DOI: 10.9756/INT-JECSE/V14I2.194 ISSN: 1308-5581 Vol 14, Issue 02, 2022

CLINICAL PROFILE IN CHILDREN WITH DEVELOPMENTAL DELAY IN A TERTIARY CARE CENTRE IN NORTH – WESTERN INDIA

Dr. Vineeta Pande, Dr. Sanika Pimparkar , Dr. Shashvat Singh , Dr. Sharad Agarkhedkar

Abstract

Background - Developmental delay occurs when a child fails to reach developmental milestones when compared to peers of the same age group. There are numerous etiologies which can occur during perinatal or postnatal periods or can be genetic.

Materials And Methods – This study was done over a period of 2 years with children aged between 6 months to 60 months with evidence of developmental delay and were assessed as per Rashtriya Bal Suraksha Karyakram (RBSK). Further detailed history and clinical examination is done with more attention given to central nervous system examination. Neuroimaging was done for all patients. EEG, genetic tests and metabolic tests were done wherever required. Total of 56 children were included in the study with developmental delay.

Results – Out of 56 patients, Global developmental delay was seen in 89% , motor disability was most commonly seen followed by language and social. Perinatal asphyxia was the most common cause of developmental delay.

Conclusion - This study shows that specific signs and symptoms can help in early detection of developmental delay.

Keywords – developmental delay, Rashtriya Bal Suraksha Karyakaram (RBSK), neuroimaging, perinatal asphyxia

Introduction

Developmental delay occurs when a child fails to reach developmental milestones when compared to peers of the same age group. Developmental delay can be of three types, mild developmental delay (functional age 33 percent less than chronological age), moderate developmental delay (functional age 34 percent to 66 percent less than of chronological age), and severe developmental delay (functional age 66 percent less than of chronological age.[1-2]

The developmental delay might occur in a single domain (that is isolated developmental delay) or multiple domains. Global developmental delay is defined as a severe delay in two or more developmental domains affecting children under the age of five years (GDD).[3]

DOI: 10.9756/INT-JECSE/V14I2.194 ISSN: 1308-5581 Vol 14, Issue 02, 2022

Delays in development can be caused by a variety of factors or disorders. Genetic influences, environmental, prenatal, perinatal and postnatal are one of the most common reasons of developmental delays in children[4].

The most common clinical pattern in children with developmental delays is cerebral palsy with a substantial prenatal or postnatal history, as well as microcephaly. They can have dysmorphic characteristics as well as developmental delays, which can indicate genetic diseases.

According to the World Health Organization (WHO), approximately 5% of the world's children aged 14 and younger have a moderate to severe impairment.

According to reports in India, 1.5-2.5 percent of infants under the age of two suffer developmental delays. High-risk babies are monitored by a professional team.[5]

As a result, the goal of this research is to discover developmental delay and associated findings such as aetiology and risk factors at an early stage so that interventions can be made to avoid difficulties later in life.

MATERIAL AND METHODS

This study is a descriptive study, conducted in tertiary hospital in north western India over a time period of September 2019 to August 2021. The sample size calculated was 56. Children with 6month to 60 months with evidence of developmental delay was included in this study. Clearance from eithical committee was obtained before starting the study and written informed consents was taken from the parents of study population.

