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Original Article

An etiological study of intellectually disabled children under 14 years old in Anhui Province, China

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Abstract: Objective: To explore the etiological factors of intellectually disabled children in Anhui Province using a multicenter etiological study. Methods: A total of 200 children aged 0 to 14 years in Anhui Province who were diagnosed with intellectual disabilities were recruited as the study cohort. Their general information (perinatal information, parental educational levels, family environments, etc.) was collected through questionnaires, and the Gesell Developmental Scale and the Wechsler Intelligence Scale were used to assess the intelligence development of the enrolled children. Results: Among the 528 children, 270 (51.14%) had severe intellectual disabilities and 258 (48.86%) had mild intellectual disabilities. It was found that various perinatal factors (premature birth, asphyxia, ischemic hypoxic encephalopathy, etc.), severe cerebral palsy, and psychosocial factors were the main etiological factors, accounting for 27.42%, 22.29%, and 17.16% respectively. There was a significant difference in the distribution of the etiologies between the rural and urban areas ($P<0.01$). The educational levels of most of the parents in the rural areas were lower than the parents' educational levels in the cities. Conclusion: Correlation analyses are helpful for the early diagnosis of children suspected of having intellectual disabilities and they provide a scientific basis for improving the children's quality of life and their early rehabilitation treatment.

Keywords: Intellectual disability, children, social adaptability

Introduction

For human beings, the coordinated development of the various functional areas of the brain enables people to survive in society. However, in our real society, there is often a group of people who suffer from certain intellectual disabilities, and for children, intellectual disability or general developmental delay is a disease that endangers their physical and mental health. This disease may be congenital, and it has become a hot topic worldwide [1]. It primarily refers to the impairment of the mental function, an uncommon disorder in children under the age of 18 years with a marked deficiency in intelligence or adaptive behavior. The medical term *intellectual disability* applies only to children over five years old [2]. There is no way to systematically test the intelligence of children before the age of five. Intellectual disability can be divided into four levels, and IQ is extremely important as the main parameter for determining the levels. Children with intellectual disabilities account for about 1% of children worldwide, and this ratio is even higher in some low- and middle-income countries [3]. Worldwide, there are about 150 million people with intellectual disabilities, a condition that causes great harm to the individuals and their families, as well as heavy medical expenses and social costs. In the United States alone, the annual expenditure is as high as 50 billion US dollars. With the development of society, many countries have attached importance to this, and interventions and treatments have made progress. The research results obtained are of great significance for improving the quality of the population [4].

The clinical manifestations and etiology of this disease are very different. Intellectual disability occurs at different periods for different groups of people. Its onset may occur alone in certain periods of young children, or together with other diseases, such as congenital malformation, epilepsy, and other diseases. It can be measured by an autism spectrum disorder test to observe whether there are complications. The etiology

of the disease has both external environmental factors and genetic factors. The external environmental factors account for 1/5, including perinatal infections [5] and drug abuse after birth, which may cause intellectual disability. Recent studies have found that the etiological structure of the genetic factors includes different types of abnormalities of the chromosome structure and number and genetic mutations [6]. Among children with intellectual disabilities, half of them have significant congenital metabolic defects, which can lead to intellectual disability. There is a very obvious etiology in genetics, but the procedure of treatment is determined, while the overall treatment of intellectual disability lacks specificity. The root etiology involved may be traced back to family inheritance and prenatal diagnosis to achieve primary etiological prevention [7]. The spread of this disease is important. There are related diagnostic procedures in the United States for reference.

The genetic research on this disease has been a hot topic in the life sciences in recent years. A large number of genetic testing companies have been established. Their presence also provides a potential therapeutic team for the etiological diagnoses of people with intellectual disabilities [8]. Research in this field has been developing very rapidly in China, and the etiology of a large number of children with intellectual disabilities has been found [9]. We have also established a standardized diagnosis and treatment platform for children to ensure the rationality of the technological applications, and at the same time establish a quality control and standardization system. On this basis, the relevant cytological analyses can be carried out for children with moderate and severe intellectual disabilities who inherited their conditions. The possibility of cutting off the genetic inheritance of the pathogenic genes in families through prenatal diagnosis and other methods has been included in the national first-level defense system, and etiological diagnosis is the most important prerequisite for this goal [10].

