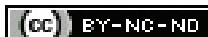


Ayurvedic Management of Duchenne Muscular Dystrophy in Children: A Narrative Review

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ABSTRACT

Duchenne Muscular Dystrophy (DMD) is the most common primary myopathy of children. There are many muscular diseases in children which are inherited through generations. All those are known as congenital myopathy. This disease is an X-linked recessive disorder produced by the abnormality of the gene Xp21. It is a severe condition that poses a life-threatening risk and significantly reduces a patient's lifespan. It is characterised by progressive symmetrical muscular weakness, with proximal muscles being more affected than distal ones. Additionally, individuals with DMD often exhibit pseudohypertrophy of the calf muscles. The compilation of data from classical Ayurvedic texts contributes to a holistic understanding of potential interventions, aiming to improve patient quality of life and prevent contractures. The study is crucial in bridging traditional and contemporary healthcare practices, offering valuable insights for clinicians and the wider medical community in addressing the multifaceted challenges posed by DMD. This research underscores the need for an integrative and comprehensive approach to enhance therapeutic strategies for this prevalent X-linked recessive disorder. In pursuit of this objective, concerted efforts have been directed towards raising awareness among both the general public and the medical community. Furthermore, the review delves into the exploration of various *Panchakarma* treatments, a traditional therapeutic approach rooted in Ayurveda. By consolidating and synthesising data derived from classical Ayurvedic texts pertaining to DMD, this review seeks to provide a holistic understanding of potential interventions. The goal is to contribute to the advancement of therapeutic strategies that can ameliorate the impact of DMD on patients' lives, fostering a more comprehensive and integrated approach to managing this challenging condition.

Keywords: *Adibala-pravrutta vyadhi*, Chromosomal disorder, Congenital myopathy, Dystrophin, *Maamsadhatu shosha*, Muscular diseases

INTRODUCTION

Duchenne Muscular Dystrophy (DMD) is a neuromuscular disease that affects children. It is a distinctive and highly prevalent childhood muscular dystrophy; it represents one of the most widespread and serious conditions within this category [1]. It is an unusual inherited musculoskeletal condition that manifests clinically as gradual muscular weakness because the muscle lacks the protein dystrophin, which eventually takes the role of fibrosis and fat accumulation.

The disease was given that name in 1860 in honour of a French neurologist named Guillaume Benjamin Amand Duchenne [2-5]. DMD is a genetic disorder affecting boys due to mutations in the dystrophin gene on the X chromosome, with an incidence of 1 in 3,600 live-born infant boys [6]. Early symptoms are having trouble in climbing stairs. The person puts his hands on the next step to help raise himself up and leans against a wall or railing for support. This is followed by a waddling gait with compensatory lumbar lordosis. Beginning at age 10, it is the most prevalent and severe type of muscular dystrophy [7].

Boys between the ages of 3 and 5 are affected and exhibit proximal muscular weakness and calf enlargement [8]. DMD features are distinct and have a relatively high rate of transmutation. Other clinical characteristics include loss of muscle coordination, the onset of contractures, the progression of scoliosis, reduced walking, cardiomyopathy, poor lung function, and confusion. The history and typical clinical findings are the primary basis of the diagnosis. Characteristics in addition to creatinine phosphokinase, which rises from a normal range of less than 500 IU/L to thousands [9].

In Ayurveda, DMD is not directly associated with any specific disease entity. Instead, its development is explained through the concept of *Adibalapravritta Vyadhi* (inherited diseases), *Shukra-shonita Dosha* [10] (gametes), *Bijabhagavayay Dushtijanya* [11] *Vyadhi* (genetic disorder), and takes *Sthanassamshraya* [10] (situated) primarily in

Mamsa Dhatu (muscle tissue), vitiation of *Vata* leads to *Mamsa-dhatvagni* and *Medodhatvagni* [11]. Impairment, which results in the buildup of aberrant tissue called *Meda Dhatu* (adipose tissue) in place of *Mamsa Dhatu* and the formation of dysfunctional *Mamsa Dhatu*. This impaired *Mamsa Dhatu* is unable to carry out *Mamsa Dhatu's Prakrita Karma* that is *Sharira Pushti*, *Meda Dhatu Pushti*, and shows symptoms of *Mamsa Dhatu Kshaya* (decreased muscle tissue) *Gatranam Sadanam* (paresthesia), *Dhamni Shaithilya* (loose and flabby arteries), *Aksha Glani* (debility of the sense organs), *Sandhi Vedana* (pain in the joints), *Sphik Griva Shushyata* (muscle wasting in hip and cervical region) [10].