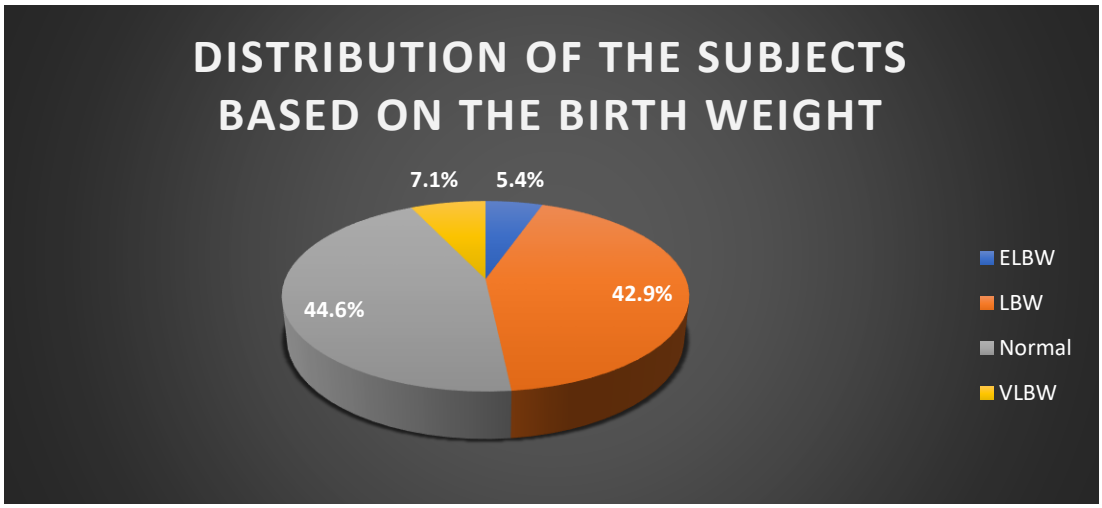
Methodology

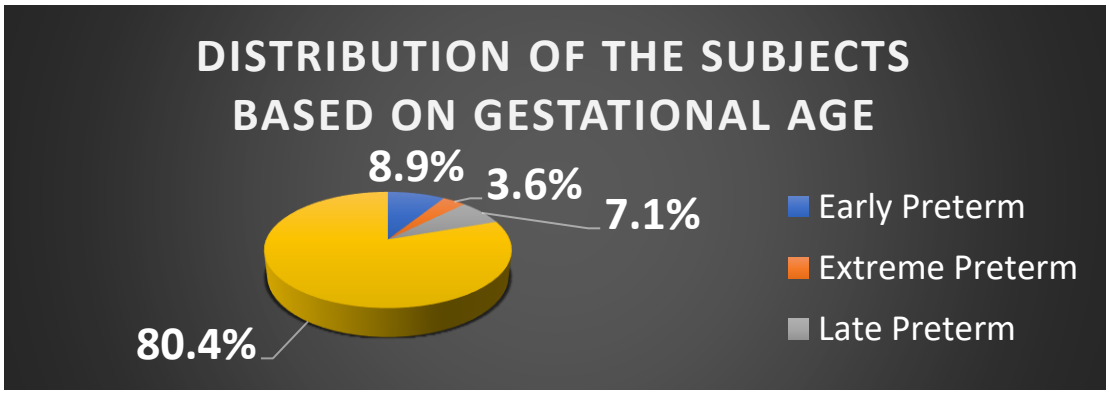
All children coming to our hospital presenting with developmental delay in age group 6 months to 60 months were enrolled. At initial assessment, they will be assessed as per RASHTRIYA BAL SURAKSHA KARYAKARAM (RBSK) then a detailed history and physical examination was done for each subject. Development quotient (DQ) was calculated for all children with development delay. Neuroimaging (computed tomography/magnetic resonance imaging [CT/MRI]) was done for all children. EEG, Genetic and metabolic tests like GCMS/TMS and Clinical Exome Sequencing were done wherever required.

DOI: 10.9756/INT-JECSE/V14I2.194 ISSN: 1308-5581 Vol 14, Issue 02, 2022

RESULTS

Among the 56 patients in this study, the mean age of patients was 27.30 ±19.24 months with 23 (41.1%) were females and 33 (58.9%) were males. Maternal and obstetric risk factors were Out of 56 patient's mother, 44.7% had no complications, while rest of th mohers had complications like anemia, PIH, GDM, hypothyroidism, PROM, pre eclampsia, GDM, hypothyroidism, PIH, rh incompatibility, Oligohydramnios, IUGR, uteroplacental insufficiency. Mode of delivery was LSCS in 23.2% and NVD in 76.8%, while 58.9% needing resuscitation. Birth weight of the patients normal in 44.6%, LBW in 24 patients 42.9%, VLBW in 7.1% and ELBW in 5.4%. Gestational age seen were 80.4% were term, 8.9% were early preterm, 7.1% were late preterm and 3.6% were extreme preterm.





