



**EPIDEMIOLOGY OF DELAYED MILESTONES IN DIFFERENT LEVEL OF  
INTELLECTUAL DISABILITIES**

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**ABSTRACT**

Intellectual disability is a life long disability that presents in infancy or the early childhood years but it cannot be diagnosed until the child is older than 5 years, when standardized measures of intelligence become reliable and valid. Intellectual disability coexists with many serious physical problems. Level of intellectual disability, age & sex of the person, associated disorder, locality and information of delayed milestones was recorded from data given by parents or center of rehabilitation. In the present study, there were 78.4% males and 21.6% females. Diagnostic studies revealed epilepsy, learning disorder, Attention-Deficit Hyperactivity Disorder (ADHD), Behavioral problem in 24%, 25%, 16%, 35% persons respectively. Cerebral palsy was seen in 45% of the children from all categories of intellectual disability. Significant difference was revealed in delayed milestones such as head control (P<0.001), crawling (P<0.001), sitting (P<0.001), standing (P<0.001), walking (P<0.001) in all three levels of intellectual disability. Increased knowledge of these delayed milestones will allow parents & others to keep track of appropriate development. Careful assessment of the child will be helpful in appropriate evaluation and referrals to provide genetic counseling resources for the family and early intervention programs for the child.

**KEYWORDS:** Delayed milestones, Genetic disorder, Genetic Counseling.

**INTRODUCTION**

Epidemiology is the study of factors affecting the health of populations, and is the foundation reason for interventions made in the view of public health and preventive medicine. Intellectual disability is one of few clinically failure to develop sufficient cognitive and adaptive level and is one of the most common human disorder.<sup>[1]</sup> American psychiatric association defines intellectual disability as the combination of IQ at or under 70 and problems with learning and social adaptation and symptoms that begins before 18 years of age.<sup>[2]</sup> There are a number of problems and challenges in relating the science of epidemiology to Intellectual disability. These relate to how intellectual disability is defined even on how these definitions may change over time. It is a genetic disorder manifested in significantly below average overall intellectual functioning and deficits in adaptive behavior.<sup>[3]</sup> It begins in childhood, affects 1-3% population.<sup>[4, 5]</sup> There is a role of many factors in the etiology of intellectual disability like chromosomal abnormalities, genetic metabolic disorders and pregnancy complication such as maternal infection exposure to toxins, radiation, perinatal hypoxia and postnatal infection.<sup>[6]</sup> Genetic factors play a major role in determining the growth rate, and particularly the changes in proportion characteristic of early human development. However, genetic factors can produce the maximum growth only if environmental conditions are adequate.

Poor nutrition, frequent injury and disease can reduce the individual's adult stature, but the best environment cannot cause growth to a greater stature than is determined by heredity. Gesell and Amatruda classified development into several skill areas: gross motor, fine motor, language, personal-social, and adaptive skills.<sup>[7]</sup>

A common concern in child development is developmental delay involving a delay in an age-specific ability for important developmental milestones. Increased knowledge of these milestones allows parents and others to keep track of appropriate development. Some of the disorders associated with intellectual disability are epilepsy, cerebral palsy, vision and hearing impairments, speech or language problems and behavior problems.<sup>[8]</sup>

Diagnosis is highly dependent on comprehensive personal and family medical history, a complete physical examination. An important implication of finding a cause and knowing the aetiology is that person with intellectual disability and their families can be educated about the long term issues such as life span and progression of disease, deciding about child bearing and antenatal monitoring of subsequent pregnancies.

## MATERIAL AND METHODS

Present study was done on persons with different level of intellectually disability taken from a wide area rehabilitation centers across state of Haryana after the consent of parent/guardian. Sex, level of intellectual disability, associated disorders and locality was recorded from data given by parents or center. For each person with intellectually disability, level of cognitive functioning (IQ) was determined using seguin form board test.<sup>[9]</sup> To find out social quotient adaptive skill area of the person, Vineland social maturity scale 5 were used.<sup>[10]</sup> Depending upon level of intellectual disability, these persons were divided into four different classes. The classification was done as per WHO system of classification.<sup>[11]</sup> The classes were as follows: - mild (IQ. 51-70), moderate (IQ. 36-50), severe (IQ. 21-35) and profound (IQ < 20). Records were evaluated as mild, moderate and severe intellectual disability categories. Developmental histories were obtained from parents. Every person with intellectually disability had a complete physical neurological examination and other history as needed. Percentage frequency of various risk factors of each class of intellectually disability was calculated and role of these factors contributing to intellectual disability was analyzed. Cerebral palsy and other associated problem were recorded with consultation of pediatrician, neurologists.

