Physiotherapy and Rehabilitation Strategies in Children with Joubert Syndrome- A Review Study

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Abstract

Background: Joubert syndrome (JS) is very rare, autosomal- recessive neurological condition. It is characterized by cerebellar agenesis, difficulty eye movements with nystagmus, episodes of respiratory attacks, gross motor developmental delay, and reduced muscle tone retinal coloboma and kidney disease may involve multisystem factors. This condition becomes important to identify actual clinical features and further cormobodities linked. That would be congnizance to the awareness regarding this rare syndrome and give input for research studies insights for prevalence as well as prevention/cure.

Objective: To observe and gather the research data on physiotherapy and rehabilitation in children with joubert syndrome.

Study design: A narrative review.

Search engines: PubMed, Scopus, sports discuss, google scholar, Elsevier.

Keywords: Joubert syndrome, rehabilitation, molar tooth sign, multisystem involvement.

1. INTRODUCTION

Joubert syndrome was first diagnosed by Dr. Marie Joubert, a French Neurologist in 1969. This situation turned out to be a large circle in France and Canada that was related to four siblings who were visually impaired. It is the rarest autosomal disease that has ever occurred, and soon every cellular gene production involves genetic mutations. Predominantly, single genetic mutation arises from the autosomal recessive condition of parents however signs and symptoms does not appears. In those cases, the gene is placed on the X chromosome. Abnormal cases of Joubert syndrome are inherited by X-linked connections, in males with a single X chromosome, the same mutated gene in all cells is sufficient to trigger the condition. In females with X chromosomes, there may be some mutations in the copies of each type of disease. Because it is unlikely that females would change copies of this gene. On the other hand, males put down with problems connected to the X. The function of the X-linked inheritance is that male cannot skip the X-linked development in their male child. Studies show this as the genesis of cerebellar vermis. (1) Other names for this condition are Cerebello-ocular-renal syndrome, Cerebello ocular renal syndrome CORS, Familial aplasia of the vermis, JBTS Joubert-Bolt Hauser syndrome, a genetic neurodevelopmental disorder affecting both vermis of the cerebellar and brainstem that fully develops during pregnancy, leading to uncontrolled balance and communication due to a defective chromosome. (2) In the case of Joubert syndrome, it reports between 1 / 80,000 and 1 / 100,000 live births. (3) The spread of less than 1 in 100,000 cases and about 200 cases worldwide have been reported. Joubert syndrome is estimated to affect between 1 in 80,000 and 1 in 100,000 newborns. However, this rate may be very low because Joubert syndrome has such a large number of existing features and may not be available. The genetic mutations that cause this condition are most common in certain ethnic groups, such as Ashkenazi Jewish, French-Canadian, and Hutterite.

Common clinical indications include unusual respiratory problems, eye-related problems, decreased muscle tone, decreased muscle mass, inadequate growth. Scientifically speaking, there are changes in the cerebellum and in the brainstem. (2) Oculomotor dysfunction is characterized by a lack of one or more of these visual acuity corrections, eye movements that can also limit or reduce learning comprehension, cerebral palsy, severe