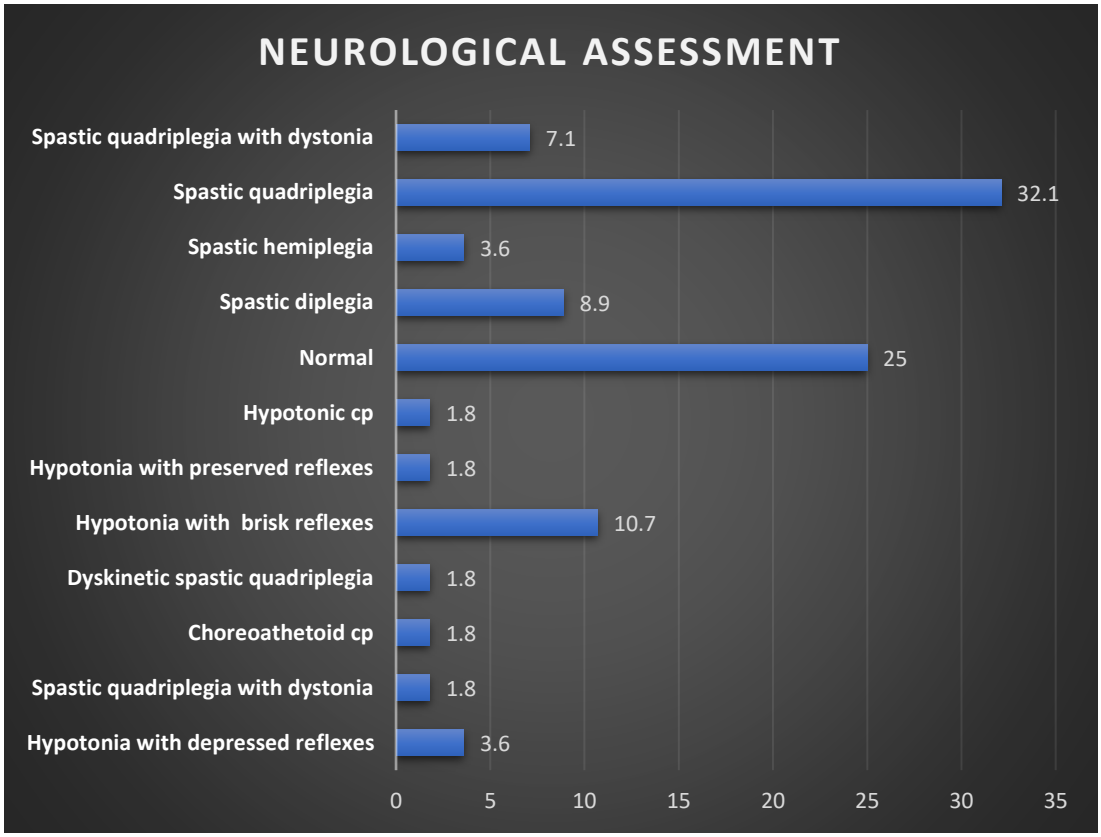
Postnatal complications were seen in 66.1% , 24 patients had perinatal hypoxia, 11 had hyperbilirubinemia, 8 had hypoglycaemia, 8 had sepsis, 7 had neonatal seizures and 2 had MAS. Family history of consanguinity seen was 10.7% had 2nd degree consanguinity, 14.3% had 3rd degree consanguinity and 75% had Non consanguineous marriage.

