**Factor Associated with Early Childhood Development in Bangladesh**

**Introduction:**

The Early years of life plays a key role in their children’s cognitive development and socioemotional characteristics1. In WHO's opinion, early childhood development (ECD) refers to physical, socio-emotional, cognitive, and motor development in the early year of age2. Child’s aged between birth and 5 years begin to learn about the world around them and this development refers to the sequences of physical, language, thought, and emotional changes,3 that allow them to maintain attention, understand and follow directions, communicate with others, and solve progressively more complex problems1. At the early age of prenatal periods to infancy and early childhood, a child’s newly developing brain is highly productive and responsive to change 4. This period is the golden period for them to make themselves highly thirsty for learning and physically fit to become successful and productive person in later life 5.

The 2007 and 2011 Series on Child Development in The Lancet, concluded data from UNICEF and the World Bank to estimate that 219 million children under the age of five years, fail to reach their development potential each year 6. The Series postulated the links between poverty and inequalities in childhood development which are mediated via biological factors including intrauterine growth restriction, child undernutrition, micronutrient deficiencies, infectious diseases and environmental exposures; and psychosocial factors including early childhood education, parenting practices and exposure to violence 7. Interest in early childhood development surged at the turn of the twenty-first century. Developed countries suggest that population-level measures can be helpful both for quantifying ECD and predicting further-life well-being 1. Yet, despite a consensus on the importance of ECD, population-based measures were not readily available, particularly for low- and middle-income countries 8. More than 200 million children <5 years across low- and middle-income countries (LMICs) are estimated to not reach their full developmental potential due to malnutrition, inadequate stimulation, and other risk factors associated with poverty 6.

As a developing country like Bangladesh, all kinds of development occur every spare of life from birth to death. Governmental and Non-governmental organizations are dealing with a lot of developmental facilities for the child, child’s parents, and child’s care-takers to ensure all kinds of rights they deserved 9. Creating an innovative foundation for strong development during the early years of life is essential for successful communities, economic productivity, and civil societies. But most parents in Bangladesh are unaware of this scientific fact, which forms the core of Early Childhood Development or ECD. UNICEF continues to popularise the concept, demonstrate the principles, provide technical facilitation and collaboration besides strengthening networks and partnership 10. However, there is as yet a lack of empirical evidence of the mechanisms of the factors associated early childhood development within and between countries. Thus, this paper aims to draw the relationship among factors associated with early childhood development in Bangladesh and we try to show the developmental condition of child in Bangladesh.

**Methodology**

**Data source and study variables**

We used two different survey data sets of 2012, 2019 Multiple Indicator Cluster Survey (MICS). MICS is a large, multi-dimensional nationally representative household survey conducted by the United Nations Children’s Fund (UNICEF). This survey uses standardized questionnaires to provide the information and key indicators on the situation of children. Mostly, they focus on reproductive health, maternal and child health interventions, child nutrition status and early childhood development. MICS also collects an identical set of socioeconomic characteristics of individuals and households. Data-sets were open access for the public domain 11.

**Sampling design and sample size**

The MICS survey is a two-stage cluster sampling procedure, randomly selecting households with children under the age of 5 years. 2012 MICS is based on a sample of 51,895 households interviewed with a response rate of 98.5% and 2019 MICS is based on a sample of 61,246 interviewed with a response rate of 99.4%. MICS provides a comprehensive picture of children and women health in the seven administrative divisions (Dhaka, Chittagong, Sylhet, Rajshahi, Rangpur, Barisal, Khulna) of Bangladesh. Districts were identified as the main sample strata for sample selection at 2 stages 11. In this study, the child age ranged from 36 to 59 months were included. Therefore, the sample included 8148 children in 2012 MICS and 9346 children in 2019 MICS having the information about the ECD and used for analysis.

**Early Childhood Development**

To measure early childhood development UNICEF made a great contribution by developing the family care indicators (FCIs) questionnaire that indicates the home environment of children like developing countries, had a strong influence on child development 12. From UNICEF’s the early childhood development index (ECDI) was 1st initiated in 2009 during the 4th round of MICS (2012 MICS) and has been available in the following survey.