Materials and methods

General information

The study was conducted in Anhui Province and involved 528 children aged 0 to 14 years who had been diagnosed with intellectual disabilities [11]. According to their intelligence levels, the children with IQs of 35-69 were placed in the severe group (n=270), and the children with IQs of 70-90 were placed in the mild group (n=258).

Inclusion criteria: In strict compliance with the *National Diagnostic and Statistical Manual of Mental Disorders*, children with certain adaptive defects at their stage of development were voluntarily enrolled in this study. The study was limited to children under the age of 14, children with no other diseases, and children and their families who agreed to participate in the study.

Exclusion criteria: Children with other diseases and children and their families who did not agree to participate in the study. During the study, some patients who quit voluntarily and those with cachexia who were unable to complete the survey were excluded. This study was approved by the Ethics Committee of Anhui Provincial Children's Hospital, and the families of the children signed and provided written informed consent.

Outcome measurement and evaluation criteria

Indicators of motor and language abilities: The Gesell Developmental Schedule is a set of testing tools developed by Gesell and his colleagues at Yale University in the United States. It mainly measures four aspects of children's abilities, such as motor skills and language skills. A total of 63 items are used as the evaluation criteria [12].

Indicators of language and operational abilities: The Wechsler Intelligence Scale is an IQ test developed by the famous American psychologist Wechsler. It is also another set of intelligence measurement scales commonly used internationally. It can measure children's language and operational abilities. In the test, the sum of each bonus item can be used to measure the original rough score. For each missing item, a weighted average score must be calculated and then converted into an average. Within the scope allowed by the standard, the language ability and operational ability scores are added together to get the total score of the scale, and finally the corresponding IQ value is determined [13].

Table 1. Comparison of the general information in the two groups

General clinical data		Severe group (*n*=270)	Mild group (*n*=258)	*t*	*P*
Gender	Male	138	131	0.006	0.938
	Female	132	127		
Mean age (years)		11.04±2.54	10.08±3.22	2.148	0.033
Parental educational level	Elementary education	70	77	3.365	0.186
	Senior middle school	146	119		
	Academic or above	54	62		
Family environment	Good	63	55	4.270	0.118
	Ordinary	187	170		
	Poor	20	33		

Development indicators: The Denver Development Screen Test was developed by Denver psychologist Frankenberg et al. in 1976 to evaluate the developmental status of children aged 0 to 6 years. The test can be used to evaluate four different aspects [14]. Developmental screening is a psychiatric term used by the Scientific and Technical Terms Review Committee.

Social ability indicators: The Adaptive Behavior Rating Scale evaluates children's social abilities. The scale has been revised and perfected after years of clinical testing and epidemiological research focused on 0-14 year old children with intellectual disabilities in China. From the perspective of national promotion, it has been widely recognized as a highly operable and assessable scale. It is assessed by the Expert Group of the Second National Sample Survey of Persons with Disabilities and has a great applicable value [15].

For development, the scale is a core indicator used to measure the mental intelligence of infants and young children. In some sports fields, it can also be a good indicator of the development of young children. The measurement results have a certain degree of real validity. It has great research value in the medical field and has a good testing ability for some of the cognitive behaviors and fluctuating emotions of young children.

Statistical analysis

SPSS 23.0 statistical software was used to process the data. The count data were expressed as n (%) and analyzed using X^2 tests. The measurement data were analyzed using Student's t tests. The comparisons of the multi-factors were analyzed using F tests. $P<0.05$ was considered statistically significant.

Results

Comparison of the differences in the general information between the two groups

There were no significant differences in terms of age, parental educational levels, or family environments (**Table 1**).

Comparison of the etiologies and the severity of the intellectual disabilities in the two groups

There were significant differences in terms of brain damage, congenital inheritance, and unexplained metabolic diseases between the two groups (**Figure 1**).