Out of 56 patients, 89.3% had global developmental delay and 10.7% had isolated developmental delay, dysmorphism was present in 25%, microcephaly was present in 57.1%

DOI: 10.9756/INT-JECSE/V14I2.194 ISSN: 1308-5581 Vol 14, Issue 02, 2022

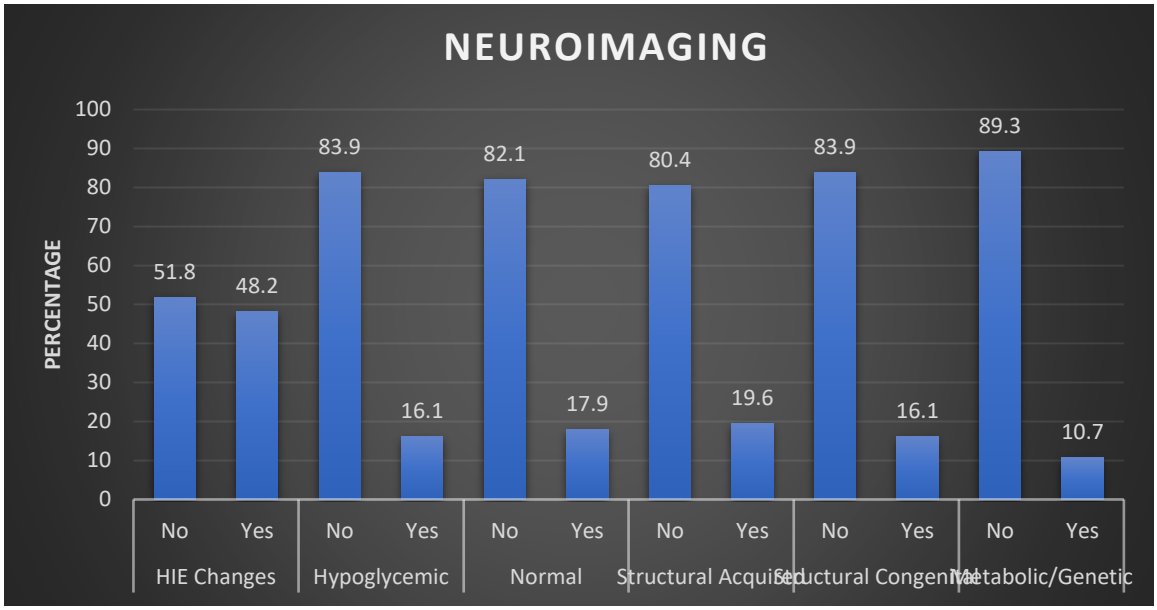
and feeding difficulties was seen in 66.07%. Hearing abnormalities was present in 37.5% while ophthalmic abnormalities was seen in 16.1%.

Neurological assessment of 56 patients showed 18 patients (32.1%) had spastic quadriplegia, 14 patients (25%) were normal, 6 patients (10%) showed Hypotonia with brisk reflexes, 5 patients (8.9%) showed spastic diplegia, 4 patients (7.1%) had spastic quadriplegia with dystonia, 2 patients (3.6%) had spastic hemiplegia, 1 patient (1.8%) showed hypotonia with depressed reflexes, 1 patient (1.8%) showed spastic quadriplegia with dystonia, 1 patient (1.8%) showed choreoathetoid CP, 1 patient (1.8%) showed dyskinetic spastic quadriplegia, 1 patient (1.8%) showed Hypotonia with depressed reflexes, 1 patient (1.8%) showed Hypotonia with preserved reflexes and 1 patient (1.8%) showed hypotonic CP.



Neuroimaging of the 56 patients revealed HIE changes were seen in 27 patients (48.2%), 9 patients (16.1%) were having hypoglycemic changes, 10 patients (17.9%) were normal, 11 patients (19.6%) had acquired changes, 9 patients (16.1%) had structural anomalies and 5 patients (9%) were genetic changes and 1 patient had metabolic changes (1.7).

DOI: 10.9756/INT-JECSE/V14I2.194 ISSN: 1308-5581 Vol 14, Issue 02, 2022



This study had 6 patients who underwent genetic studies by Clinical Exome Sequencing. Out of which there were 2 patients of Dravert syndrome of SCIN1A mutation, 2 patients of West syndrome of COL4A1, 1 patient with MTHFR gene deficiency and 1 patient with PEX gene mutation and two patients had GCMS/TMS metabolic assessments. One of the patients had CPT-1 deficiency, and the other had a peroxisomal abnormality.