A 10-item module was used to calculate the Early Child Development Index (ECDI). The primary purpose of the ECDI is to inform public policy regarding the developmental status of children in Bangladesh. The index is based on selected milestones that children are expected to achieve by ages 3 and 4. The 10 items are used to determine if children are developmentally on track in four domains:

**Literacy-numeracy:** Children are identified as being developmentally on track based on whether they can identify/name at least ten letters of the alphabet, whether they can read at least four simple, popular words, and whether they know the name and recognize the symbols of all numbers from 1 to 10. If at least two of these are true, then the child is considered developmentally on track.

**Physical:** If the child can pick up a small object with two fingers, like a stick or a rock from the ground and/or the mother/caretaker does not indicate that the child is sometimes too sick to play, then the child is regarded as being developmentally on track in the physical domain.

**Social-emotional:** Children are considered to be developmentally on track if two of the following are true: If the child gets along well with other children, if the child does not kick, bite, or hit other children and if the child does not get distracted easily.

**Learning:** If the child follows simple directions on how to do something correctly and/or when given something to do, is able to do it independently, then the child is considered to be developmentally on track in this domain. ECDI is then calculated as the percentage of children who are developmentally on track in at least three of these four domains.

**Outcomes variable**

Children who achieve three of these four above domains are called developmentally on track, for each domain, a score of 1 was assigned to each ‘on track’ and a score of 0 for ‘off track’. ECDI variable was constructed based on the summation of these scores and used as outcome variable. This had a possible range of 0 to 4, whereby at least three of these four domains indicated developmentally on track. Finally, scores greater than or equals to three were assigned to ‘On track’ category and the rest scores were treated as to fall in the category, ‘off track’ by ECDI percentage.

**Covariates**

MICS survey indicates 10 items these are used to determine if the children are developmentally on track in four domains. Children can identify/ name at least ten letters of the alphabet, can read at least four simple, popular word, they know the name, recognize the symbols of all number from 1 to 10, can pick up small object with two fingers, like stick or rock from the ground, child is sometimes too sick to play, get alone with other children, doesn’t kick, bit or hit other children, child doesn’t get distracted easily, follow simple directions how to do something correctly, when given something to do, is able to do it independently. For identifying the factors associated with ECDI some reliable variables are selected as age of child, child’s sex, residence area, division, mother’s educational level, wealth index, religion, household’s sex, ethnicity of the respondent.

**Statistical Analysis**

The Bivariate analysis (Chi-square test for association) was conducted to assess the association between ECDI with children developmentally on track status with the other covariates. Binary logistic regression model applied in two-way, univariate logistic regression model and multivariate logistic regression model to show the factors individuals and adjusted associations or impact of different socio-demographic variables with the early childhood development index on the developmentally track. For both the 2012 and 2019 MICS survey data we applied both model separately to find the associations separately.

Variables with a probability of its score statistic less than 0.05 were included in the model. We introduce simultaneously all the covariates to examine their effects on ECDI. Odds ratio (OR) measure of association between the exposure and outcome. OR > 1 indicates that the event is more likely to occur in the first group. And OR < 1 indicates that the event is less likely to occur in the first group. All the statistical analysis were conducted in Stata version 13 (Stata Corp, College Station, TX).

The population of Bangladesh was selected systematically with probability proportional to size from MICS 2012 & 2019.

51,895 and 64,400 household were interviewed from MICS 2012 and 2019.

11144, 40751 and 12680, 51720 of the respondents were Urban and Rural from 2012 and 2019.

Women of 15-49 years of age were 60161 and 64378 from 2012 and 2019 MICS.

23430 and 24686 children of age under 5 years were selected from 2012 and 2019 MICS respectively.

Results

Without willingness to invest and provide better services for early care and development, Bangladesh will continue to lose massive economic potential, despite the young demographic.

The Bangladesh government has formulated a national policy for Early Childhood Care and Development. But realising the policy’s aim of prioritising and investing in children’s development urgently requires coordination of multiple sectors and adequate funding.

