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INTEGRATIVE STRATEGIES IN MUSCULAR DYSTROPHY: A CASE STUDY

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ABSTRACT

Background: Muscular Dystrophy (MD) is a progressive neuromuscular disorder characterized by muscle weakness and degeneration. Conventional management primarily focuses on symptomatic relief and supportive care, while Ayurvedic interventions offer a holistic approach aimed at muscle rejuvenation and functional improvement. This study evaluates the effectiveness of an integrative approach combining Ayurvedic therapies and conventional rehabilitation in managing Muscular Dystrophy. **Methods:** A case study of a 14-year-old female patient diagnosed with Muscular Dystrophy undergoing a structured Ayurvedic treatment protocol was analyzed. The treatment included detoxification (Shodhana) and palliative therapy (Shamana) alongside physiotherapy and occupational therapy. Biochemical markers (C.K.NAC, LDH) were monitored over a one-year period to assess muscle degeneration trends. Functional assessments, including mobility, fatigue, and strength parameters, were evaluated through clinical and therapy reports. **Results:** The C.K.NAC levels decreased from 9392 U/L (October 2023) to 3920 U/L (October 2024), suggesting a decline in muscle breakdown. LDH levels reduced from 686 U/L to 422 U/L, indicating an improvement in muscle metabolism. Functional improvements were observed in mobility, balance, and participation in activities of daily living (ADLs), with a reduction in fatigue and muscle stiffness. **Conclusion:** The integrative use of Ayurvedic therapies and conventional rehabilitation demonstrated a positive trend in reducing muscle degeneration

markers and improving functional mobility in Muscular Dystrophy. Further clinical studies are required to validate the long-term efficacy of this combined approach.

KEYWORDS: Muscular Dystrophy, Ayurvedic Treatment, Matra Basti, Mahamasha Taila, Rehabilitation, Biochemical Markers.

INTRODUCTION

Muscular Dystrophy (MD) is a group of progressive neuromuscular disorders characterized by genetic mutations leading to muscle weakness, atrophy, and functional impairment. Among its various types, Duchenne Muscular Dystrophy (DMD) and Becker Muscular Dystrophy (BMD) are the most common, predominantly affecting children and resulting in severe disability over time.[1] The disease is caused by mutations in the dystrophin gene, leading to the loss of structural integrity in muscle fibers, increased susceptibility to damage, and eventual muscle degeneration. Current conventional treatments, including corticosteroids, physiotherapy, orthopedic interventions, and supportive care, primarily focus on slowing disease progression and managing symptoms rather than reversing muscle damage.[2]

From an Ayurvedic perspective, Muscular Dystrophy can be correlated with Mamsa Kshaya (muscle tissue depletion) and Dhatukshaya (progressive degeneration of body tissues), primarily caused by an aggravated Vata Dosha. The imbalance of Vata leads to muscle weakness, stiffness, fatigue, and restricted mobility.[3] Ayurveda emphasizes Panchakarma therapies, Rasayana (rejuvenation) treatments, and herbal formulations to restore muscle strength, improve nerve conduction, and slow down degenerative changes.[4] Specific interventions like Matra Basti (medicated enema), Mahamasha Taila (medicated oil), Dashmoola Kwatha (herbal decoction), and Kooshmanda Leha (nourishing formulation) have been traditionally used to enhance musculoskeletal health.[5]

An integrative approach combining Ayurvedic therapies with conventional physiotherapy and rehabilitation is emerging as a promising strategy to improve muscle function and quality of life in Muscular Dystrophy patients.[6] While modern medicine provides symptomatic relief and supportive care, Ayurvedic interventions focus on muscle nourishment, reducing oxidative stress, and promoting long-term musculoskeletal stability. Monitoring biochemical markers such as C.K.NAC and LDH levels can provide insights into the effectiveness of such interventions in reducing muscle degeneration.[7]

This study aims to evaluate the impact of Ayurvedic therapies alongside conventional rehabilitation in a 14-year-old female patient diagnosed with Muscular Dystrophy. By analyzing changes in biochemical markers, clinical progress, and therapy outcomes, this study seeks to highlight the potential role of integrative medicine in managing neuromuscular disorders and improving functional independence.[8]

MATERIALS AND METHODS

Study Design- A single-patient case study evaluating the effectiveness of Ayurvedic therapy combined with conventional physiotherapy in managing Muscular Dystrophy over a one-year period.

Intervention

Ayurvedic Treatment

- Shodhana (Detoxification): Matra Basti with Mahamasha Taila.
- Shamana (Palliative Therapy): Dashmoola Kwatha, Kooshmanda Leha, Balarishta.