Comparison of the distributions of the etiologies of the intellectual disabilities in the two groups

By studying the hypoxia metabolism and endocrine abnormalities caused by viral infections and brain mechanical damage in the daily life of the two groups of children, it was found that these conditions are accompanied by psychosis and social psychological factors (**Figure 2**).

Comparison of the distribution of the action times of the etiology of intellectual disabilities in the two groups

There were significant differences in the factors before birth, at birth, and after birth in the two groups (**Figure 3**).

Comparison of the ratio of intellectual disabilities caused by prenatal factors in the two groups

Genetic diseases and pregnancy-induced hypertension can lead to fetal developmental

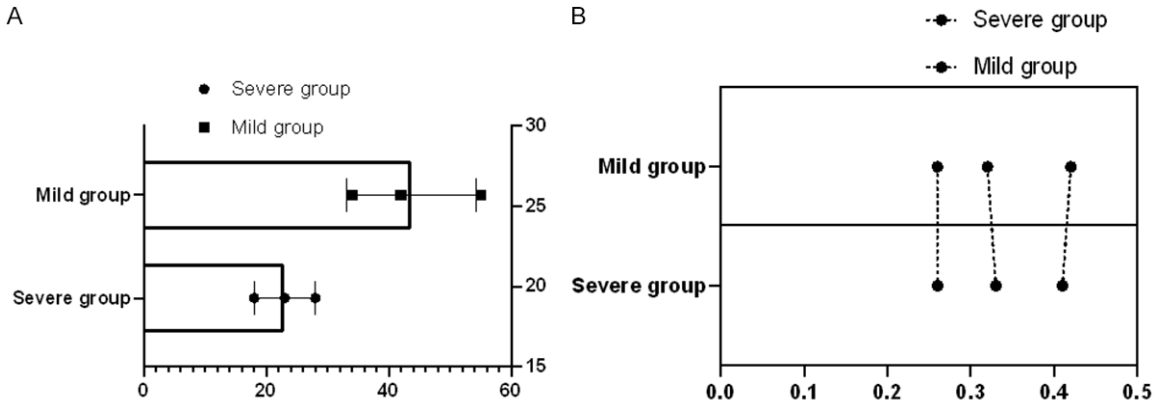

Figure 1. Comparison of the etiology and severity of the intellectual disabilities between the two groups. There were 65 cases (32.5%) with brain damage, 52 cases (26%) with congenital inheritance, and 83 cases (41.5%) with unexplained metabolic diseases in the two groups (P<0.05).