Family is the backbone for all development of a child and it permanently grows in his/her early life. Parenting interventions have become increasingly prioritized as a key strategy for mitigating such risk factors and increasing children’s resilience during early childhood 13. Talking with them, playing with them, singing, telling stories, counting, calling names, home-based study all of these make sure from the family member of a child. By proper care, a child can be properly developed as his/her childhood 14. All these elements can create a child more sophisticated for the real world. Optimizing the early years of children’s lives is the best investment we can make as a society in ensuring their future success 15.

In Bangladesh, most parents have limited knowledge on child care and rearing. Young children are deprived of proper care while their parents are at work.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | | **2012** | | **P-value** |
| **Characteristics** | | **Developmentally on track** | |
| **Yes** | **No** |
| **N (%)** | **N (%)** |
| **Age of child** | 3 | 2392 (59.46) | 1649(40.54) | <0.001 |
| 4 | 2909 (71.40) | 1198 (28.60) |
| **Child’s sex** | Male | 2669 (63.41) | 1565 (36.59) | 0.002 |
| Female | 2632 (67.65) | 1282 (32.35) |
| **Area** | Urban | 4388(63.72) | 2467 (36.28) | <0.001 |
| Rural | 913 (72.17) | 380 (27.83) |
| **Division** | Barishal | 526 (67.86) | 262 (32.14) | <0.001 |
| Chattogram | 940 (55.04) | 682 (44.96) |
| Dhaka | 1286 (67.45) | 674 (32.55) |
| Khulna | 740 (71.70) | 326 (28.30) |
| Mymensingh | - | - |
| Rajshahi | 527 (66.76) | 263 (33.24) |
| Rangpur | 866 (78.38) | 262 (21.62) |
| Sylhet | 416 (54.15) | 378 (45.85) |
| **Mother’s education** | Primary incomplete | 2076 (58.80) | 1462 (41.20) | <0.001 |
| Primary complete | 772 (62.73) | 447 (37.27) |
| Secondary incomplete | 1800 (70.01) | 760 (29.99) |
| Secondary complete or Higher | 653 (79.46) | 178 (20.54) |
| **Wealth Index** | Poorest | 1503 (58.34) | 1039 (41.66) | <0.001 |
| Second | 1118 (62.85) | 657 (37.15) |
| Middle | 954 (65.97) | 479 (35.03) |
| Fourth | 885 (67.20) | 407 (32.80) |
| Richest | 841 (77.55) | 265 (22.45) |
| **Religion** | Islam | 4486 (66.08) | 2384 (33.92) | 0.044 |
| Others | 534 (61.42) | 321 (38.58) |
| **Household’s sex** | Male | 4411 (65.67) | 2348 (34.33) | 0.852 |
| Female | 609 (65.26) | 357 (34.74) |
| **Ethnicity** | Bengali | 4865 (65.58) | 2620 (34.42) | 0.798 |
| Others | 155 (66.60) | 85 (33.40) |
| **Total** |  | 5301 (65.46) | 2847 (34.54) |  |