The incorrect synthesis of Progressive tissues *Uttarottara Dhatu* (follow-up progressive tissues) [12] is brought on by dysfunctional *Dhatvagni* (metabolic enzymes). Additionally, this causes the production of *Ama* (undigested metabolic product), *Sanga Srotodushti*, and *Vimarga Gamana* of *Vata*. As a result, *Mamsa Dhatu* is depleted, and the damaged muscle fibres gradually deteriorate and die. DMD may fall under the *Paurasadini Jaataharini* category (where the diseased child passes away before the age of 16) [13] depending on how it manifests itself. In the current medical system, steroids are recommended because there is no lasting treatment for this illness. Due to their rapidly deteriorating heart muscles these patients have a relatively short lifespan [14]. Ayurveda and other conventional pathies have proven the treatment for curing the disease till date [15]. Hence, to enhance the quality of life of DMD patients and for prevention of contractures of muscles i.e., early deterioration can be prevented by *Panchakarma* protocol, yoga, physiotherapy, occupational therapy along with vasa therapy (ball exercise), and *Pathya-Apathya*. This article is aimed at increasing awareness among people and doctor community regarding treatment of DMD using various therapies to improve both quality of life of patient and reduce the likelihood of complications that could be fatal.

Types of Muscular Dystrophy

According to Ayurveda this disease comes under *Adhibala Pravrutta Vyadhi* (inheritance disease) which occurs by *Bheeja Bagahaavyava Dusti* (chromosomal disability), which causes *Vata Prakopa*, takes *Sthana Samshraya* (situated) in *Mamsa*, and the *Medo Dhatu* vitiates and depletes them. There are various types of Muscular Dystrophies- Detailed description of types of DMD is explained in [Table/Fig-1] [16].

| Type | Description | Prevalence | Onset of disease |
|--------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------|
| Duchenne Muscular Dystrophy (DMD) | It is most common in children. The dystrophin gene, which is mutated in DMD, is situated on the short arm (p) of the X chromosome at the Xp21 location | Prevalence (General Population): 4.78 per 100,000 | Age of onset for X-linked recessive diseases is 3-5 years |
| Congenital muscular dystrophy | Resulting from a mutation in the gene for the sarcolemma protein Merosin | Prevalence (General Population): 0.99 per 100,000 | Autosomal recessive and present since birth |
| Myotonic muscular dystrophy | Comes from the Dystrophia Myotonic Protein Kinase's (DMPK) poor expression and is most common in adults | Prevalence (General Population): 8.26 per 100,000 | 10-15 years is age of onset, X-linked dominant |
| Becker muscular dystrophy | Caused by a mutation of muscle protein dystrophin gene | Prevalence (General Population): 4.78 per 100,000 | 10-20 years is age of onset, X-linked recessive |
| Oculopharyngeal muscular dystrophy | Caused by autosomal dominant GCG trinucleotide repeats resulting in deficient mRNA transfer from the nucleus | Prevalence (General Population): 0.13 per 100,000 | 30-40 years is age of onset, X-linked dominant |
| Limb-Girdle (Erb) muscular dystrophy | Caused by Myotilin gene deletion. X-linked dominant | Prevalence (General Population): 0.48 to 1.63 per 1 lac | Various onset ages depending on the presence of muscles. While dominant form develops later and more slowly, recessive form advances earlier and faster |

[Table/Fig-1]: Types of muscular dystrophy [16].