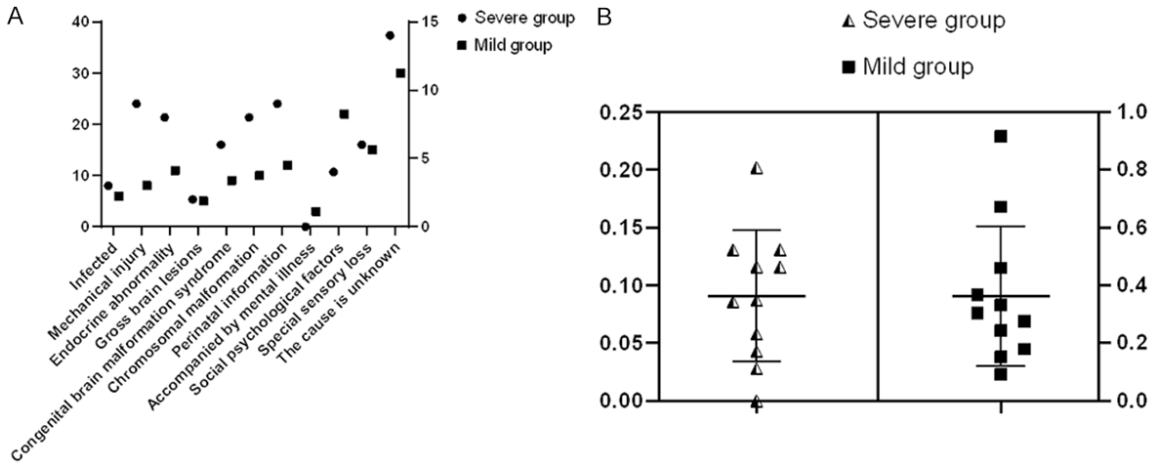

Figure 2. Comparison of the distribution of the etiology of intellectual disabilities between the two groups. Infections, brain mechanical injuries, hypoxia, endocrine abnormalities, brain gross lesions, congenital brain malformation syndrome, chromosomal mutations, perinatal factors, concomitant psychosis, psychosocial factors, and unknown etiology were compared, and there were significant differences between the two groups (P<0.05).

retardation, premature birth, and poisoning, and the differences between the two groups were statistically significant (**Figure 4**).

Comparison of the ratios of intellectual disability caused by postnatal factors between the two groups

Some of the newborn disorders, such as Japanese encephalitis, meningitis, brain diseases, craniocerebral trauma, *etc*. can cause psychological damage to children, and the survey results showed that there were also significant differences between the two groups (**Figure 5**).

Discussion

Intellectual disabilities are common among children worldwide. The etiology of this disease is very complex, and its consequences are serious. To a certain extent, it not only affects the children's physical and mental health, it also brings heavy economic and spiritual burdens to families and society [4, 16]. The existence of these burdens will make children with intellectual disabilities have a sense of inferiority, leading to undesirable results. China attaches great importance to the treatment of this disease, and the prevention of intellectual disabilities is an important aspect of eugenics. In this study,

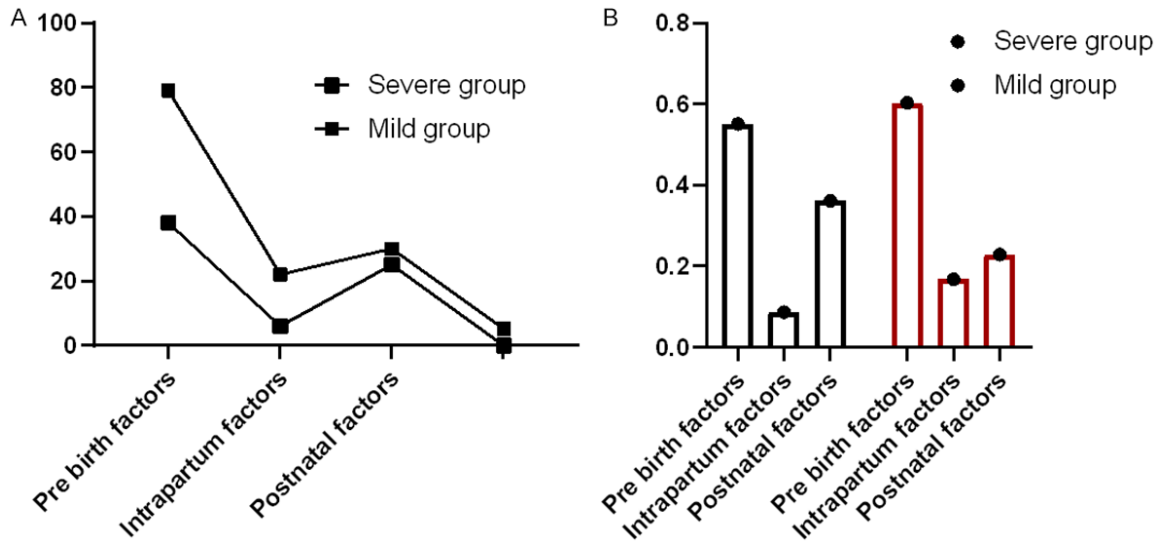

Figure 3. Comparison of the distributions of the action times of the etiology of intellectual disabilities between the two groups. There were significant differences in the factors before birth, at birth, and after birth between the two groups (P<0.05).