Statistics using SPSSv17 were used to describe the delayed milestones and early milestones in different levels of intellectual disability.

As a part of ongoing study, parents completed a developmental milestones questionnaire, they were asked to indicate whether their child was on time or late for 5 developmental milestones listed. These were included when the child first began to control the head, sit, crawl, stand and walk. Based on the retrospective history of early developmental milestones provided by the parents, children were classified as either 'on time' or 'late' in achieving developmental milestones. In event that the parent did not indicate whether their child was on time or late, the month at which their child achieved each milestone was recorded and analyzed whether it is with in the same period or delayed that is after 90% of the normal population.

To determine the percentage the children with intellectual disability (n = 500) reported to on time versus late for each developmental milestones a frequency count was used. The delay of each developmental milestone between different levels of intellectual disability was calculated and analyzed for the delays associated with cognitive functioning.

## RESULTS

In the present study of evaluation of intellectual disability with developmental delay, 500 persons of age group >5 years were studied. There were 78.4% males and 21.6% females. In Cognitive level 138 persons of

mild, 270 moderate and 92 severe were found. In term of locality of intellectual disability persons 72% Urban and 28% rural were noted.

Diagnostic studies revealed epilepsy, learning disorder, Attention-Deficit Hyperactivity Disorder (ADHD), Behavioral problem in 24%, 25%, 16% and 35% persons with intellectual disability respectively. Cerebral palsy was seen in 42% of the children from all categories of intellectual disability (Table I).

**Table I (Frequency of motor function disorders and associated Problems)**

Sr. No.	Associated Disorders	Percentage frequency
1.	Epilepsy	24%
2.	Learning disorder	25%
3.	Attention-Deficit Hyperactivity Disorder (ADHD)	16%
4.	Behavior problems	35%
5.	Cerebral Palsy	42%

Recording of time periods in months of different milestones at which children with different level of intellectual disability achieved each milestone was done (Table II). The percentage of children with intellectual disability of different level to be "On Time" and "Late" for each milestones with control was found (Table III)

**Table II (Time period for milestones in different levels of intellectual disability)**

S.No.	Milestones	Mild	Moderate	Severe	Normal
1.	Head control	4-7 m	4-5 m	6-8 m	2-5 m
2.	Sitting	9-15 m	9-18 m	11-24 m	>5 m
3.	Crawling	9-12 m	18 m	11-18 m	6-12 m
4.	Standing	10-11 m	11-18 m	>18 m	9-13 m
5.	Walking	21-27 m	18-31 m	21-36 m	9-15 m

Development of various milestones varied from mild to severe group and one individual to another. Variability showed from one year to more than three years. Various milestones like head control, crawling, sitting, walking and standing were studied in detail in person with different levels of intellectual disability and persons without intellectual disability.

Attainment of head control was observed from 4-7 months in mild group. In moderate group maximum frequency of children to attain the head control was in range of 4-5 months. Children of severe group attained the head control in 6-8 months. In persons without intellectual disability attained of head control was up to 2-5 months of age. Sitting in persons without intellectual disability begin from fifth month, whereas persons with intellectual disability showed a delay up to 9-15 months in mild group, 9-18 months in moderate group and 11 to 24 months in severe group.

In persons without intellectual disability, age of crawling occurred between 6-12 months. Maximum frequency of

crawling of children occurred from 9-12 months in persons with mild intellectual disability. Person with moderate group of intellectual disability showed delayed crawling up to 18 months. In severe group crawling occurred from eleven months to eighteen months.

Age of standing in persons without intellectual disability was between 9-13 months. Capability to stand varied from 10 months to two and half years in persons with intellectual disability. Maximum persons of mild group started standing between 10-11months. Some persons of mild group stand up between 12-18 months of age. In moderate group maximum frequency of persons to stand up varied from 11 to 18 months. In severe group maximum persons were able to stand up after 18 months of age.

In persons without intellectual disability, age of walking was between 9-15 months. Whereas persons of mild intellectual disabled group started walking between 21-27 months of age. In moderate group the range was 18 to 31 months, whereas in severe group no person could walk up before 21 months and walking was delayed up to three years.

The percentage of children with intellectual disability of different level to be 'On Time' and 'Late' for each milestone was calculated and compared with persons without intellectual disability (Table III).