In Ayurveda, DMD is not directly associated with any specific disease entity. Instead, its development is explained through the concept of *Adibalapravritta Vyadhi*. This perspective attributes the condition to *Beejadusti* (genetic factors) and *Aatma Karma* (individual actions), leading to an imbalance in *Mamsavahastrotas* (muscular tissue channels) and impairment of *Dhatvagni* (tissue metabolism). DMD is viewed as an imbalance of *Vatadosha* (biological air element), *Saptadhatu* (seven bodily tissues crucial for formation of functional and structural components up to tissue metabolism levels), and *Ojas* (vital essence), considering its progressive degeneration and systemic involvement. The primary manifestation is *Chestahani* (decreased mobility), indicating a decline in *Chalaguna* (biological mobility factor). Recent advancements in both supportive and medical fields are focused on addressing multi-systemic complications, thereby enhancing quality of life, and extending life expectancy for those with DMD as depicted in [Table/Fig-2] [17].

Nidan Panchaka of DMD According to Ayurveda

In the context of disease analysis, *Nidan Panchaka* entails five essential components. Firstly, "*Hetu*" identifies the cause or root factor contributing to the disease. Secondly, "*Purvarupa*" highlights the early symptoms or indicators that precede the full manifestation of the illness. Thirdly, "*Rupa*" describes the characteristic features and

| S. No. | Sign | Symptoms |
|--------|-----------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1. | Muscle weakness | The muscles around the hips and upper thighs are the first to be impacted. Walking, running, jumping, climbing stairs, and standing up from the floor may be challenging for children. |
| 2. | Neck flexor muscle weakness | - |
| 3. | Waddling gait | (Trendelenburg) gait for gluteal weakness, resulting in a lordotic position. |
| 4. | Gower's sign | A positive Gower's sign is difficulty in standing from recumbent position due to pelvic girdle weakness. When prompted, the patient usually turns on his side, elevates his trunk by supporting his weight on his arms, and then stands up as if climbing on his body with hand support. |
| 5. | Pseudohypertrophy | Calf muscle pseudohypertrophy with thigh muscle withering. Pseudohypertrophy of the tongue and forearms is possible. Deep jerks from the distal extremities, such as the ankle and brachioradialis, are more powerful than biceps/triceps jerks. |
| 6. | Proximal muscle weakness | Proximal muscle weakness, such as respiratory involvement (weak cough and recurrent respiratory infection) and/or pharyngeal muscle weakness (recurrent aspirations, nasal twang, and regurgitation). |

[Table/Fig-2]: Signs and symptoms of muscular dystrophies [17].

presentation of the disease, aiding in its recognition and diagnosis. Fourthly, "*Upshaya*" refers to relieving factors, guiding therapeutic strategies. Lastly, "*Samprapti*" elucidates the progression and course of the disease, including its natural history and potential complications. Together, these components form a comprehensive framework for understanding, diagnosing, and managing diseases in clinical practice. Hence, these five components are described as follows:

Nidan/Hetu (causative factors): The pathological condition manifests as a partial vitiation observed either in *Shukra*, the reproductive tissue, or *Shonita*, the blood component, within the physiological framework. This aberration is further characterised by a specific defect in the *Beejabhag* or *Beejabhagavaya*, indicative of a chromosomal abnormality specifically localised on the Xp21 chromosome. Moreover, the intricacies of this defect extend into the *Matruj Bhava*, underscoring the involvement of maternal factors, as the genesis of *Mamsa*, the muscular tissue, is intricately linked with these maternal influences [18,19].

Purvarupa: The identification of a developing movement deficit in a child's developmental trajectory serves as a key indicator of the vitiation of *Vata*, a fundamental concept in Ayurveda highlighting the imbalance in the bodily *Vata Dosha* and *Kapha* elements. Furthermore, the compromise in metabolic functions is intricately linked to *Pitta Dushti*, denoting an imbalance in the *Agni* and *Jala* elements within the physiological framework. In a parallel context, the erosion of the quality characterised by "*Sthiratva*," emphasising stability and steadfastness, is a consequential outcome attributed to the influence of *Kapha Dushti*, underscoring an imbalance in the *Pruthvi* and *Jala* elements in the body [20].

Roop (characteristic features): "*Rupa*" includes the characteristic features and presentation of the disease (signs and symptoms) and diagnosis.

Signs and symptoms of DMD: According to modern science [8], the first signs of DMD usually show between the ages of 3 and 5.

Associated symptoms- e.g., cardiomyopathy and minor mental retardation or learning difficulties are found in nearly all cases, albeit to varying degrees of severity, and are not always related to the severity of muscular disease.