GENETIC TEST AND METABOLIC TEST	Frequency	Percent
NOT DONE	47	83.9
Clincal Exome - Mutation noted in PEX gene	1	1.8
CLINICAL EXOME - COL4A mutation s/o west syndrome	1	1.8
Clinical Exome- Mutation of SCIN1A gene s/o Dravert syndrome	1	1.8
Clinical Exome- COL4A1 gene mutation s/o west syndrome	2	3.6
EXOME SEQUENCING- Mutation in SCNIA gene s/o Dravert syndrome	1	1.8
GCMS, TMS- CPT-1 deficiency	1	1.8
Clinical Exome sequencing- HOMOZYGOUS MUTATION OF MTHFR GENE LEADING TO HOMOCYSTEINURIA D/T MTHFR DEFICIENCY	1	1.8
GCMS/TMS - peroxisomal disorder	1	1.8
Total	56	100.0

DOI: 10.9756/INT-JECSE/V14I2.194 ISSN: 1308-5581 Vol 14, Issue 02, 2022

Etiology and risk factors established were 27 patients had HIE, out of which 15 had isolated HIE and 12 and HIE with other abnormalities. 10 patients had genetic etiology, out of which 6 were and 4 were with other abnormalities. 2 patients had metabolic etiology. 9 patients had nutritional etiology of which 5 were isolated and 4 were with other abnormalities. 8 patients had NHBI, of which, 5 were isolated and 3 were with other abnormalities. 3 had BIND. 7 patients had structural abnormalities, of which, 7 were acquired and 3 were congenital.

In MTHFR deficiency, fronto-parietal bossing, flat occiput. Head circumference of 31 cm(-2 & -3 SD), Cradle cap dermatitis. Denuded erythematous skin lesion present over scalp, in suboccipital region and back hypopigmented lesion over both lower limbs (thighs)

DISCUSSION

This Descriptive study was conducted at a tertiary care center of a medical college hospital at Pune to assess the clinical profile in children with developmental delay.

This study had the mean age of patients was 27.30 ±19.24 months with 23 (41.1%) were females and 33 (58.9%) were males. Study by Pallavi Sharma et al[5] discovered that the most frequent ages were less than 2 years (46 percent). Study by Hediger et al[6] discovered that boys have much more developmental delay in social and motor domains than girls.

Maternal and obstetric risk factors were Out of 56 patient's mother, 44.7% had no complications, while rest of the mothers had complications like anemia, PIH, GDM, hypothyroidism, PROM, pre eclampsia, GDM, hypothyroidism, PIH, rh incompatibility, Oligohydramnios, IUGR, uteroplacental insufficiency. Study done by Torabi et al[7] found out a significant correlation between high risk pregnancy and children with developmental delay.

DOI: 10.9756/INT-JECSE/V14I2.194 ISSN: 1308-5581 Vol 14, Issue 02, 2022

Mode of delivery was LSCS in 23.2% and NVD in 76.8%, while 58.9% needing resuscitation. Study done by Al Khalaf et al (2015)[8] found that children born by elective CS children faced more delay in development.

Birth weight of the patients normal in 44.6%, LBW in 24 patients 42.9%, VLBW in 7.1% and ELBW in 5.4%. Gestational age seen were 80.4% were term, 8.9% were early preterm, 7.1% were late preterm and 3.6% were extreme. Study done by Vykuntaraju K. Gowda et al[9] observed that out of 100 cases with developmental delay 81% cases were born at term, 4% cases were late preterm and 15% cases were early preterm.

In this study, Postnatal complications were seen in 66.1% , 24 patients had perinatal hypoxia, 11 had hyperbilirubinemia, 8 had hypoglycaemia, 8 had sepsis, 7 had neonatal seizures and 2 had MAS. This in comparison with study done by Sharma et al[6] and Pratibha Singhi et al[10] who observed birth asphyxia being the most common post natal complication.

