Original Articles

The Impact of Maternal and Household Characteristics on Childhood Impairments and Disabilities in Bangladesh

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Abstract

Objective: *To examine the risk factors associated with impairments and disabilities in children in Bangladesh.*

Methods*: A two-stage methodology for identifying children with disabilities was employed in the Kishoreganj district of Bangladesh in 2001-2002. Ordered and generalized logit regressions were used to examine the correlation of childhood impairment and disability with a number of potential risk factors.*

Results: *Children with consanguineous parents were 43.5% more likely to have an impairment; and poor children were 23.1% more likely. Maternal education reduced the chances of impairments developing into disabilities by 35%. Differences in risk factors existed between mild and severe disabilities. For example, boys were 66% more likely to have mild disabilities but not severe ones.*

Conclusions: *Consanguinity and poverty are major factors associated with impairments, but maternal education might be an important tool towards limiting the probability of those impairments progressing to disabilities. Evidence also suggests that the causes of severe disabilities are significantly different from those causing mild disabilities.*

Introduction

People with disabilities are typically among the poorest of the poor[1,2]; and children from Bangladesh are no exception[3,4]. In fact, causation between disability and poverty generally goes both ways. Risk factors associated with poverty lead to disability, and once a person has a disability various barriers in society can prevent a person from improving their livelihood[5,6]. Such a situation often locks a child into a lifetime of generational and inter-generational poverty. Studies have shown that disability is a stronger indicator of educational attainment than both gender and poverty combined[7]; and when they become adults, their chances of employment are significantly lower[8].

Breaking down these barriers and creating an environment that is not disabling to children with functional limitations is vital. The International Classification of Function (ICF) paradigm, which captures the temporal relationship between early functional limitations, i.e., impairments, and their progression to disability[9], suggests that prevention or amelioration of disabilities and impairments is optimal when intervention programs begin at an earlier age[10].

Measures need to be taken to prevent impairments and provide medical and rehabilitative services that keep impairments from progressing to disabilities. In order to do that, it is important to identify the risk factors that lead to disability.

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Sometimes these risk factors occur at or prior to birth, for example from poor maternal health or congenital conditions; other causes include childhood disease, poor nutrition, accidents, and violence[11]. Isolating key risk factors for disability can greatly enhance prevention programs which are to be planned.

The objective of this study was to determine the correlation between disability among children in Bangladesh and socio-demographic factors so that insights can be gained for designing programs for prevention.

Methods and Materials
Estimating the impact of various factors on the presence of disability in children is difficult. Rarely does high quality data exist for children younger than ten. Systematically identifying disability via a survey is complex and especially problematic when it comes to children[12,13]. However, a method has been developed that identifies such children using a two-stage procedure[14]. This procedure, developed in Bangladesh and other developing countries, has been repeatedly validated in the field[15,16,17].

Study Site
The study was conducted in 2 unions, Maria and Binnati, of Sadar Thana of Kishoreganj district in Bangladesh.

First Stage
The Ten Questions Plus (TQP) screening questionnaire[17], which includes a 11th question on behavior problems (Appendix), was administered to mothers of children aged 2 to 9 in a door-to-door community-based survey. Data collectors were six high-school graduates (passed HSC, or Class 12). All 'screened positives' in the first stage were taken to have 'impairments', ie, limitations in body functions or structure that put them at risk of becoming disabled if they live in an unaccommodating environment, or do not receive appropriate treatment or services; or 'disabilities', ie, permanent limitations in body functions or structures[9].

Second Stage
All 'screened positives' in stage one, and an equal sample of 'screened negatives', were assessed by a multidisciplinary team composed of a child health physician and a child psychologist. Assessments included a comprehensive neurodevelopmental assessment and tests for hearing and vision by the physician; and assessment of adaptive behavior and psychometric testing by the psychologist. At the end of the respective assessments the two professionals made a consensual diagnosis of either an impairment or a disability in the following developmental domains: motor, vision, hearing, speech, cognition, behavior, and seizures.