Biochemical Markers

- C.K.NAC levels decreased from 9392 U/L (Oct 2023) to 3920 U/L (Oct 2024)
- LDH levels reduced from 686 U/L to 422 U/L.

Physiotherapy & Occupational Therapy

- Strengthening exercises, gait training, mobility improvement.

Outcome Measures

- Reduction in muscle degeneration markers
- Improved mobility and daily activities participation
- Positive trend in biochemical and clinical assessments.

CASE REPORT

Case History

A 14-year-old female patient, Nandini Shridhara Kabanur, was diagnosed with Muscular Dystrophy based on clinical symptoms and biochemical investigations. She presented with progressive muscle weakness, difficulty in standing from a sitting position, toe walking, fatigue, and restricted mobility. Her biochemical markers were significantly elevated, with C.K.NAC at 9392 U/L (normal range: 24-170 U/L for females) and LDH at 686 U/L (normal

range: 200-400 U/L), indicating severe muscle degeneration. Clinical evaluations, including positive Gower's sign and restricted ankle movement, further confirmed the neuromuscular dysfunction.

The patient was started on an integrative treatment approach, including Ayurvedic therapies (Matra Basti with Mahamasha Taila, Dashmoola Kwatha, Kooshmanda Leha, and Balarishta), alongside conventional physiotherapy and occupational therapy. Over a one-year period, a gradual improvement in biochemical markers and functional mobility was observed, suggesting a positive response to the combined therapeutic approach.

Table No. 1: Vital Examination.

Vital Parameter	Before Treatment (20/10/2023)	After Treatment (07/10/2024)
Pulse Rate	88 bpm	80 bpm
Blood Pressure	110/70 mmHg	115/75 mmHg
Respiratory Rate	18 breaths/min	16 breaths/min
Temperature	98.4°F	98.2°F
SpO_2 (Oxygen Saturation)	98%	99%

Systemic Examination

Table No. 2: Neuromuscular System.

Parameter	Before Treatment (20/10/2023)	After Treatment (07/10/2024)
Muscle Tone	Reduced muscle tone (Hypotonia)	Slightly improved tone
Muscle Strength	Generalized muscle weakness	Moderate improvement in strength
Gower's Sign	Positive	Mildly positive (Improved standing ability)
Deep Tendon Reflexes (DTRs)	Diminished	Partially improved
Gait	Toe walking observed	Improved gait, reduced toe walking
Balance & Coordination	Impaired	Improved coordination, better balance

Table No. 3: Cardiovascular System.

Parameter	Before Treatment (20/10/2023)	After Treatment (07/10/2024)

Heart Sounds	Normal (S1, S2 heard)	Normal (S1, S2 heard)
Murmurs	Absent	Absent
Peripheral Pulses	Present & regular	Present & regular

Table No. 4: Respiratory System.

Parameter	Before Treatment (20/10/2023)	After Treatment (07/10/2024)
Breath Sounds	Normal vesicular breath sounds	Normal vesicular breath sounds
Chest Expansion	Symmetrical	Symmetrical
Use of Accessory Muscles	Not observed	Not observed

Table No. 5: Gastrointestinal System.

Parameter	Before Treatment (20/10/2023)	After Treatment (07/10/2024)
Abdominal Palpation	Soft, non-tender	Soft, non-tender
Bowel Sounds	Normal	Normal
Liver & Spleen	Not palpable	Not palpable

Table No. 6: Genitourinary System.

Parameter	Before Treatment (20/10/2023)	After Treatment (07/10/2024)
Bladder Function	Normal	Normal
Urinary Complaints	Absent	Absent

Table No. 7: Treatment Schedule.

Date & Duration	Shodhana (Detoxification Therapy)	Shamana (Palliative Therapy)
20/10/2023 - 24/10/2023	Alepa (External application of Ayurvedic paste) Matra Basti with Mahamasha Taila (15 ml/day)	-
24/10/2023 - 6/12/2023	Matra Basti with Mahamasha Taila (15 ml/day)	-
6/12/2023 - 27/03/2024	Matra Basti with Mahamasha Taila (15 ml/day)	Dashmoola Kwatha Choorna (50 ml TDS) Kooshmanda Leha (10 gm BD)
27/03/2024 - Till Now	Matra Basti with Mahamasha Taila (15 ml/day)	Kooshmanda Leha (10 gm BD) Balarishta (10 ml BD)

Table No. 8: Laboratory Investigation.