Family history of consanguinity seen was 10.7% had 2nd degree consanguinity, 14.3% had 3rd degree consanguinity and 75% had Non consanguineous marriage. Similarliar observations were seen by Amira Masari et al.[11]

Out of 56 patients, this study had 89.3% global developmental delay and 10.7% isolated developmental delay, motor disability was most commonly seen as most of the patients were quadriplegic CP followed by language and social. Dysmorphism was present in 25%, microcephaly was present in 57.1% and feeding difficulties was seen in 66.07%. Hearing abnormalities was present in 37.5% while ophthalmic abnormalities was seen in 16.1%. Study done by Pallavi Sharma et al[6], Khandekar et al[12] and Das et al[13] showed abnormalities in the speech, hearing and visual impairments and feeding difficulties.

Out of 56 patients this study had 18 patients (32.1%) had spastic quadriplegia, 14 patients (25%) were normal, 6 patients (10%) showed Hypotonia with brisk reflexes, 5 patients (8.9%) showed spastic diplegia, 4 patients (7.1%) had spastic quadriplegia with dystonia, 2 patients (3.6%) had spastic hemiplegia, 1 patient (1.8%) showed hypotonia with depressed reflexes, 1 patient (1.8%) showed spastic quadriplegia with dystonia, 1 patient (1.8%) showed choreoathetoid CP, 1 patient (1.8%) showed dyskinetic spastic quadriplegia, 1 patient (1.8%) showed Hypotonia with depressed reflexes, 1 patient (1.8%) showed Hypotonia with preserved reflexes and 1 patient (1.8%) showed hypotonic CP. Other research, such as Pallavi Sharma et al[6] and Das et al[13], have found spastic quadriplegic CP to be the most prevalent.

In present study, on neuroimaging, HIE changes were seen in 27 patients (48.2%), 11 patients (19.6%) had acquired changes, 10 patients (17.9%) were normal, 9 patients (16.1%) were having hypoglycemic changes, 9 patients (16.1%) had structural anomalies and 5 patients (9%)

were having genetic changes and 1 patient had metabolic changes (1.7). Study done by Ali et al[14] in a prospective and observational study compared the MRI findings of eighty-one (n=81) pediatric patients.

In the present study 6 patients underwent genetic studies by Clinical Exome Sequencing. Out of which there were 2 patients of Dravert syndrome of SCIN1A mutation, 2 patients of West syndrome of COL4A1, 1 patient with MTHFR gene deficiency and 1 patient with PEX gene mutatio. Mahler et al[15] in 21 children (42% of the collective), we were able to identify the cause of the development delay by Exome sequencing.

In this study 2 patients underwent metabolic tests by GCMS/TMS. Out of which there was 1 patient with CPT-1 deficiency and 1 patient with peroxisomal disorder. Study done by Altimimi et al[16] found that a high rate of IEM was detected in children with unexplained developmental delay in Misan (18%).

On the basis of etiological and risk factors diagnosis, this study had, 27 patients had HIE, of which, 15 had isolated HIE and 12 and HIE with other abnormalities. 10 patients had genetic etiology, of which, 6 were and 4 were with other abnormalities. 2 patients had metabolic etiology. 9 patients had nutritional etiology of which 5 were isolated and 4 were with other abnormalities. 8 patients had NHBI, of which, 5 were isolated and 3 were with other abnormalities. 3 had BIND. 7 patients had structural abnormalities, of which, 7 were acquired and 3 were congenital. Study done by Roshan Koul et al[17] found out the most common etiology was perinatal asphyxia (26 patients; 23.7%). Metabolic disorders were the next common cause seen in 13 patients (11.4%). Neuronal migration disorder or cerebral dysgenesis was seen in 12 patients (10.5%).

CONCLUSION

- This study helps in establishing an idea in the region of developmental delay.
- This study also shows that specific signs and symptoms can help in early detection of developmental delay.
- Advancements in genetic technology have the potential to improve diagnosis and eventually outcomes in developmental delays patients, which could enable for early detection and treatment of developmental delays caused by specific causes.
- Many preventable causes like perinatal asphyxia, hyperbilirubinemia, neonatal infections etc can identified and managed.