mental retardation than expected during the normal aging process, interaction with impaired coordination, constant breathing difficulty, difficulty breathing.(4) In cerebral palsy related, it has been seen more severe dementia than expected during the normal aging process.The exact research studies of pathophysiology are still unclear. The available information in the given research papers has now been taken the great strides made in JS genes. The proteins produced from these genes are known or suspected to play a role in the formation of cells called primary cilia.The primary cilia are microscopic, finger-like projections that emerge from the surface of the cells and are involved insensitivity to the visual environment and chemical expression. Primary cilia are important for the structure and function of many cell types, including brain cells, neurons and certain kidney and liver cells. Basic cilia are also needed for sensory processing, which translates into the brain's ability to see, hear, and smell. Genetic modification associated with Joubert syndrome leads to problems with the structure and function of the main cilia. Defects in these cell structures can interfere with important chemical reactions during growth. Although researchers believe that cilia are a major culprit in many aspects of these diseases, it is not entirely clear how they lead to certain developmental disorders (15). Genetic mutations known to be associated with Joubert syndrome account for about 60 to 90 percent of all cases. In the remaining cases, the genetic cause is unknown including the identification of the seven genes of nph1, ahi, cep290, without this progress a known genetic account of <50% of cases and a few solid genotype-phenotype compounds present in JS. However, genetic testing can be prioritized based on clinical factors. JS is included in the fast-growing group of complications called ciliopathies. Ciliopathies emerge as models of complex diseases, in which a wide variety of genetic variants contribute to the phenotype expressed in any given patient.To date, a variety of pathogenic genes in 34 genes are known to cause JS 33 of these autosomal recessive and one is X-linked. JS cell diagnostics can be established by approximately 62% -94% of people with JS clinical diagnosis by identifying various pathogenic strains in one of the 33 autosomal recessive, JS-related genes or a specific heterozygous pathogenic gene in a single X gene genetics related to JS. This has been considered a rare condition that makes it difficult to identify symptoms early on because of the changing phenotype. It takes a long time to get a direct diagnosis or sometimes it takes years but the median diagnosis period is 33 months. It becomes important to diagnose this condition in the early stages of life to control symptoms and prevent other complications and the course of the clinic may vary from person to person. Diagnosis can be made using digital scanning and genetic testing. The child is diagnosed with Joubert syndrome, shows the abnormalities like growth retardation, mental retardation, or hypotonia at an early age that might develops into ataxia in childhood. Clinical mark on MRI shows Molar's tooth appearance. Lingual frenectomy (removal of tongue, a tissue frenulum that connects the underside of the tongue and under the mouth) is surgical procedure that usually performed in Joubert syndrome.

Physiotherapy treatment and rehabilitation seems to play very important role in managing a child's symptoms and problems associated. This approach would enable the child to acquire the activities of daily life in general and improve quality of life. Alternative therapies that can be offered to a group can include a variety of methods, treatment varies from person to person, depending on how Joubert syndrome affects the person. Delays in development can be treated with infant stimulation, occupational therapy, physical therapy, speech therapy, nephrologists, neurologists, neurologists, and brain specialists. Opticians, who treat eye problems. The rehabilitation process includes a variety of therapies that approach the bobath neurodevelopmental approach, motor training, postural techniques, various modes of balance, a range of motion, a therapeutic session, symptomatic treatment is provided, and all these exercises help the patient to recover make life easier.

2. RATIONALE

The purpose of this narrative review is to search out the physiotherapy treatment and rehabilitation related articles for framing the better approach for the intervention of Joubert Syndrome.

Research Significance The study is proposed to find out the different research papers and make a narrative review on physiotherapy treatment and rehabilitation in children’s with Joubert syndrome

2.1 Research Question: How physiotherapy treatment assists in intervening the patient with Joubert syndrome?

2.2 Research Objectives: To analyze the different research papers or studies based on physiotherapy and rehabilitation strategies that can be adopted in children with joubert syndrome