Investigations Required for the Diagnosis of DMD [21]

a) Genetic tests: Examining a blood sample for the faulty gene associated (X-gene) with DMD.

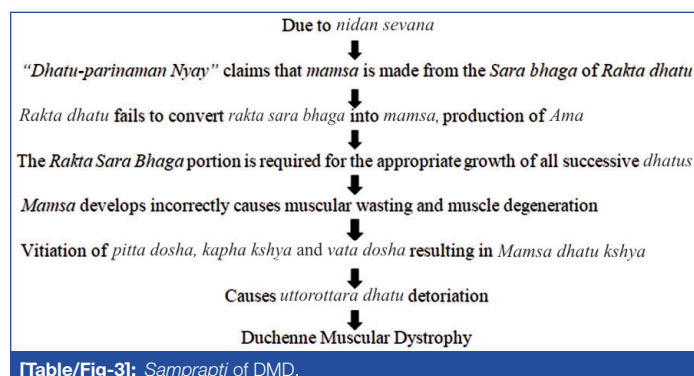
b) Blood tests: Creatine phosphokinase (CPK) spills into the blood from weak or injured muscles.

c) Muscle biopsy: A biopsy is a process to remove a microscopic sample of muscle for examination. Only when the initial genetic test yields a negative result is a biopsy necessary. In roughly 30 percent of cases, this happens. Typically, the thigh muscle is used to collect the sample (quadriceps).

d) Electromyography (EMG): For a reliable diagnosis of motor neuron disease, an EMG is a necessary examination. It can show the extensive denervation and fasciculations that are needed. Considered as an extension of the clinical evaluation, EMG records electrical activity in muscle. It can distinguish between neurogenic and myopathic muscular weakness and atrophy. In clinically normal muscle, it can find anomalies such as persistent denervation or fasciculations. It can distinguish between localised nerve, plexus, or radicular pathology by looking at the distribution of neurogenic abnormalities. It can also offer evidence in favour of the pathophysiology of peripheral neuropathy, such as axonal degeneration or demyelination.

Upashaya (relieving factors): Temporary relief occurs due to *Panchakarma* procedures including *Shaman Chikitsa*, also helps to increase quality of life without using steroidal formulation [22].

Samprapti of the disease: “*Samprapti*” elucidates the progression and course of the disease, including its natural history and potential complications as described below in [Table/Fig-3].



Samprapti Ghatak (Aetiopathogenesis)

Ayurvedic management of DMD: DMD, as mentioned in [Table/Fig-4], viewed through the lens of Ayurveda, involves a disruption in the equilibrium of *Tridosha*, impacting vital bodily tissues such as *Rasa*, *Rakta*, and *Mamsa dhatu* [17,23-30]. The disturbance extends to *Agni*, encompassing *Jatharagni*, *Rakta*, and *Mamsa Dhatvagni*, signifying an imbalance in metabolic processes. Identified within the *Adhishtan* of *Mamsa* or muscle tissue, the condition is recognised for its complexity. *Acharyas* classified as *Asadhya*, DMD poses inherent challenges in treatment; however, its potential for betterment, labelled as *Yapya*, is acknowledged through proactive measures such as early detection and meticulous management, aligning with Ayurvedic principles of holistic well-being [31].

The therapeutic interventions for DMD, aimed at disrupting its aetiological progression, are comprehensively detailed in [Table/Fig-5] [32]. This table elucidates treatment modalities based on the Ayurvedic principles of *Guna* (quality), *Karma* (action), and efficacy, providing a nuanced understanding of interventions effective in addressing the complexities of DMD.