Conflict of interest – none

Source of fundings – none

REFERENCES

1. Diagnostic and statistical manual of mental disorders. 4th ed. Washington DC: American Psychiatric Association; 2000.
2. Petersen MC, Kube DA, Palmer FB. Classification of developmental delays. Semin Pediatr Neurol 1998;5:2-14.
3. Special topics report No. 28 on persons with disabilities and chronic diseases. Hong Kong: Census and Statistics Department; 2001.
4. Ashwal S, Michelson D, Plawner L, Dobyns WB. Practice Parameter: Evaluation of the child with microcephaly (An Evidence-based Review): Report of the quality standards subcommittee of the American academy of neurology and the practice committee of the Child Neurology Society. Neurology 2009;73:887-97.
5. Sharma P, Sharma SD, Jamwal A, Digra S, Saini G. Clinical Profile of Patients with Cerebral Palsy – A Hospital-based Study. Int J Sci Stud 2019;7(1):196-200.
6. Hediger ML, Overpeck MD, Ruan WJ, Troendle JF. Birth weight and gestational age effects on motor and social development. Paediatr Perinat Epidemiol. 2002;16:33–46. [PubMed] [Google Scholar]
7. Correlation between high-risk pregnancy and developmental delay in children aged 4–60 months Fatemeh Torabi, Sedigheh Amir Ali and Hamid Alavi Majd
8. The impact of obstetric mode of delivery on childhood behavior.. Al Khalaf SY, O'Neill, SM, O'Keeffe LM, Henriksen TB, Kenny LC, Cryan JF, Khashan AS, Soc Psychiatry Psychiatr Epidemiol. 2015 Oct; 50(10):1557-67.
9. Gowda VK, Kumar A, Shivappa SK, Srikanteswara PK, Shivananda, Mahadeviah MS, et al. Clinical profile, predisposing factors, and associated co-morbidities of children with cerebral palsy in South India. J Pediatr Neurosci. 2015 Apr- Jun;10(2):108-13.
10. Pratibha Singhi and Arushi Gahlot Saini. Changes in the Clinical Spectrum of Cerebral Palsy over Two Decades in North India—An Analysis of 1212 Cases. Journal of Tropical Pediatrics. 2013;59(6):434-440.
11. Profile of developmental delay in children under five years of age in a highly consanguineous community: A hospital-based study – Jordan. Amira Masari, Hanan Hamamay. Volume 33, Issue 10, November 2011

DOI: 10.9756/INT-JECSE/V14I2.194 ISSN: 1308-5581 Vol 14, Issue 02, 2022

12. Khandaker G, Muhit M, Karim T, Smithers-Sheedy H, Novak I, Jones C, et al. Epidemiology of cerebral palsy in Bangladesh: A population-based surveillance study. Dev Med Child Neurol 2019;61:601-9.
13. Das N, Beboruah G, Das I. Study on the clinical profile of patients with cerebral palsy. IOSR J Dent Med Sci 2016;15:54-8.
14. Magnetic Resonance Imaging (MRI) Evaluation of Developmental Delay in Pediatric Patients. Althaf S. Ali, Naziya P. Syed. J Clin Diagn Res. 2015 Jan; 9(1): TC21–TC24.
15. Exome Sequencing in Children. Undiagnosed Developmental Delay and Neurological Illness. Elisa A. Mahler, , Jessika Johannsen. Dtsch Arztebl Int. 2019 Mar; 116(12): 197–204.
16. Altimimi HA, Aljawadi HF, Ali EA. Inborn Errors of Metabolism in Children with Unexplained Developmental Delay in Misan, Iraq. Oman Med J. 2019 Jul;34(4):297-301. doi: 10.5001/omj.2019.59. PMID: 31360317; PMCID: PMC6642708.
17. Evaluation Children with Global Developmental Delay: A Prospective Study at Sultan Qaboos University Hospital, Oman. Roshan Koul, Mohammed Al-Yahmedy, and Amna Al-Futaisi. Oman Med J. 2012 Jul; 27(4): 310–313.