিং			0 1
৩১.	হাত			0 1
৩২.	গাড়ী			0 1
মোট				

Annex- VII**Consent Form (the policy of Plagiarism)**

I have read the policy on Plagiarism. I understand the consequences of plagiarism including receiving a zero for y work to being dismissed from the program.

Student Signature:  28.04.10

Date: _____

Student's Supervisor: 

Date: 28.04.2010