**Table.1 Sample characteristics of children by developmental status, MICS 2012.**

**Table.2 Sample characteristics of children by developmental status, MICS 2019.**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | | **2019** | | **P-value** |
| **Characteristics** | | **Developmentally on track** | |
| **Yes** | **No** |
| **N (%)** | **N (%)** |
| **Age of child** | 3 | 3166 (68.72) | 1584 (31.28) | <0.001 |
| 4 | 3680 (81.26) | 916 (18.74) |
| **Child’s sex** | Male | 3383 (71.51) | 1440 (28.49) | <0.001 |
| Female | 3463 (78.46) | 1060 (21.54) |
| **Area** | Rural | 1305 (78.15) | 430 (21.85) | <0.001 |
| Urban | 5541 (73.99) | 2070 (26.01) |
| **Division** | Barishal | 552 (67.8) | 269 (32.20) | <0.001 |
| Chattogram | 1479 (78.26) | 470 (21.74) |
| Dhaka | 1453 (81.85) | 343 (18.15) |
| Khulna | 895 (73.07) | 409 (26.93) |
| Mymensingh | 347 (61.26) | 209 (38.74) |
| Rajshahi | 720 (69.57) | 307 (30.43) |
| Rangpur | 896 (83.71) | 207 (16.29) |
| Sylhet | 504 (61.73) | 286 (38.27) |
| **Mother’s education** | Pre-primary | 847 (68.53) | 389 (31.47) | <0.001 |
| Primary | 1590 (68.62) | 727 (31.38) |
| Secondary | 3363 (74.63) | 1143 (25.37) |
| Higher secondary + | 1046 (81.27) | 241(18.73) |
| **Wealth Index** | Poorest | 1625 (68.35) | 750 (31.65) | <0.001 |
| Second | 1401 (71.50) | 581 (28.5) |
| Middle | 1287 (75.45) | 462 (24.55) |
| Fourth | 1287 (75.86) | 442 (24.14) |
| Richest | 1246 (84.05) | 264 (15.95) |
| **Religion** | Islam | 6165 (74.90) | 2250 (25.10) | 0.790 |
| Others | 681(74.44) | 250(25.56) |
| **Household’s sex** | Male | 6223 (73.02) | 2299 (26.98) | 0.367 |
| Female | 623 (75.61) | 201 (24.39) |
| **Ethnicity** | Bengali | 6684 (74.89) | 2438 (25.11) | 0.474 |
| Others | 162 (72.70) | 62 (27.30) |
| **Total** | - | 6846 (74.86) | 2500 (25.14) | - |

**Table.3 Factors associated with developmental status of children, MICS 2012.**

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| --- | --- | --- | --- | --- |
|  | **MICS- 2012** | | | |
| **Univariate** | | **Multi-variate** | |
| **Variables** | **Unadjusted**  **OR (95% CI)** | **P-value** | **Adjusted**  **OR (95% CI)** | **P-value** |
| **Age of child** |  |  |  |  |
| 4 | 1.70 (1.52-1.91) | <0.001 | 1.78 (1.58-2.01) | <0.001 |
| 3 | Reference | - | Reference | - |
| **Child’s sex** |  |  |  |  |
| Female | 1.21 (1.07-1.36) | 0.002 | 1.27 (1.12-1.44) | <0.001 |
| Male | Reference | - | Reference | - |
| **Area** |  |  |  |  |
| Rural | 1.48 (1.21-1.79) | <0.001 | 1.28 (1.05-1.57) | 0.013 |
| Urban | Reference | - | Reference |  |
| **Division** |  |  |  |  |
| Chattogram | 0.58 (0.47-0.71) | <0.001 | 0.49 (0.39-0.62) | <0.001 |
| Dhaka | 0.98 (0.80-1.20) | 0.859 | 0.87 (0.70-1.08) | 0.217 |
| Khulna | 1.20 (0.97-1.49) | 0.097 | 1.07 (0.84-1.36) | 0.553 |
| Rajshahi | 0.95 (0.75-1.20) | 0.675 | 0.92 (0.71-1.18) | 0.514 |
| Rangpur | 1.72 (1.38-2.13) | <0.001 | 1.71 (1.36-2.14) | <0.001 |
| Sylhet | 0.56 (0.44-0.71) | <0.001 | 0.59 (0.46-0.75) | <0.001 |
| Barishal | Reference | - | Reference |  |
| **Mother’s education level** |  |  |  |  |
| Secondary complete or Higher | 2.71 (2.14-3.43) | <0.001 | 1.89 (1.46-2.46) | <0.001 |
| Secondary incomplete | 1.64 (1.43-1.87) | <0.001 | 1.43 (1.22-1.68) | <0.001 |
| Primary complete | 1.17 (0.99-1.40) | 0.062 | 1.16 (0.96-1.39) | 0.117 |
| Primary incomplete | Reference | - | Reference | - |
| **Wealth Index** |  |  |  |  |
| Richest | 2.47 (1.98-3.08) | <0.001 | 1.82 (1.38-2.40) | <0.001 |
| Fourth | 1.46 (1.22-1.75) | <0.001 | 1.24 (1.01-1.52) | 0.040 |
| Middle | 1.32 (1.12-1.56) | 0.001 | 1.22 (1.01-1.47) | 0.036 |
| Second | 1.21 (1.04-1.41) | 0.014 | 1.06 (0.90-1.26) | 0.482 |
| Poorest | Reference | - | Reference | - |
| **Religion** |  |  |  |  |
| Islam | 1.22 (1.01-1.49) | 0.045 | 1.29 (1.03-1.62) | 0.029 |
| Others | Reference | - | Reference | - |
| **Household’s sex** |  |  |  |  |
| Female | 0.98 (0.81-1.19) | 0.852 | 1.04 (0.86-1.26) | 0.656 |
| Male | Reference | - | Reference | - |
| **Ethnicity** |  |  |  |  |
| Bengali | 0.96 (0.67-1.35) | 0.799 | 0.72 (0.48-1.06) | 0.095 |
| Others | Reference | - | Reference | - |