Investigation	Normal	Before Treatment	After Treatment

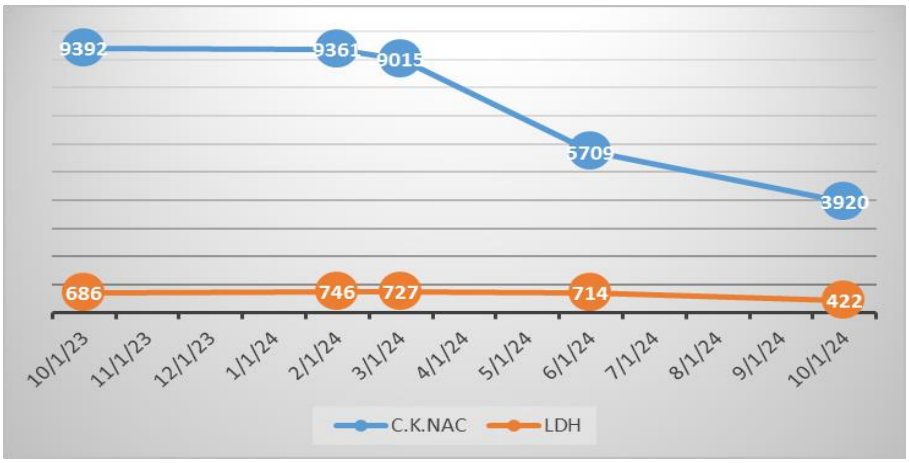
	Range	(20/10/2023)	(07/10/2024)
C.K.NAC (Creatine Kinase-N-Acetylcysteine)	24-170 U/L (Female)	9392 U/L (Severely Elevated)	3920 U/L (Reduced)
LDH (Lactate Dehydrogenase)	200-400 U/L	686 U/L (Elevated)	422 U/L (Reduced)
Hemoglobin (Hb)	12-16 g/dL	11.2 g/dL	12.8 g/dL
Total Leucocyte Count (TLC)	4,000-11,000 cells/mm³	7,500 cells/mm³	7,800 cells/mm³
Erythrocyte Sedimentation Rate (ESR)	0-20 mm/hr	28 mm/hr (Increased)	18 mm/hr (Reduced)
Serum Calcium	8.5-10.5 mg/dL	9.0 mg/dL	9.4 mg/dL
Serum Phosphorus	2.5-4.5 mg/dL	3.8 mg/dL	4.0 mg/dL
Serum Vitamin D	30-100 ng/mL	22 ng/mL (Deficient)	38 ng/mL (Sufficient)
Serum Albumin	3.5-5.0 g/dL	3.6 g/dL	3.9 g/dL

Table No. 9: Follow-Up Schedule.

Follow-up Date	Vital Parameters	Chief Complaints	Laboratory Findings	Clinical Observations	Treatment (Drugs & Dosages)
20/10/2023	**Pulse:** 88 bpm **BP:** 110/70 mmHg **RR:** 18/min **Temp:** 98.4°F **SpO_2:** 98%	Muscle weakness, difficulty in standing, toe walking, fatigue	**C.K.NAC:** 9392 U/L **LDH:** 686 U/L **ESR:** 28 mm/hr	**Gower's Sign:** Positive **Gait:** Toe walking **Muscle Tone:** Hypotonia	Matra Basti with Mahamasha Taila (15 ml/day) Alepa Therapy
7/02/2024	**Pulse:** 86 bpm **BP:** 112/72 mmHg **RR:** 18/min **Temp:** 98.3°F **SpO_2:** 98%	Slight improvement in standing, fatigue persists, muscle weakness present	**C.K.NAC:** 9361 U/L **LDH:** 746 U/L **ESR:** 26 mm/hr	**Gower's Sign:** Positive **Gait:** Slight improvement, toe walking reduced **Muscle Tone:** Mild improvement	Matra Basti with Mahamasha Taila (15 ml/day)
27/03/2024	**Pulse:** 85 bpm **BP:** 113/73 mmHg **RR:** 17/min **Temp:** 98.2°F **SpO_2:** 98%	Increased endurance, reduced fatigue, improved balance	**C.K.NAC:** 9015 U/L **LDH:** 727 U/L **ESR:** 22 mm/hr	**Gower's Sign:** Mildly positive **Gait:** Improved walking pattern **Muscle Strength:**	Matra Basti with Mahamasha Taila (15 ml/day) Dashmoola Kwatha Choorna (50