**Table III (Percentage frequency of person with different levels of intellectual disability and person without intellectual disability and developmental milestones)**

Milestones	*Mild(137)		*Moderate(270)		*Severe( 92)		Control(350)	
	Late onset	On Time	Late onset	On Time	Late onset	On Time	Late onset	On Time
Head control	62	39	75.9	24.07	94.5	5.4	2.2	97.7
Crawling	52	49	66.6	33.3	85.8	14.1	14.2	85.7
Sitting	52	48.1	73.3	26.6	89.1	10.8	8.5	91.4
Standing	47.4	53.2	72.2	27.7	86.9	13.4	7.1	92.8
Walking	44.5	56.2	71.1	28.8	78.2	21.7	10	90

\*Significant,  $P < 0.001$

Results of  $\chi^2$  analyses revealed that children with intellectual disability were rated late more in all developmental milestones than persons without intellectual disability.

Children with all three levels of intellectual disability were often in delayed in motor milestones such head control ( $P < 0.001$ ), crawling ( $P < 0.001$ ), sitting ( $P < 0.001$ ), standing ( $P < 0.001$ ), walking ( $P < 0.001$ ). There was significant difference in delayed milestones between three levels of intellectual disability

## DISCUSSION

The importance of a child health in society has been marked ever since human existence came into being. As children are also general indicators of general health of society. Therefore primary preventive strategies are deemed important at early years in child life.

In the present study, most of the persons with intellectually disability came from urban as compared to rural back round. This in accordance with analysis conducted by Ganguli(2000) who concluded that intellectual disability occurs mostly in the urban areas than rural areas with a ratio of 243/100.<sup>[12]</sup> Lack of awareness may be the possible reason for the lesser number of individuals from villages.

Higher percentage of intellectually disabled males in the present group of population may be explained by the tendency of the community based social setup to nurture

a male child more as compared to the female child expecting future financial contributions from the male children once they grow up.

The finding in the study is in accordance with a analysis conducted by Ganguli (2000) who concluded that intellectual disability occurs mostly in the urban areas than rural areas with a ratio of 243/100.<sup>[13]</sup> Lack of awareness is also a possible reason for the lesser number of persons from villages. According to traditional clinical approach mental retardation is a permanent condition which originates from birth or shortly after birth, therefore prevalence of retardation should be about the same in all age groups. However the case is different practically, many of the cases of mental retardation remain undiagnosed among the preschool and young children go undiagnosed. Nutrition deprivation and environmental conditions seem to be relevant predisposing factors. Because some of the specific causes and risk factors for mental retardation that are now uncommon in developed countries mental retardation remain highly prevalent in less developed countries. Socio-environmental factors particularly the role of the mother can be very important in influencing the level of mental functioning and development.<sup>[14]</sup>

Present report is not addressing the etiologic evaluation of children who are diagnosed with development delay /intellectually and associated disorder. Some children were present with both development delay and associated disorder. Epilepsy (24%), learning disorders, (25%),

ADHD (16%), cerebral palsy (42%) and behavioral problems (35%) were seen in the intellectually disabled children. Kaur et al., (2006) reported Epilepsy, learning disorders, ADHD, cerebral palsy, behavioral problems with the frequency of 25%, 24%, 12%, 50%, 10% respectively.<sup>[15]</sup>

In this case judgment of clinical geneticist will be important in evaluation of child by primary neurodevelopment diagnosis. Recognition of infant/child has cognitive disability can be matter of clinical judgment so it is very important to Pediatrician and consulting clinical geneticist for deciding the best approach to the diagnostic evaluation.

The result of etiologic evaluation of development delay in intellectually disabled children varied world wide from 10% to 81%.<sup>[14,16,17]</sup> This variation in the evaluation is due to many factors such as prevalent population differences, extent of diagnostic evaluations time period during which the study was completed<sup>[18,19,20,21]</sup>. Development disabilities affect 5% to 10% of all children<sup>[22]</sup> but the prevalence of developmental delay is 1 to 3% and there is state to state variation in rates.<sup>[23]</sup>

## CONCLUSION

Epidemiology of delayed milestones is very important in diagnosis of intellectually disabled persons in society. Development screening may led to early detection of moderately and severely retarded children. It may also help in establishment of various development screening programmes. Present study suggests that development delay should be diagnosed by comparison with characteristic variability of a milestone, not with respect to an average age at achievement.

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