The numerous *Shamana Chikitsa* formulations and their effectiveness in DMD are presented in [Table/Fig-6] [33-36]. These medications not only play a crucial role in alleviating symptoms but also contribute significantly to the strengthening of muscles. Complemented by *Rasayan* therapies, these formulations collectively represent a comprehensive approach in the therapeutic management of the disease, aiming to enhance overall well-being and mitigate the impact of DMD on muscle health.

| S. No. | Shodhana karma | Action |
|--------|--------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1 | Udavartana [23] | <i>Rookshana Poorvakarma</i> reduces vitiated <i>Kapha</i> due to its dryness, inducing obstruction-clearing abilities. <i>Udwartana</i> can assist in lowering weight, BMI, body circumference, and skin fold thickness as well as normalising lipid profiles in case of dyslipidaemia [24]. |
| 2 | Parishekha with Dhanyamla [17,24-26] | <i>Pachana</i> medicines are also explained as a mode of <i>Rukshana Chikitsa</i> and it is also must in the treatment of DMD initially with <i>Deepana Dravya</i> like <i>Dhanyamla</i> . Due to <i>Ushna Guna</i> and <i>Ushna Veerya</i> , <i>Dhanyamla Dhara</i> destroys the vitiated <i>Vata</i> or <i>Kapha</i> or <i>Vata Kapha</i> . <i>Dhanyamla</i> corrects metabolism. It is also a remedy for weakness of muscle. |
| 3 | Abhyanga | <i>Abhyanga</i> stimulate circulatory system, enhancing cell activity, increases blood flow, vasodilatation results in nourishment of the muscles, strengthening the muscles, releasing facial constrictions, assisting in reducing connective tissue thickening and provide flexibility by decreasing fibrous adhesions from muscle tissue injury [27]. |
| 4 | Swedana | The metabolic activity is increased by <i>Swedana Karma</i> , which also raises the need for oxygen and blood flow. The superficial nerve endings are stimulated by this vasodilatation, which results in a reflex dilation of the arterioles. There will be a reflex stimulation of sweat glands in the areas exposed to heat as a result of the influence of heat on the sensory nerve ending. As the increased blood supply ensures the ideal conditions for the muscular contraction, this increase in temperature causes muscle relaxation and boosts the effectiveness of muscle action. It acts by the mechanism of thermoregulation regulated by skin and coordinated with the functions of the other excretory organs [28]. |
| 5 | Shashtishali Pinda Sweda | <i>Pinda Sweda</i> helps tone the body while relieving tense muscles. In essence, it enhances the body's metabolism by boosting blood circulation and oxygen flow. The nerves and sweat glands in the hot area are stimulated by this [29]. |
| 6 | Vasti Karma | <i>Vasti</i> is having two actions, expelling the <i>Dosha</i> and nourishing the body as it is indicated in <i>Gambhiragata Vata</i> also work throughout the body, they must be absorbed. Its second important effect relates to facilitating the excretion of harmful compounds linked to the illness process into the colon, where they are eliminated [30]. |

[Table/Fig-4]: Ayurvedic treatment as a Shodhana therapy [17,23-30].

| S. No. | Modalities based on guna and karma | Panchakarma procedures |
|--------|------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------|
| 1 | Vata Shamak activity | <i>Sarvanga Utsadan</i> , <i>Sarvanga Snehana</i> , <i>Nadi Sweda</i> , <i>Patrapottali Pinda Sweda</i> , <i>Basti Chikitsa</i> |
| 2 | Strotoshodhana | <i>Upanaha</i> (poultice), <i>Patra Pottali Sweda</i> , <i>Niruha Basti</i> and <i>Kwatha Dhara</i> e.g., <i>Dhanyamla</i> , <i>Kanji</i> |
| 3 | Brimhana | <i>Shashti Shali Pinda Sweda</i> and <i>Majja Kshir Basti</i> (<i>Raj Yapan Basti</i>), <i>Madhutailik Basti</i> |

[Table/Fig-5]: Therapeutic procedures for DMD to break the aetiology [32].