Analysis
All information wase collected in pre-coded forms, which were databased on MS Access and analyzed using the SAS statistical software, with observation weights to adjust for probability sampling. Two new variables called 'any impairment' and 'any disability' were created if a child had => 1 impairment or =>1 disability in the seven developmental domains, respectively. Correlation of various family, maternal and child characteristics (ie, independent variables) with 'any impairment' or 'any disability' (ie, dependant variables) was made by a series of ordered and generalized logits[18]. Logit regressions are a statistical technique used for looking at correlations of independent variables with binary dependent variables. In a generalized logit model explanatory variables are allowed to have different impacts on the different outcome variables. In an ordered logit, the impact of the explanatory variables is restricted to be the same for both. If one believes the determinants of impairment and disability can be different (in magnitude or direction) one would use a generalized logit model. If one believes that disability is simply a more extreme expression of the same underlying phenomenon that causes impairment, then one can use an ordered logit. Using a generalized logit — with independent outcomes for impairment and disability– allows us more flexibility. Using an ordered logit – which assumes that impairment and disabilities are both expressions of the same underlying phenomenon but disability is just a higher degree of impairment – enables us to get more efficient estimates, provided we are willing to accept that restriction. In this paper, severe and mild disabilities were also examined with an ordered logit to allow for explanatory variables possibly having a different impact on the two degrees of disability.

For the latter analysis two dependent variables were created based upon severity ratings. That is, 'any impairment' or 'any disability' was categorized by grades of severity as 'mild' (when there was => 1 'mild' impairment or disability, respectively) or 'serious' (when there was =>1 moderate or severe impairment or disability, respectively).

Ethical considerations

For both Stage One and Stage Two verbal consent was taken from all mothers. Logistic support, i.e., travel cost and lunch, were provided to the families for attending the assessment session. The research protocol was approved by the Affairs of the NGO Bureau, Chief Advisor's Office, Government of Bangladesh to the Bangladesh Protibondhi Foundation, who were responsible for financial management and field work.

Results

Study population in Stage One and Stage Two of the survey

In Stage One, community health workers screened 4,005 children aged 2-9 years. Of the 3,979 children without missing values, 18.1% children 'screened positive', ie, were identified as having impairments according to the TQP. Table-I shows the percentage of children identified as having a probable impairment in Stage One by each question. These figures sum to greater than 18.1 percent because some children had impairments in more than one domain.

In Stage Two sub-samples of children (total number=1018;100%), which included 461 (45.3%) 'screened positive' and 557 (54.7%) 'screened negative', were assessed by teams of professionals comprising of a psychologist and a child health physician to identify whether children had an impairment or a disability. The percentage of 1,018 children identified by the follow-up assessments as having a disability was 4.6%, with about one-sixth of them – or just under one percent of the total -- having a severe disability.

Table-I
Percentage of Children Identified as Having Impairments, by Ten Questions Plus (TQP)

Question		Percent
1	Delay in sitting, standing, walking	1.4
2.	Seeing	1.6
3.	Hearing	3.8
4.	Understanding others	0.8
5.	Move arms or legs	1.3
6.	Seizures	10.0
7.	Learning	0.9
8.	Speak and understand words	1.1
9.	Speech patterns	1.4
10.	Mentally slow	0.8
11.	Behavior Problem	0.6

Socio-demographic characteristics of study population

In addition to data on impairments and disability, a set of economic and demographic characteristics were collected. These are defined in Table-II, which also includes the variables' means and standard deviations. Majority of these children were from poor families with mothers with limited education. Additionally, about 7% parents were consanguineous.

Table-II
Variable Definitions and Descriptive Statistics

Variable name	Definition	Mean	Std. Deviation
Young	1 if child aged 2-5	0.51	0.12
	0 if child aged 6-9		
Boy	1 if child is male	0.51	0.25
	0 if child is female		
MageB	Mother's age at child's birth	27.70	6.15
Consang	1 if Mother and father are consanguineous, else 0	0.07	0.26
LiveBirths	Mother's number of live births	4.60	2.40
ChildDeaths	Number of mother's children who died	0.41	0.49
DBRatio	Death to birth ratio	0.12	0.17
MPrimary	Mother received primary education	0.23	0.42
MSecondary	Mother received secondary education	0.11	0.31
MTertiary	Mother received higher education	0.002	0.047
Lowinc	Family is below poverty threshold	0.24	0.42
Tinhouse	Family lives in tin house	0.68	0.47
Brickhouse	Family lives in brick house	0.01	0.17

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Maternal and family characteristics of children with impairments

The logit results presented in Table-III, display the correlation between child and family characteristics with the presence of an impairment. Older children, consanguinity, increasing number of maternal live births, and low income were positively associated with the presence of an impairment at the 95% confidence level. Mother's education and type of dwelling (which is a wealth indicator) had no impact.