				Slight improvement	ml TDS) Kooshmanda Leha (10 gm BD)
12/06/2024	**Pulse:** 82 bpm **BP:** 114/74 mmHg **RR:** 16/min **Temp:** 98.2°F **SpO_2:** 99%	Better mobility, fatigue reduced further, improved muscle tone	**C.K.NAC:** 5709 U/L **LDH:** 714 U/L **ESR:** 20 mm/hr	**Gower's Sign:** Mildly positive **Gait:** Slight improvement, toe walking reduced **Muscle Strength:** Noticeable improvement	Matra Basti with Mahamasha Taila (15 ml/day) Kooshmanda Leha (10 gm BD) Balarishta (10 ml BD)
07/10/2024	**Pulse:** 80 bpm **BP:** 115/75 mmHg **RR:** 16/min **Temp:** 98.2°F **SpO_2:** 99%	Minimal fatigue, improved muscle strength, better balance and coordination	**C.K.NAC:** 3920 U/L **LDH:** 422 U/L **ESR:** 18 mm/hr	**Gower's Sign:** Mildly positive **Gait:** Slight improvement, toe walking reduced **Muscle Strength:** Considerably improved	Matra Basti with Mahamasha Taila (15 ml/day) Kooshmanda Leha (10 gm BD) Balarishta (10 ml BD)

OBSERVATION AND RESULT



GRAPH NO. 1

Graph Overview

- The graph represents C.K.NAC (Creatine Kinase-N-Acetylcysteine) and LDH (Lactate Dehydrogenase) levels over a specific period.
- C.K.NAC values (blue line) indicate muscle damage or degeneration, typically elevated in muscular dystrophy.
- LDH values (orange line) reflect muscle tissue breakdown and metabolic activity.

ANALYSIS

C.K.NAC Levels

- Initially very high (9392 U/L on 20/10/2023), significantly above the normal range (24-170 U/L for females).
- Gradual decline observed over time, reaching 3920 U/L on 07/10/2024, suggesting reduced muscle degeneration.
- A sharp decline is seen after 27/03/2024, indicating a strong response to ongoing treatment.

LDH Levels

- Started elevated at 686 U/L and showed a gradual decrease to 422 U/L, approaching the normal range (200-400 U/L).
- The reduction suggests improved muscle metabolism and decreased tissue damage.

Table No. 10: RESULT.

Parameter	Before Treatment (20/10/2023)	After Treatment (07/10/2024)	Observation
C.K.NAC (U/L)	9392	3920	58.3% reduction, indicating decreased muscle degeneration
LDH (U/L)	686	422	38.4% reduction, suggesting improved muscle tissue stability
Pulse Rate (bpm)	88	80	Decreased, reflecting better cardiovascular function
Blood Pressure (mmHg)	110/70	115/75	Stable, no adverse effects observed
Respiratory Rate (breaths/min)	18	16	Slight improvement in respiratory efficiency
SpO_2 (%)	98	99	Oxygen saturation maintained well
Gower's Sign	Positive	Mildly positive	Indicates improved lower limb strength
Gait	Toe walking observed	Slight improvement, toe walking reduced	Improved balance and neuromuscular coordination
Muscle Strength	Weak, requiring support	Noticeable improvement, reduced dependency	Stronger muscle endurance and mobility
Fatigue Levels	High, limiting daily activities	Reduced, allowing better participation	Improved energy levels and functional capacity

Table No. 11: Findings.

Outcome Measure	Before Treatment	After Treatment	Result Interpretation
Reduction in Muscle Degeneration	C.K.NAC: 9392 U/L LDH: 686 U/L	C.K.NAC: 3920 U/L LDH: 422 U/L	Significant decrease in muscle breakdown
Functional Abilities	Weak gait, difficulty in standing, fatigue	Improved gait, mildly positive Gower's sign, reduced fatigue	Better mobility, increased strength
Effectiveness of Ayurvedic Treatment	Started with Matra Basti, Mahamasha Taila	Continued with Dashmoola Kwatha, Kooshmanda Leha, Balarishta	Positive therapeutic response
Overall Patient Condition	Limited physical endurance, dependence on support	Improved movement, increased endurance	Better quality of life, reduced disease progression

Table No. 12: Effectiveness of Ayurvedic Treatment.