**Table.4 Factors associated with developmental status of children, MICS 2019.**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **MICS- 2019** | | | |
| **Uni-variate** | | **Multi-variate** | |
| **Variables** | **Unadjusted**  **OR (95% CI)** | **P-value** | **Adjusted**  **OR (95% CI)** | **p-value** |
| **Age of child** |  |  |  |  |
| 4 | 1.97 (1.77-2.20) | <0.001 | 2.08 (1.85-2.32) | <0.001 |
| 3 | Reference | - | Reference | - |
| **Child’s sex** |  |  |  |  |
| Female | 1.45 (1.31-1.61) | <0.001 | 1.47 (1.32-1.63) | <0.001 |
| Male | Reference | - | Reference | - |
| **Area** |  |  |  |  |
| Rural | 1.26 (1.09-1.44) | <0.001 | 0.89 (0.77-1.03) | 0.125 |
| Urban | Reference | - | Reference | - |
| **Division** |  |  |  |  |
| Chattogram | 1.71 (1.43 - 2.05) | <0.001 | 1.55 (1.27-1.89) | <0.001 |
| Dhaka | 2.14 (1.77 -2.60) | <0.001 | 1.91 (1.56-2.34) | <0.001 |
| Khulna | 1.29 (1.07-1.55) | 0.008 | 1.18 (0.96-1.43) | 0.101 |
| Mymenshing | 0.75 (0.59 - 0.95) | 0.017 | 0.77 (0.60-0.98) | 0.035 |
| Rajshahi | 1.09 (0.88-1.33) | 0.430 | 1.04 (0.84-1.29) | 0.719 |
| Rangpur | 2.44 (0.62-0.95) | <0.001 | 2.59 (2.10-3.19) | <0.001 |
| Sylhet | 0.77 (0.62-0.95) | 0.015 | 0.75 (0.60-0.93) | 0.010 |
| Barishal | Reference | - | Reference | - |
| **Mother’s education level** |  |  |  |  |
| Higher secondary + | 2.26 (1.82-2.79) | <0.001 | 1.76 (1.38-2.23) | <0.001 |
| Secondary | 1.53 (1.31-1.78) | <0.001 | 1.37 (1.16-1.62) | <0.001 |
| Primary | 1.04 (0.88-1.23) | 0.651 | 1.04 (0.87-1.23) | 0.689 |
| Pre-primary or none | Reference | - | Reference | - |
| **Wealth Index** |  |  |  |  |
| Richest | 2.44 (2.04 -2.93) | <0.001 | 1.85 (1.47-2.31) | <0.001 |
| Fourth | 1.45 (1.24-1.70) | <0.001 | 1.17 (0.98-1.40) | 0.084 |
| Middle | 1.42 (1.22-1.66) | <0.001 | 1.22 (1.03-1.46) | 0.019 |
| Second | 1.16 (1.00-1.35) | 0.051 | 1.07 (0.91-1.25) | 0.412 |
| Poorest | Reference | - | Reference | - |
| **Religion** |  |  |  |  |
| Islam | 1.02 (0.86-1.22) | 0.790 | 1.08 (0.88-1.33) | 0.451 |
| Others | Reference | - | Reference | - |
| **Household’s sex** |  |  |  |  |
| Female | 1.08 (0.91-1.29) | 0.368 | 0.95 (0.79-1.14) | 0.551 |
| Male | Reference | - | Reference | - |
| **Ethnicity** |  |  |  |  |
| Bengali | 1.12 (0.82-1.53) | 0.474 | 0.93 (0.63-1.39) | 0.735 |
| Others | Reference | - | Reference | - |

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| **Fig 1. Distribution of developmental status of children by different survey years.** |

References:

1. McCoy, D. C. *et al.* Early Childhood Developmental Status in Low- and Middle-Income Countries: National, Regional, and Global Prevalence Estimates Using Predictive Modeling. *PLOS Med.* **13**, e1002034 (2016).