Table-III
Impairment Logit Results

Parameter	Estimate	Standard Error	Wald Chi-Square	Pr > ChiSq
Intercept	-4.79	0.42	130.93	<.0001
Older	3.01	0.35	72.18	<.0001
Boy	0.10	0.084	1.45	0.23
MageB	-0.0043	0.0082	0.28	0.60
Consang	0.36	0.15	5.80	0.02
LiveBirths	0.05	0.024	4.29	0.04
ChildDeaths	-0.013	0.18	0.0054	0.94
DBratio	0.42	0.47	0.82	0.37
Mprimary	-0.14	0.11	1.78	0.18
Msecondary	-0.15	0.15	0.93	0.33
Mtertiary	-0.35	1.07	0.10	0.75
LowInc	0.21	0.10	4.34	0.037
Tinhouse	-0.048	0.09	0.27	0.61
Brickhouse	-0.21	0.41	0.26	0.61

The odds ratio estimates for consanguinity revealed that children with parents who were biologically related were 43.5 percent more likely to have an impairment. Being poor increased a child's chances of having an impairment by 23.1 percent.

Maternal and family characteristics of children with disability

The next step in the analysis was to see if the determinants of a disability were different than from those of an impairment. Table-IV displays an ordered logit with disability as an ordered dependent variable (mild and severe). In this regression, the assumption is that the correlates of mild and severe disabilities are same. The impact of the variables is only a matter of degree. Table-IV reveals that the determinants of a disability were to some extent different from those of an impairment. Older age of the child was still related to disability, as were consanguinity and low income (at the 90% confidence level), but now gender and mother's education were significantly correlated as well. However, there was no added benefit for receiving education above the primary level. It should be noted that the mother's education variables were negatively correlated with disability because the excluded group was "no primary education. The odds ratios computed using these estimates showed that having a mother with at least a primary education reduced the chances of having a disability by about 35 percent.

Table-IV
Disability Ordered Logit Results

Parameter		Estimate	Standard Error	Wald Chi-Square	Pr > ChiSq
Intercept	1-Severe	-7.55	0.53	199.49	<.0001
Intercept	2-Mild	-5.85	0.51	133.84	<.0001
Young		2.67	0.29	85.36	<.0001
Boy		0.49	0.16	9.57	0.002
MageB		-0.023	0.015	2.36	0.12
Consang		0.45	0.26	3.10	0.078
LiveBirths		0.03	0.044	0.46	0.50
ChildDeaths		0.19	0.32	0.36	0.55
DBration		0.16	0.83	0.039	0.84
Mprimary		-0.43	0.21	4.36	0.037
Msecondary		-0.21	0.28	0.57	0.45
Mtertiary		-10.75	374.2	0.0008	0.98
LowInc		0.31	0.17	3.08	0.080
tinhouse		0.23	0.17	1.77	0.18
brickhouse		-0.63	1.042	0.36	0.55

Table-V
Disability Generalized Logit Results

Parameter	DisabilityStatus	Estimate	Standard Error	Wald Chi-Square	Pr > ChiSq
Intercept	1-Severe	-8.42	1.04	65.85	<.0001
Intercept	2-Mild	-5.76	0.57	102.22	<.0001
Young	1-Severe	3.28	0.47	48.79	<.0001
Young	2-Mild	2.42	0.34	51.25	<.0001
Boy	1-Severe	0.39	0.34	1.29	0.26
Boy	2-Mild	0.50	0.18	8.12	0.004
MageB	1-Severe	-0.013	0.03	0.16	0.69
MageB	2-Mild	-0.026	0.017	2.40	0.12
Consang	1-Severe	1.23	0.44	7.81	0.005
Consang	2-Mild	0.20	0.31	0.39	0.53
LiveBirths	1-Severe	-0.018	0.10	0.038	0.85
LiveBirths	2-Mild	0.049	0.049	0.96	0.33
ChildDeaths	1-Severe	0.84	0.66	1.60	0.21
ChildDeaths	2-Mild	0.008	0.36	0.0005	0.98
DBratio	1-Severe	-0.51	1.68	0.091	0.76
DBratio	2-Mild	0.27	0.94	0.086	0.77
Mprimary	1-Severe	-0.87	0.51	2.94	0.087
Mprimary	2-Mild	-0.33	0.22	2.13	0.14
Msecondary	1-Severe	-0.62	0.66	0.87	0.35
Msecondary	2-Mild	-0.11	0.31	0.14	0.71
Mtertiary	1-Severe	-13.08	2132.1	0.0001	1.00
Mtertiary	2-Mild	-12.50	1081.4	0.0001	0.99
LowInc	1-Severe	-0.049	0.40	0.015	0.90
LowInc	2-Mild	0.42	0.19	4.96	0.026
Tinhouse	1-Severe	0.38	0.39	0.94	0.33
Tinhouse	2-Mild	0.19	0.19	1.01	0.32
Brickhouse	1-Severe	1.47	1.13	1.71	0.19
Brickhouse	2-Mild	-12.65	431.4	0.0009	0.98

