BIOLOGICAL AND PSYCHOSOCIAL PREDICTORS OF DEVELOPMENTAL DELAY IN PERSONS WITH INTELLECTUAL DISABILITY: RETROSPECTIVE CASE-FILE STUDY

Amarjyothi Persha*, Saroj Arya**, R. K. Nagar***, P. Behera***,
R. K. Verma***, M. T. Kishore***

ABSTRACT

Intellectual disability is one of the commonest disabilities during the developmental period. It is often associated with several factors. The aim of the study was to identify the biological and psychosocial factors associated with developmental delay resulting in intellectual disability. The study team reviewed 438 case files of persons with intellectual disability. Results indicated that maternal age at conception, foetal presentation, neonatal seizures and infections were the best indicators of developmental delay characteristic of intellectual disability. Psychosocial variables such as emotional trauma during pregnancy, economic status and education of parents had no significant impact on development. It is concluded that developmental delay characteristic of intellectual disability could be predicted by specific biological factors, which will help in initiating appropriate intervention.

INTRODUCTION

Intellectual disability is associated with several biological and psychosocial factors. The biological factors are further divided into genetic and non-genetic factors (1). The risk factors may be singular or multiple. Several studies have documented the role of intrauterine environment, consanguinity, hazards of prematurity and birth process, and postnatal factors that could arrest development (2, 3, 4). Among the non-genetic biological factors, maternal age at conception, infections, neonatal seizures and dietary deficiencies were found to be detrimental to overall development (1, 4, 5, 6, 7, 8). Similarly, several psychosocial factors such as psychological trauma, impoverished environment, low socioeconomic status and certain cultural influences on child rearing were identified to be detrimental to development,

leading to intellectual disability (4, 9). Some recent surveys have identified few probable causes of intellectual disability such as illness during pregnancy, birth related factors and illness or head injury during childhood (10). The risk of developmental delay depends on the interaction between biological and psychosocial variables (4). Therefore, it is difficult to identify specific etiology (11). From the review of literature it appears that intellectual disability can have multiple causes and the more the number of risk factors, the greater the chance of significant developmental delay. Nevertheless it is notable that a majority of these factors are preventable.

Although there are several developmental scales to identify at-risk population, this approach is not always feasible due to lack of expertise and availability of tools. It also has limited predictive value. Therefore, identifying the probable causes will help in identifying children at risk and in initiating early intervention strategies to minimise the risk of developmental delay (4).

The aim of the study was to identify biological and psychosocial predictors of developmental delay in persons with intellectual disability.

METHODS

The study was conducted at the National Institute for Mentally Handicapped (NIMH) Regional Centre, Kolkata, India. Data were collected from the case files. The information from the case files is authentic as data were collected by clinical staff having at least a graduate degree in the field of intellectual disability and minimum of four years experience thereafter. The files recorded medical, psychosocial and educational information from parents, interviews and from other relevant anecdotal records. At the next level the information was verified and detailed assessment was conducted individually by a psychiatrist, a clinical psychologist and a special educator. Case files of individuals between one and 18 years with data reported by first degree relatives and with a development quotient (DQ) of below 70 on Developmental Screening Test (DST) (12) were included in the study. Age limit was decided on the premise that perceptible changes in various areas of development could be seen by the first year and that developmental assessment loses its relevance in diagnosing intellectual disability after 18 years. DQ cutoff was chosen corresponding to intelligence quotient in standard practice of diagnosing intellectual disability (13). Cases where

DST score did not match with other psychological tests of adaptive behaviour and intelligence were excluded from the study.

Though detailed psychological assessment was carried out in most of the cases, the present study has taken only the scores of DST, as it was not feasible to apply comprehensive intelligence scales in certain cases due to the nature of intellectual disability or associated disabilities. DST measures development from 0 to 15 years in the general population and is applicable to any age group of persons with intellectual disability. It yields developmental quotient (DQ). Despite criticism that DST is loaded with speech and language items, it is widely used in the Indian context to assess overall development and also as a screening tool of intellectual disability. DST shows good correlation with Vineland Social Maturity Scale and Indian adaptation of Binet's scales (14).

The analysis was carried out with Statistical Package for Social Sciences (SPSS Version 12.0) for Windows. Descriptive statistics and linear regression analysis were done as per their basic assumptions.

RESULTS

There were 712 new cases registered with the institute from August 2004 to July 2005 from which 204 files were excluded due to lack of sufficient data and another 70 that did not fit the age limit. The final sample was 438 of which the majority were males (64.1%) and the mean age was 8.17 (SD 4.80). Mild and moderate retardation had equal distribution (31.7%), which was followed by severe retardation (25.3%). Hundred percent of fathers had gainful occupation or employment though only 82.4% were literate. Among the mothers, 79.2% were literate and 96.8% were housewives. The mean age of conception of mothers was 24.86 years (range: 15-48 years; SD 5.54). The majority was from urban area (52.7%) followed by rural (25.6%) and semi-urban areas (21.7%).