2. Early child development. *WHO* (2017).

3. Junek, W. The Development of the Person: The Minnesota Study of Risk and Adaptation from Birth to Adulthood. *J. Can. Acad. Child Adolesc. Psychiatry* **16**, 180 (2007).

4. Currie, J. & Vogl, T. *Early-Life Health and Adult Circumstance in Developing Countries*. http://www.nber.org/papers/w18371.pdf (2012) doi:10.3386/w18371.

5. Heckman, J. J. The economics, technology, and neuroscience of human capability formation. *Proc. Natl. Acad. Sci. U. S. A.* **104**, 13250–13255 (2007).

6. Grantham-McGregor, S. *et al.* Developmental potential in the first 5 years for children in developing countries. *Lancet* vol. 369 60–70 (2007).

7. Walker, S. P. *et al.* Inequality in early childhood: Risk and protective factors for early child development. *The Lancet* vol. 378 1325–1338 (2011).

8. UNICEF. Development of the Early Childhood Development Index in MICS surveys. 1–53 (2017).

9. Policy Brief: The situation of children in Bangladesh. *Unicef* (2020).

10. UNICEF Bangladesh. *Early care for growth and development*. https://www.unicef.org/bangladesh/en/early-care-growth-and-development.

11. MICS. BANGLADESH 2012-13 MICS FINAL REPORT RELEASED - UNICEF MICS. https://mics.unicef.org/news\_entries/15 (2015).

12. Hamadani, J. D. *et al.* Use of family care indicators and their relationship with child development in Bangladesh. *J. Heal. Popul. Nutr.* **28**, 23–33 (2010).

13. Jeong, J., McCoy, D. C., Yousafzai, A. K., Salhi, C. & Fink, G. Paternal stimulation and early child development in low-and middle-income countries. *Pediatrics* **138**, (2016).

14. Chinen, M. & Bos, J. M. Impact Evaluation of the Save the Children Early Childhood Stimulation Program in Bangladesh: Final Report. 331 (2016).

15. Huebner, G. *et al.* Beyond Survival: The Case for Investing in Young Children Globally. *NAM Perspect.* **6**, (2016).

1. Currie, J., & Vogl, T. (2012). NBER WORKING PAPER SERIES EARLY-LIFE HEALTH AND ADULT CIRCUMSTANCE IN DEVELOPING COUNTRIES Early-Life Health and Adult Circumstance in Developing Countries. http://www.nber.org/papers/w18371. 2.

Hamadani, J. D., Tofail, F., Hilaly, A., Huda, S. N., Engle, P., & Grantham-McGregor, S. M. (2010). Use of family care indicators and their relationship with child development in Bangladesh. Journal of Health, Population and Nutrition, 28(1), 23–33. https://doi.org/10.3329/jhpn.v28i1.4520. 3.

Junek, W. (2007). The Development of the Person: The Minnesota Study of Risk and Adaptation from Birth to Adulthood. Journal of the Canadian Academy of Child and Adolescent Psychiatry, 16(4), 180. 4.

Mccoy, D. C., Peet, E. D., Ezzati, M., Danaei, G., Black, M. M., Sudfeld, C. R., Fawzi, W., & Fink, G. (2016). Early Childhood Developmental Status in Low-and Middle-Income Countries: National, Regional, and Global Prevalence Estimates Using Predictive Modeling. https://doi.org/10.1371/journal.pmed.1002034. 5. OPPORTUNITIES FOR IMPACT: THE BUSINESS CASE FOR EARLY CHILDHOOD DEVELOPMENT. (n.d.).