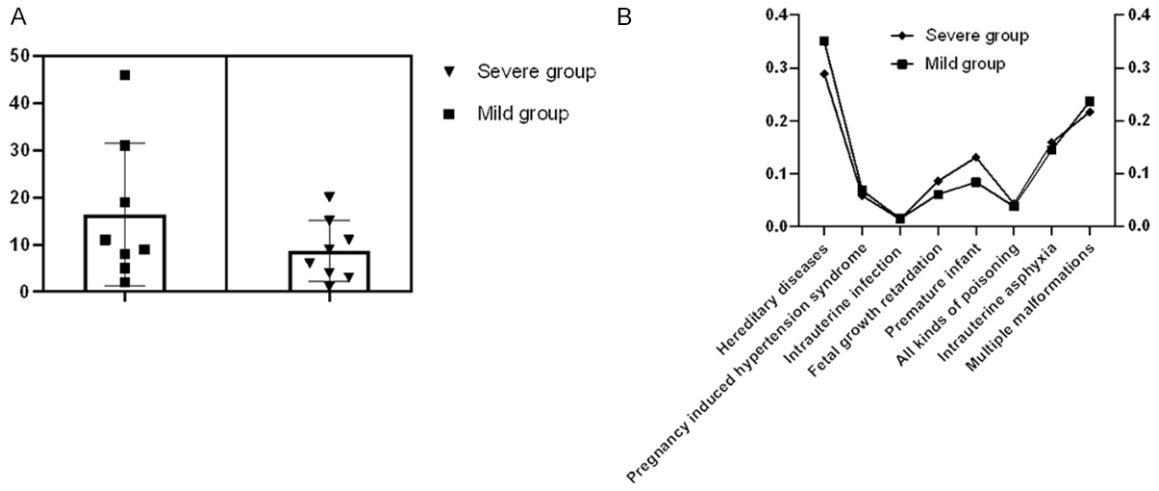

Figure 4. Comparison of the ratios of intellectual disabilities caused by prenatal factors between the two groups. Genetic diseases, pregnancy-induced hypertension, intrauterine infections, fetal developmental retardation, premature birth, poisoning, intrauterine asphyxia, and multiple malformations were compared, and there were significant differences between the two groups (P<0.05).

we conducted a preliminary analysis of the etiology of intellectual disabilities in children in schools for the mentally handicapped [17], and discovered the methods of prevention and treatment, which aroused wide societal concern. An improvement in the population quality will reduce the rate of children born with intellectual disabilities. Due to various physiological and psychological reasons, the etiology of children with intellectual disabilities in China has changed greatly in recent years. With the development of the social economy and the improvement in the cultural level, the treatment of some children with intellectual disabilities has become possible [18]. With the reduction of central nervous system infectious diseases, some congenital metabolic abnormalities and endocrine diseases have proved to be effective methods of diagnosis and treatment.

During delivery, various factors may cause suffocation and intracranial hemorrhage in chil-