Table 1. Frequency of risk factors[1]

Variables	n (%)
Prenatal factors	
Emotional trauma	58 (13.2%)
Malnutrition	33 (7.5%)
Physical trauma	27 (6.2%)
History of abortion	12 (2.7%)
Infections	12 (2.7%)
Prescribed drugs	6 (1.4%)
Epilepsy	2 (.5%)
Natal and postnatal factors	
Delayed birth cry	224 (51.1%)
Neonatal seizures	141 (32.2%)
Low weight	123 (28%)
Premature birth	73 (16.7%)
No immunization	51 (11.6%)
Infections	32 (8.2%)
Head injury	29 (6.6%)
Overweight	22 (5.0%)
Abnormal colour	13 (3.0%)
Post-term birth	13 (3.0%)

[1]Given in descending order

Table 2. Biological and psychosocial predictors of development

Independent variables	Unstandardised Coefficients (ß)	Standard Error	Standardised Coefficients (ß)	t
(Constant)	29.250	58.522		.500
Biological factors				
Maternal age at conception	.633	.206	.267	3.065**
History of abortion	2.686	7.392	.019	.363
Self-medication	-.742	6.786	-.006	.109
Malnutrition	-6.664	3.840	-.096	1.735
Maternal infections	-1.196	1.105	-.082	1.082
Prescribed drugs	-11.466	6.808	-.090	1.684
X-Ray	-2.928	11.574	-.013	.253
Gestation	.872	2.213	.022	.394
Type of delivery	-.554	.917	-.036	.604
Normal foetal presentation	38.018	16.601	.173	2.290*
Prolapsed Cord	-3.704	17.628	-.012	.210
Delayed birth cry	-1.411	1.707	-.051	.827
Abnormal birth weight	-.746	.923	-.050	.808
Colour	.167	.627	.016	.266
Neonatal seizures	-5.038	1.930	-.140	2.611**
Cerebral infections	-7.237	3.306	-.117	2.189*
Head Injury	1.115	.775	.078	1.438
Family History	.847	.818	.056	1.036
Psychosocial factors				
Psychological trauma	-1.268	.998	-.069	1.270
Fathers' Education	1.852	1.412	.110	1.312
Mothers' Education	.612	1.414	.035	.433
Socio Economic Status	.002	.000	.045	.679
Rural/urban	.655	.678	.052	.966

* P < .05
** P < .001
Dependent Variable: Developmental Quotient

Table 1 indicates the frequency of several prenatal and postnatal factors. Table 2 indicates that maternal age at conception, foetal presentation, neonatal seizures and cerebral infections were found to be detrimental to the overall development.

DISCUSSION

Intellectual disability is a condition associated with significant intellectual delay and deficits in adaptive behaviours. In general this condition is caused by interaction of several biological and psychosocial factors (4). Contrary to previous studies (3, 8), the present study revealed that higher the age the better the development of children. This finding could be understood from the fact that approximately 50% of the maternal population in this study had conceived between 20 to 28 years of age, a period which is biologically and psychologically conducive for gestation and child rearing. This finding indirectly supports few earlier studies in which older mothers were found to be more interactive and showed inventiveness and tolerance in child rearing thereby facilitating conducive environment for growth and development (15, 16). The psychosocial implication of this finding is that teenage couples should be given appropriate information on consequences of conception with reference to the age of the mother, need for regular antenatal checkup, nutrition and strategies to secure social support to guide them in child rearing.

Normal foetal presentation at the time of delivery was found to be indicative of normal development. The present study also revealed that high proportion of individuals had neonatal seizures (32.2%), which emerged a predictive factor. The incidence of neonatal seizures is much higher than earlier reports (17). However, this corroborates findings of earlier studies on general population that the incidence is high in developing countries (18). In the context of neonatal seizures a question may arise that the study population was developmentally delayed therefore possible neurological defects could have led to seizures rather than the other way. Though this is possibility, it can be noted that all neonatal epileptic seizures except typical absence seizures may themselves aggravate the brain injury responsible for the seizures (19). However, physicians should consider whether there were any neurological abnormalities in the first one year of life before the onset of seizures, as this combination may indicate poor prognosis of cognitive development (20).