| S. No. | Aushadhi ghataka (formulation) | Action |
|--------|------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------|
| 1 | <i>Ashwgandha Churna</i> [33] | <i>Kshyaa</i> , <i>Shosha</i> , <i>Baalashosh</i> , <i>Balya</i> , <i>Brimhana</i> , <i>Rasayan</i> |
| 2 | <i>Praval Pishti</i> [34,35] | <i>Deepana</i> , <i>Pachana</i> (carminative and digestive) <i>Balya</i> , <i>Vishaghna</i> , <i>Vrushya</i> , <i>Bhutaghna</i> |
| 3 | <i>Ekanga Veer Rasa</i> [34] | <i>Jivaniya</i> and <i>Vishaghna</i> properties |
| 4 | <i>Kumar Kalyana Rasa</i> [34,35] | <i>Krishna</i> (emaciation), <i>Pachana</i> and <i>Daurbalya</i> (carminative and digestive) |
| 5 | <i>Laghumalini Vasant</i> | <i>Kshaya</i> (emaciation), <i>Shulaghna</i> (pain relieving), <i>Vatavikar</i> |
| 6 | <i>Madhumalini Vasant</i> | <i>Asthi Shayu Bala Prada</i> (strengthening of muscles) |
| 7 | <i>Kukkutanda Bhasma</i> [35] | <i>Rasayana</i> , <i>Vajikarana</i> (rejuvenation therapy) |
| 8 | <i>Chitrakadi Vati</i> , <i>Shunthi Churna</i> , <i>Trikatu Churna</i> | <i>Deepana</i> (carminative), <i>Pachana</i> digestive (<i>Amadosha</i>), <i>Dourbalya</i> (weakness) |
| 9 | <i>Guggulu Kalpa</i> [36] | <i>Asthiposhak</i> (for stronger bones) |
| 10 | <i>Kalyanak Ghruta</i> | To treat weakness, fatigue mental stability, reduced appetite, <i>Kasa Shawasa Hara</i> |

[Table/Fig-6]: Ayurvedic treatment as Shamana therapy [33-36].

In conjunction with the treatment modalities, [Table/Fig-7] these provide a detailed exposition of the inclusion of *Yogasana*, physiotherapy (traction), and occupational therapy (braces). These integrative therapies prove highly efficient in augmenting muscle strength. Additionally, the incorporation of *Pranayama*, a key component, not only regulates breathing patterns but also extends lifespan. *Pranayama* imparts a soothing effect to the body, fosters mental calmness, and cultivates a positive outlook, contributing holistically to the well-being of individuals affected by DMD [37].

| Physiotherapy | Yogasana and pranayama | Occupational therapy |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------|
| Passive/active Range of Motion (ROM) exercise for all joints | <i>Sukshma</i> and <i>Sthula Vyayama</i> in standing position | Music therapy |
| Active assisted/active breathing exercises | Exercises in supine position Knee cap tightening Dorsal stretch Acute thigh flexion | Traction and braces (knee belt, ankle belt, scoliosis braces) |
| Task-oriented exercises: Rolling, lying to sitting, sitting to standing, standing, walking, climbing one flight of stairs, throwing, and kicking a ball, passing the ball from left to right and then from front to back and vice versa, hand activities | Breathing exercises hand stretch breathing hands in and out breathing <i>Tadasana</i> breathing Tiger breathing and stretching | Vasa therapy (ball exercise) |
| Activity-based breathing exercises initiating with deep inspiration: Blowing pieces of paper, blowing candle placed at varying distances, blowing balloons of different sizes, blowing a party whistle, blowing bubbles with a straw, picking up objects such as small pieces of paper or small pharmacol balls, sucking through a straw and then keeping it at a particular orientation | <i>Asanas</i> Standing- <i>Tadasana</i> and <i>Vrikshasana</i> Sitting- <i>Vakrasana</i> and <i>Marjarasana</i> Prone- <i>Bhujangasana</i> Supine- <i>Pavanmuktasana</i> , <i>Markatasana</i> , <i>Setu bandhasana</i> | Creative problem solving Communication skills |
| Stretching exercises: For trunk, chest wall, and commonly affected muscles [38] | <i>Pranayama</i> and <i>Kriya</i> Yogic breathing <i>Kapalbhati</i> <i>Nadi Shuddhi</i> <i>Bhastrika</i> and <i>Bhramari</i> [38] | Personal-care tasks, like eating or bathing |

[Table/Fig-7]: Other therapies for better quality of life (Yogasana, physiotherapy, occupational therapy) [37].