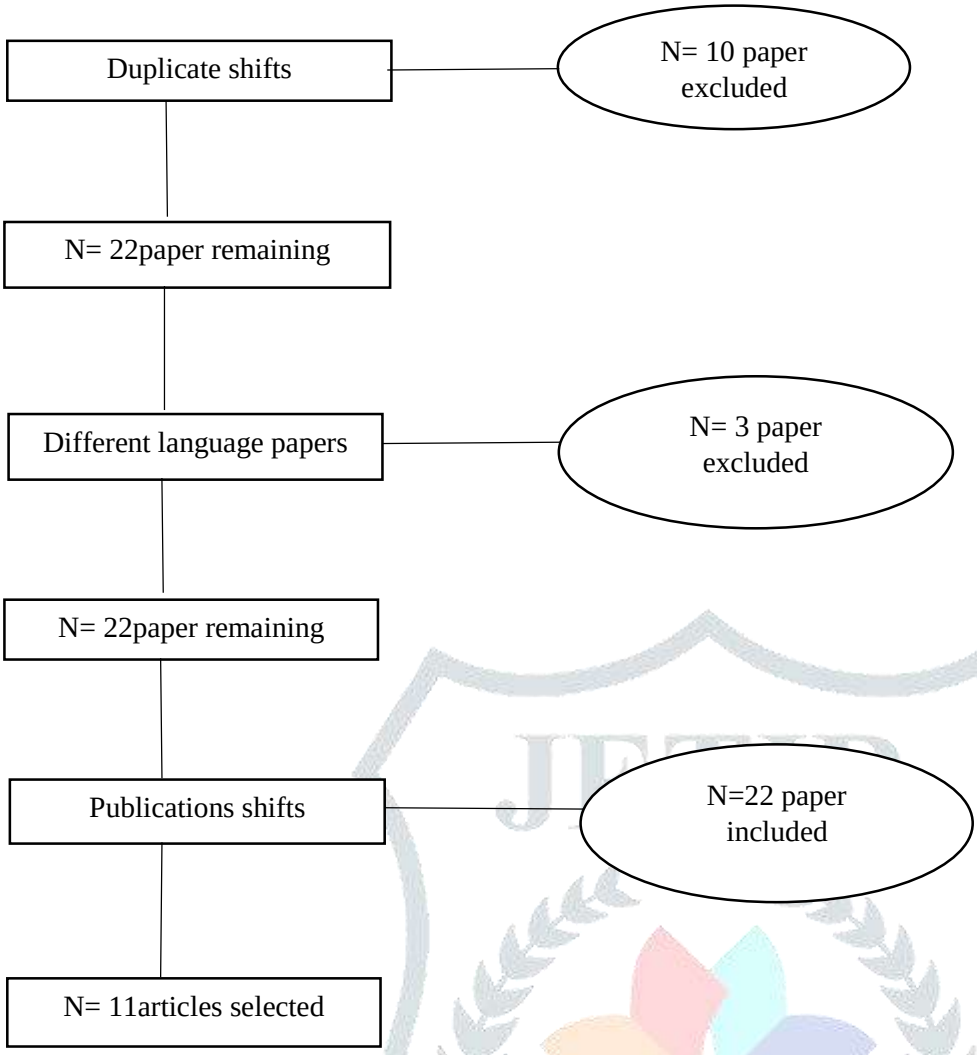
2.3 Research Hypothesis: Does the physiotherapy treatment and rehabilitation benefits the child with joubert syndrome or not ?

3. METHODOLOGY

The research design of this study is narrative review study. The inclusion criteria for this study involves the research papers on joubert syndrome from approved journals and cited in English language. Articles from systematic review, narrative reviews, case studies, experimental and observational area are also included. The exclusion criteria includes the research papers other than joubert syndrome i.e. Cogan oculomotor apraxia syndrome. Research papers that are published in other languages. Studies other than rehabilitation are excluded. Table 1 shows the selection and eligibility criteria. Table 3 shows the details of inclusion criteria for physiotherapy and rehabilitation in children with joubert syndrome**.**

Table 1. Selection and eligibility criteria

Study selection and eligibility criteria	
The following studies were selected in this review articles- 1. Experimental studies. 2. Case studies 3. Review studies	It mainly focuses on physiotherapy on joubert syndrome 1.2 2.11 3.3