In the present study 8.2% had cerebral infections including meningitis and encephalitis although

there were no data to suggest whether they were primary or secondary. Nevertheless, cerebral infections emerged as a predictor of developmental delay supporting earlier studies that these infections will cause wide range of impairments particularly related to cognitive development (5). As early detection is crucial in treating these infections effectively, young parents should be educated about the common signs while their childrens are under neonatal care so that they can utilise appropriate health facilities when emergency arises. Contrary to earlier studies, lack of significant effect of psychosocial variables in this study could be due to well matched subcategories.

Based on the above findings it is concluded that age of mother at the time of conception, abnormal foetal presentation, neonatal seizures and cerebral infections could be risk factors for development. Wherever appropriate health facilities are not available, this information could be imparted to families through grassroot professionals such as health workers, where available. These findings can be generalised with due consideration to certain limitations intricate to any retrospective study such as lack of anecdotal records in all cases and hence possibility of recall bias by the informants.

* Formerly, HoD
Dept. of Medical Science, National Institute for the Mentally Handicapped (NIMH)
Secunderabad 500 009, India
**HoD Dept. of Rehabilitation Psychology, NIMH, Secunderabad 500 009, India
***NIMH Regional Centre, NIOH Campus, Bt Road, Bonhoogly, Kolkata 700 090, India
Address for correspondence:
M.T. Kishore
e-mail: mtk_psy@rediffmail.com

REFERENCES

1. Baroff GS. ***Mental Retardation: Nature, causes, and management***. Washington: Hemisphere Publishing Co., 1986.
2. Narayanan HS, Rao BSSR, Rao PM, Subbukrishna DK. ***Observation of mentally retarded cases with special reference to consanguinity***. NIMHANS Journal 1987; 5:121-123.
3. Singh H, Nizamie A, Jahan M, Jagadheesan K, Nizamie SH. ***Profiles of individuals with mental retardation in Ranchi: A community study***. Indian Journal of Clinical Psychology 2002; 29: 178-185.

4. Persha AJ, Rao VRPS. ***Early intervention-A service model: Early intervention to IUGR children at risk for developmental delays.*** Secunderabad: National Institute for the Mentally Handicapped, 2003.
5. Sells CJ, Bennett FC. ***Prevention of mental retardation: the role of medicine.*** American Journal on Mental Deficiency1977; 82: 117-129.
6. Kaur H, Singh S, Malhotra D. ***Malnutrition and cognitive development.*** Journal of Personality and Clinical Studies 1985; 1: 23-25.
7. Udan PM. ***Protein energy malnutrition (PEM), brain and various facets of child development.*** Indian Journal Pediatrics 1992; 59**:** 165-186.
8. Packman S. ***Diagnostic evaluation of the child with mental retardation.*** In: Rudolf AM, Hoffman JIE, Rudolf CD, eds. Rudolf's Pediatrics. Stanford, Appleton & Lange, 1996: 424-426.
9. Sethi BB. ***Nutrition and mental retardation.*** Indian Journal of Psychiatry 1976; 21: 97-99.
10. National Sample Survey Organization. ***NSSO 58th round (July-December).*** Ministry of Statistics and Programme Implementation, Government of India, 2003.
11. Mathew A. ***Prenatal psychological stress: a significant factor in mental retardation.*** Disabilities and Impairments 2002; 16: 42-46.
12. Bharatraj J. ***Developmental Screening Test.*** Mysore: Swayam Sidha Prakashanam, 1977.
13. World Health Organization. ***The ICD-10 classification of mental and behavioural disorders: Clinical Descriptions and Diagnostic Guidelines.*** Geneva: World Health Organization, 1992.
14. Jayashankarappa BS. ***Intellectual tests and social-adaptive behavioural scales used for the assessment of the mentally handicapped in India.*** Journal of Personality and Clinical Studies 1986; 2: 89–98.
15. Von Windeguth BJ, Urbano RC. ***Teenagers and the mothering experience.*** Pediatric Nursing 1989; 15: 517-520.
16. Culp RE, Culp AM, Osofsky JD, Osofsky HJ. ***Adolescent and older mother's interaction patterns with their six-month-old infants.*** Journal of Adolescence 1991; 14: 195-200.
17. Richardson SA, Koller H, Katz, M. ***A functional classification of seizures and its classification in a mentally retarded population.*** American Journal on Mental Deficiency 1985; 90: 1-8.
18. Shorovon SD, Farmer PJ. ***Epilepsy in developing countries. A review of epidemiological, sociocultural and treatment aspects.*** Epilepsia 1988; 29 (Suppl 2): 185-194.
19. Dam M. Children with epilepsy: ***The effect of seizures, syndromes and etiological factors on cognitive functioning.*** Epilepsia 1990; 31(suppl 4): S26-S29.
20. Ellenberg JH, Hirtz DG, Nelson KB. ***Do seizures in children cause intellectual deterioration?*** New England Journal of Medicine 1986; 314: 1085-1088.