Acharya Kashyapa in Ayurveda regards diet as the (*Mahabheshaja*) supreme medicine, emphasising that adherence to prescribed dietary guidelines, known as *Pathya*, is essential for health. Maintaining balance in *Sapta-dhatu* and *tri-dosha* through proper nutrition influences various aspects of well-being, including voice, lifespan, happiness, strength, development, intellect, and complexion. *Aahara Kalpana* underscores the crucial role of nutrition in preserving health and treating diseases by considering its impact on *Dosh*, *Dhatu*, *Mala*, and *Agni* [38]. This pivotal insight is detailed in [Table/Fig-8], elucidating the principles of *Pathya* (beneficial) and *Apathya* (to be avoided). Adhering to these dietary guidelines becomes paramount in ensuring optimal health outcomes for individuals, particularly children, grappling with DMD [15].

| Pathya | Apathya |
|-------------------------------------|--------------------------------------|
| High protein diet at morning | Fried and outside food articles |
| Bajra jawar chapati at evening time | Curd |
| Green leafy vegetables | Cold drinks |
| Cow milk and ghee | Packed foods and wafers, spicy items |
| Moong dal khichadi | |
| Vegetable soups | |

[Table/Fig-8]: Dietary habits (Pathya-Apathya) [15].

DISCUSSION

The DMD is an inherited X chromosome-linked recessive myopathy for which no cure exists [39]. The greatest possible outcome for treating genetic abnormalities is to keep the patient comfortable

and functional [40]. The primary pharmacological palliative treatment for DMD up to this point has been corticosteroids, but these medications have a long list of side effects. There is a need for an alternative therapy that may prevent the growth of this illness without causing any negative effects [41]. When describing the *Dhatupaka Avastha*, *Acharyas* emphasise the significance of *Agni*, who is wholly and solely responsible for the development of the following *Dhatus*. Therefore, *Deepana* and *Pachana Dravya* administration should be used to rectify the *Agni* in order to strengthen the process. *Doshas* must also be balanced, and *Panchakarma* should be used to remove metabolic poisons from the *Dhatus* [42]. The concept of “*Brhmanyastu Mrudu Langyet*,” which refers to the use of *Rukshana* for better *Brihmana* treatment modalities, is present in the preoperative process mentioned by *Acharyas*. There are various *Shodhana* treatment modalities for beneficiaries of patient, like *Udvaltana*, which performs *Sthiri Karana* on *Angas* and aids in the eradication of *Srotorodha*. Additionally explained as a form of *Rukshana* are *Pachana* medications [43].

Due to the *Kapha-vatahar* action, *Sarvanga dhara* by *Kwath* promotes muscle strength while also reducing rigidity. *Pinda Swedana* is effective for ailments related to wasting. Additionally, *Pindasweda* was goal-oriented in a few trials. Because it simultaneously uses the *Vatahar* mechanism’s pre-procedure *Abhyanga*, *Swedan*, and *Lepan* with nutrition, as with *Parishekha* and *Dhanyamla*, *Chikitsa* is essential in the first *deepana* treatment of DMD [44]. *Upanah* is helpful in the reduction of spasticity and contractures due to its *Ushna*, *Teekshna Kapha-vatahar* action [45]. Since cardiomyopathy is a specific sign of muscular dystrophy, a neuromuscular assessment is required in this instance. It might not show any symptoms till the very end of the disease. Boys affected by DMD experience a progressive weakening of muscles, resulting in the eventual inability to walk. This condition also contributes to the development of scoliosis, respiratory decline, and compromised cardiac function. Scoliosis is a problem that often arises when ambulation is lost and should be periodically radiologically examined [46].

Last but not least, according to *Acharya Kashyapa*, food is essential for preserving health, as it is said to be *Mahabheshaja* in children [38]. *Pathya* and *Apathya* explained in [Table/Fig-8] should be followed. Counselling (*Satvavajay Chikitsa*) should be provided to the patient’s parents in order to ensure their well-being and provide them with life support.

CONCLUSION(S)

Since DMD is a genetic ailment, there is currently no permanent treatment for it; instead, doctors aim to extend the patient’s life and enhance their quality of life. In order to improve patient quality of life and prevent contractures of the body, which make life worse, efforts have been made to inform the public and the medical community about the treatment options. Many Ayurveda *Panchakarma* modalities, including *Shodhana* and *Shaman Chikitsa*, as well as occupational therapies like traction, braces, and skill development, as well as physiotherapy, *Yogasana*, and *Pranayama*, will help to stop deterioration muscles of the heart and body, and last is diet that includes *Pathya* and *Apathya*, i.e., which diet should or should not be followed.

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