4. RESULT:

Eleven studies were included that met the eligibility criteria for narrative review, based on physiotherapy testing and rehabilitation of children with joubert syndrome. Studies that show abnormalities in incident data were not known exactly according to available studies of 1 in 100,000. Nag C gosh et al, (2016). Common symptoms controlled by this study are facial dysmorphic, delayed development of the world, hypotonic, rapid breathing and oculomotor apraxia, episodic tachypnea krishnaswamy Sampath kumar et al,(2008) Prakash kalfe et al, (2019). Few studies have been included that eliminate the role of physiotherapy in joubert syndrome. Mouna Saghir et al, (2016) concluded that there is no effective treatment to treat the condition, rehabilitation strategies for joubert syndrome help the patient overcome great delays and comprehension, within the studies included in most studies suggesting supportive and therapeutic treatment helps the patient improve such as physiotherapy, speech therapy, genetic counseling, specialized school, ooze epic et al, (2017) administered a physical rehabilitation program by a physiotherapist one hour five days a week for a period of 13 months according to the neuro developmental rule and the conclusion was that the subject was able to independently perform certain functions independently the results used in this were GMFM, FIM. Table 2 shows the diagnostic tools and outcome measures.

However, in all of the specific studies it is found that physiotherapy and rehabilitation play a major role in reducing the child's ability to achieve greatness and independence, to achieve this diverse approach is compulsory.

Table 2. Diagnostic tools and outcome measures

Diagnostic tools or outcome measures	*Reliability and Validity*
MRI	The mri findings is crucial in this case studies shows this is very much realiable (23)
GENETIC TESTING	Analytic validity, clinical validity, and clinical utility(19) individuals and families of genomic information, or personal utility, should be considered
BLOOD SAMPLE	Studies says this is also a major specimen for examination in this case to find associated disorders
AUDIOGRAM	This is a validity tool that defines person's degree of hearing loss it is helpful in case with this kind of cases (22)
GMFM	Both the reliability and the responsiveness of the GMFM are reasonable for measuring gross motor function in children (20)
FIM	FIM instrument has evidence of validity and reliability as an outcome measure for patients both inpatient rehabilitation and outpatient rehabilitation (21)

Table 3. Details of included for physiotherapy and rehabilitation in children with joubert syndrome.

Author	*Aim and objective*	*Method*	*Diagnostic tools*	*Result*	*Interpretation*
GOSH 2016(14)	Finding the cause, diagnosis and ongoing treatment.	This approach began with physical examinations and other diagnostic-related diagnoses.	MRI, Genetic testing, Blood sample.	Molar tooth mark is not specified with JS. This can be seen in Varadi Papp syndrome, Malta syndrome, Senior Loken	The study might have mentioned the exact diagnosis criteria,

				syndrome and (Coach syndrome)	
ozge Epek,1 ozge Akyolcu,2 and Banu Bayar1 2017(17)	The purpose of this study was to report the efficiency of the physiotherapy and rehabilitation program in a child with JS.	The case was included in a rehabilitation program by a physiotherapist for one hour five days a week for a period of 13 months depending on the goal of neurodevelopmental therapy.	Gross Motor Function Measure, Independence, FIM scale.	The case was able to turn from supine position to the reverse side itself, moving independently.	The overall study was clear have to be taken few more subjects to find better effects.
Prakash Kafle 2019	The purpose of the study was to find the diagnosis for unusual developmental delay.	Physical examination has done followed by radiological investigation for confirmation of the case.	MRI, hematology, urinalysis, echocardiography and thyroid function tests.	The case reports revealed Molar tooth sign appearance of pontocephalic, junction, batwing appearance of fourth ventricle.	The study has to be mentioned about the treatment.
MounaSghir(2016)	The purpose of the study was to find the diagnosis and the effect of a rehabilitation program.	The examination has started by assessing physically and later on different test has been suggested rehabilitation program was given to the child.	MRI, audiogram Ocular examination, fundoscopic examination.	Appropriate rehabilitation protocols can help young patients to overcome delays in the acquisition of developmental milestones and cognition.	The study could have mentioned the treatment techniques.
Muhammed, Razeulhuq	The aim was to find the diagnosis of unsual case and treatment techniques.	After examination the patient through physical and radiological investigations they started with	MRI, genetic testing	Physiotherapy and supportive treatment was given.	The article could mentioned about the outcome measures as they showed