Socio-demographic correlates of mild versus severe disability

Finally, we wanted to ascertain whether the correlates of a mild disability were different from a severe disability. It is possible that different factors causing disability might be associated with different grades of severity of disabilities. Therefore, we estimated a generalized logit. This technique allows for the effect of a given variable to be different, depending on the severity of the disability. Table-V shows that while age was similar for both severity levels, boys were more likely to have mild disabilities, but not severe disabilities. Boys were 66 percent more likely to have a mild disability.

Appendix
Ten Questions Plus (TQP)

1. Compared with other children, did your child have any serious delay in sitting, standing, or walking?

2. Compared with other children, does your child have difficulty seeing, either in daytime or night time?

3. Does your child appear to have difficulty in hearing?

4. When you tell your child to do something, does she/he seem to understand what you are saying?

5. Does your child have difficulty in walking or moving his/her arms or does he/she have weakness and/or stiffness in the arms or legs?
    If no, skip to question 6.
    If Yes, ask these questions:
    Does he/she need help in walking?
    Can he/she use his/her hands to pick up things?

6. Does your child have fits, become rigid or lose consciouness?

7. Does the child learn to do things like other children of his/her age?

8. Does your child speak at all understood in words; can he/she say any recognizable words?

9. For 3-9 year-old children, ask:
    Is your child's speech in any way different from normal?
    (Not clear enough to be understood by people)
    For 2 year – old children, ask:
    Can he/she name at least one object: (e.g. an animal, a toy, a cup, a spoon)?

10. Compared with other children of his/her age, does the child appear in any way mentally slow, delayed or behind?

11. Overall, do you think that your child has difficulties in one or more of the following areas: emotions, concentration, behaviour or being able to get on with other people?

Discussion

The findings from this study have several important implications for disability prevention and service delivery in Bangladesh. They are in line with previous epidemiological work that has shown that factors such as poverty[3,4] and consanguineous marriage[4] are significant risk factors for disabilities among children in Bangladesh.

The higher rate of reported disability for boys over girls is consistent with findings from other countries[19] (OECD 2004). . This could either be a biological construct or a gender bias makes parents and teachers more apt to notice and be concerned about difficulties that boys are having.

Another finding consistent with previous literature is that consanguinity is strongly correlated with severe disabilities, but not with mild ones[4]. This fact is most likely due to the nature of the disabilities caused by genetically inherited disorders. This finding is supported by previous work on cognitive disabilities that shows serious mental retardation occurs irrespective of socioeconomic status, but mild mental retardation is significantly related to low socio-economic status[3]. Being poor, *per se*, is significantly correlated with mild disabilities, but not severe ones; and might have to do with the nature of the conditions (eg. poor psychosocial stimulation; malnutrition) associated with low income. Unfortunately, consumption information or data that could be used to construct an asset indicator – which are the preferred poverty measures for developing countries[6], was not available for the present data set.

The new insight that this study provides is the potential role that mother's education can have in preventing impairments from progressing to the level of a disability. The exact mechanism behind the relationship between maternal education and lower levels of disability is not clear. The results suggest that disabilities may

be prevented through early identification of impairments by raising maternal awareness and knowledge, and developing services at the grass root level. In a prospective neurodevelopmental follow-up study of preterm babies in Dhaka Shishu Hospital, we found that educated but poor mothers were the most compliant, their children did better in their neurodevelopment, but, paradoxically, the mothers who came most frequently were at highest risk for psychiatric morbidity[20]. Services far away from the home, travel costs, and cultural taboos which disallow young women from traveling long distances with young children were found to restrict attendance to services which we have also found to be the case in another study of children with cerebral palsy[21] .

Conclusions

This study provides a correlation between a variety of household and maternal factors to childhood impairments and disabilities. Poverty and consanguinity were found to be correlated to the presence of impairments. Results also suggest that maternal education might be an important tool limiting the probability that those impairments will progress to disabilities, suggesting that various interventions aimed at increasing the knowledge and awareness of mothers regarding impairments and their treatments, as well as easy access to services, could significantly prevent childhood disability. Study findings also suggest that the causes of severe disabilities might be significantly different from milder disabilities. Further study into the causes of specific and severe disabilities is needed.

Acknowledgements

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