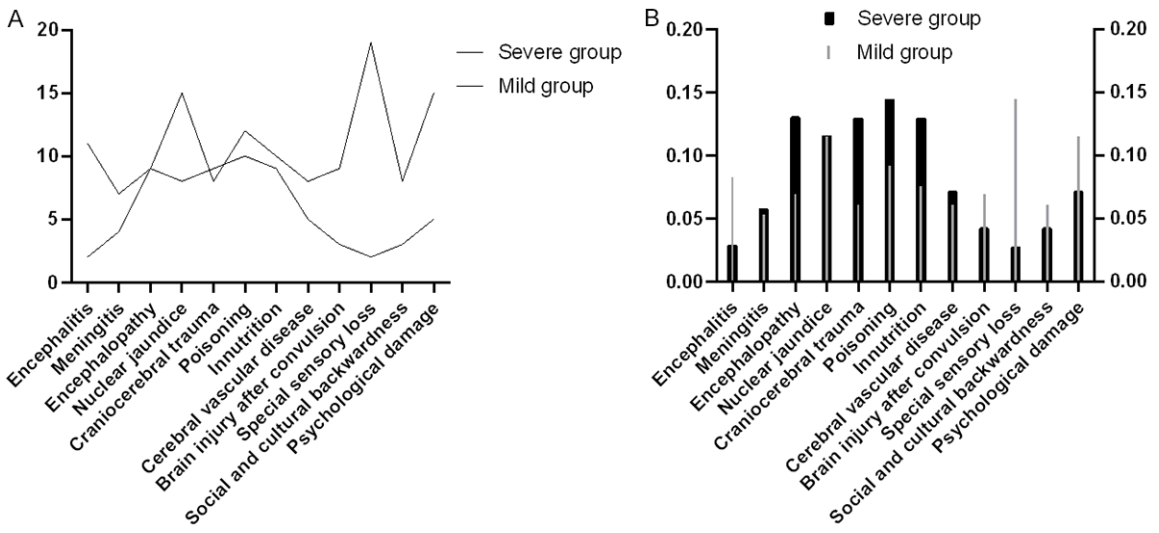

Figure 5. Comparison of the ratio of intellectual disabilities caused by postnatal factors between the two groups. Japanese encephalitis, meningitis, encephalopathy, kernicterus, craniocerebral trauma, any poisoning, malnutrition, cerebrovascular disease, brain degeneration, brain injury after convulsions, special sensory defects, social and cultural backwardness, and psychological damage were compared, and there were significant differences between the two groups (P<0.05).

dren. These conditions can lead to brain damage and even intellectual disability in children. Injury is not a direct cause of intellectual disability. Therefore, it is necessary to conduct an in-depth study on asphyxia during childbirth [5], in order to clarify the relevant diagnostic and treatment standards, and to make a specific assessment and analysis of the causes of intellectual disability in each case. After the birth of the child, an investigation of the biomedical, social and cultural reasons will be carried out. Through health care, serious injuries caused by various medical reasons can be prevented, and at the same time, the economic and cultural levels and the psychological quality can be improved to prevent intellectual disabilities. Through early intervention and special education [19, 20], these children may be cured.

The etiology of intellectual disabilities is very complex and includes psychological and social factors. Relevant studies have shown that more than 60% of the intellectual disabilities in children have a clear cause, and the main reason is brain damage during the pre-natal period and early childhood. Genetic causes also account for a large proportion, such as trisomy syndrome, hypothyroidism, and phenylketonuria [17]. With the increasing degree of intellectual disability in children, the proportion of patients with unknown etiology is gradually decreasing, which provides a good starting point for treatment. Some scholars have found that almost two-thirds of moderate intellectual disabilities have a known etiology, and a quarter of intellectual disabilities have unknown causes. This is an important direction for medical research. Thus it can be seen that social psychology education based on intellectual disabilities and various biological factors is very important [20]. In patients with mild intellectual disabilities, family conditions, malnutrition, poor parenting, and parents suffering from mental illnesses, can lead to intellectual diseases in children. According to a report on the intelligence of children aged 0 to 6 years in Beijing, more than 60% of children had mild intellectual disabilities, more than 20% of children had moderate intellectual disabilities, and about 6% of children had severe intellectual disabilities, and suffocation is the main etiology of intellectual disabilities in children [21, 22].

Health care during childhood and real-time fetal monitoring of high-risk pregnancies have a very important research significance. This has a very important guiding role for the screening of neonatal diseases and reducing the occurrence of children's intellectual disabilities [23]. Since 1998, the screening of these congenital diseases has been carried out. The significance

of this work has raised concerns about patients with mild intellectual disabilities to a certain extent. They only need a simple accompanying treatment to obtain a certain degree of social adaptability. During the research process, we conducted early interventions for some high-risk families [11]. The intervention methods were to conduct home visits and telephone consultations to guide the parents to create a good family environment to meet the development needs of the children at different stages, thereby reducing the occurrence of intellectual disabilities.

In summary, there are few research achievements on the etiology of children with intellectual disabilities in China. There has been no systematic etiological diagnosis, and there is a lack of standardized diagnostic guidelines and a diagnostic platform. Therefore, few research achievements can be referred and used for reference. In addition, due to the lack of depth of the professional knowledge, the discussion on the etiology of children with intellectual disabilities is not comprehensive or systematic, so the discussion needs to be more in-depth.

Disclosure of conflict of interest

None.

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