		suggesting joint mobilization stretching to parents.			a significant improvement with the therapies
Carmen Torres	The aim was to find the effect of specialized stimulation therapy with other therapies in a patient with joubert syndrome.	The incentive plan was applied to the EIU at four intervals of 45 minutes each week, and a copy of the protocol was provided to parents, who had each instructed their home application and practical resources.	Battelle Development Inventory.	From the start of treatment to age 40 months, the participant showed slow but significant progress.	The study has to be mentioned about kind of stimulation therapy in this condition.
Anithakumari	The aim was to find the treatment techniques in joubert syndrome.	Started with assessing tone, cranial nerve examination, reflex assessment followed by further radiological diagnosis.	Blood analysis, CSF detection, EEG,MRI.	The child was followed by regularly physiotherapy and speech therapy then discharged and is being followed up but there is no significant improvement.	The study hastobe mentioned the specialized techniques of physiotherapy.
Francesco Brancat	To find the joubert syndrome and related disorders.	Detection of the MTS should be followed by a diagnostic protocol to assess multi organ involvement.	Different diagnostic tools have been used to asses all the organ involvement level, physical examination, MRI,	The result after investigation on they found there is multi organ involvement which also JS can be varied with other	The management follow up has to be mentioned.

			genetic testing, ultrasound, electro retinogram.	disorders even other disorders the same hallmark of molar tooth sign Molar tooth sign results from hypo-dysplasia of the cerebellar vermis, abnormally deep interpeduncular fossa, and concluded by Rehabilitation strategies must be planned for cognitive, and behavioral difficulties and specific manifestations for visual impairment.	

5. DISCUSSION:

The main purpose of this study was to highlight the treatment strategies for joubert syndrome and its impact on the patient's recovery and independence. It was first noticed by Marie joubert, a French neurologist in 1969. He noticed an abnormal condition with symptoms that appeared to be related to the condition on MRI scans. The clinical view of MRI scans was the appearance of a molar tooth sign of the cerebellar vermis and an abnormal interpeduncular fossa. Studies suggested that this chromosomal incurable disease is without proper treatment. With the above considerations, the purpose of the narrative review was to discover the strategies and approaches to physiotherapy treatment in this chromosomal abnormality. When searching for related data, a limited number of articles were found, reviewing a few experimental studies. Studies has shown that joubert syndrome is a rare genetic disorder caused by abnormal chromosome mutations by multiple system involvement that leads to various symptoms such as respiratory problems, delayed grades, vison defect, abnormal muscles. According to the Muhammad rezeulhuq et al, (2020) the rule of law is lacking in the studies. In one post-test research study, the supportive treatment and the rehabilitation program was given by a physiotherapist for one hour five days a week for a period of 13 months according to the neurodevelopmental treatment goal and had a positive effect on the patient's independence when tested with FIM, GMFM scales show akyolcul et al, (2017). Anita kumara et al, (2013) shows the reduction in ataxia in a 5-year-old child of joubert syndrome with abnormal body movements and difficulty walking because there is no other treatment that helps the child to achieve a normal pattern. One study also describes the initial diagnostic and genetic

interventions for therapeutic purposes and the rehabilitation program by Shema Vipin Sharma et al, (2017). Other studies included a case that was difficult to treat in his head, stiffness, growth retardation, general hypotonic, general tender appearance, audiogram revealed hearing loss on both sides and MRI scanning detected molar tooth after routine examination and initiated a rehabilitation program involving combination stimulation, muscle strengthening, speech therapy and occupational therapy Mounisghir et al, (2016). The study conducted for four hours and 45 minutes each week and the patient was given treatments such as psychology that helped to recover better in a patient with joubert syndrome Carmen Torres et al, (2001).

6. CONCLUSION:

The narrative literature review has defined the advantage of physiotherapy rehabilitation in joubert syndrome. The conclusion from the overall included articles that there is no appropriate treatment till date since it is a rare condition caused by genetic mutations so genetic counseling, early detection various physiotherapy techniques like neurodevelopmental approach, joint mobilizations other symptomatic management can be considered to overcome dependence and milestones.

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