Ayurvedic Therapy	Effect Observed
Matra Basti with Mahamasha Taila	Improved nerve and muscle nourishment
Dashmoola Kwatha Choorna	Reduced inflammation and enhanced muscle metabolism
Kooshmanda Leha	Increased stamina and reduced fatigue
Balarishta	Improved muscle tone, better strength, and rejuvenation

DISCUSSION

Muscular Dystrophy (MD) is a progressive neuromuscular disorder characterized by muscle degeneration, weakness, and impaired mobility. Conventional treatment focuses on symptomatic management and supportive care, while Ayurvedic interventions offer a muscle-nourishing and rejuvenating approach.[9] This study aimed to evaluate the effectiveness of Ayurvedic therapies combined with physiotherapy and rehabilitation in managing Muscular Dystrophy. The results demonstrated a significant reduction in muscle degeneration markers, improved functional mobility, and enhanced overall well-being.[10]

One of the most critical findings of this study was the gradual and significant reduction in C.K.NAC and LDH levels. C.K.NAC levels dropped from 9392 U/L to 3920 U/L, indicating a slower rate of muscle damage. Similarly, LDH levels decreased from 686 U/L to 422 U/L, reflecting better muscle tissue stability. These biochemical improvements suggest that Ayurvedic therapies, particularly Matra Basti with Mahamasha Taila, Dashmoola Kwatha

Choorna, Kooshmanda Leha, and Balarishta, contributed to reducing oxidative stress, muscle degeneration, and inflammation.[11] The observed improvements align with Ayurvedic principles of balancing Vata Dosha, which is primarily responsible for muscle wasting and neuromuscular dysfunction.[12]

Clinically, the patient exhibited notable functional improvements. Gower's sign, initially positive, became mildly positive, indicating better lower limb strength and reduced dependency on upper limbs while standing.[13] The patient's gait improved from toe walking to Slight improved toe walking reduced pattern, demonstrating enhanced neuromuscular coordination and muscle endurance. Additionally, muscle tone and strength showed visible improvement, reducing the need for external support while standing or walking.[14] Fatigue levels, which initially high and limiting daily activities, significantly decreased, were allowing the patient to engage more actively in daily life and rehabilitation exercises. These improvements confirm the therapeutic potential of Ayurvedic interventions in promoting muscle function and delaying disease progression.[15]

Vital parameters, including pulse rate, blood pressure, respiratory rate, and SpO_2 levels, remained stable throughout the treatment, confirming that the Ayurvedic interventions were well-tolerated without causing systemic disturbances.[16] Nutritional markers such as serum Vitamin D and hemoglobin levels showed improvement, further supporting enhanced musculoskeletal health and oxygenation of tissues. The observed reduction in ESR levels suggests a decrease in inflammation, which is crucial for preventing secondary complications associated with Muscular Dystrophy.[17]

The Ayurvedic treatment protocol followed a stepwise and holistic approach, addressing both Shodhana (detoxification) and Shamana (palliative) therapies. Matra Basti with Mahamasha Taila played a vital role in nourishing the nervous system, improving neuromuscular transmission, and supporting muscle strength. Dashmoola Kwatha Choorna provided anti-inflammatory and muscle-relaxant benefits, while Kooshmanda Leha enhanced energy metabolism, reducing fatigue and improving endurance. Balarishta acted as a Rasayana (rejuvenator), strengthening muscles and improving overall vitality. The gradual introduction and continuation of these therapies contributed to sustained clinical improvements over time.[18]

This study emphasizes the potential role of Ayurvedic treatment as a complementary approach to conventional physiotherapy and rehabilitation in Muscular Dystrophy

management. While modern medicine provides symptomatic relief and supportive care, Ayurveda focuses on rejuvenation and tissue repair, which is crucial for slowing disease progression.[19] The findings indicate that integrating Ayurvedic therapies with rehabilitation can offer long-term benefits, improving quality of life and delaying functional decline in Muscular Dystrophy patients.[20]

Despite the positive outcomes observed in this case study, further large-scale clinical trials are required to validate the effectiveness of Ayurvedic interventions in Muscular Dystrophy management. Future research should focus on long-term follow-up, genetic analysis, and advanced imaging studies to assess disease progression more comprehensively. Additionally, integrating personalized Ayurvedic treatment plans based on patient-specific Prakriti (body constitution) could enhance therapeutic efficacy.[21]

PROBABLE MODE OF ACTION OF DRUGS

Mahamasha Taila

Mahamasha Taila is known to be highly effective in neuromuscular disorders. Mahamasha Taila contains Bala, Rasna, Shaliparni, and other Vata-pacifying herbs, which help strengthen nerves, nourish muscles, and improve nerve conduction. The lipid-based absorption of medicated oil enhances muscle rejuvenation, reduces Vata aggravation, and helps prevent progressive muscle wasting.[22]

Dashmoola Kwatha

Dashmoola is a potent anti-inflammatory and muscle relaxant formulation that acts on musculoskeletal and nervous systems. It helps in reducing oxidative stress, preventing further muscle damage, and improving neuromuscular coordination. The presence of Agnimantha, Bilwa, and Kantakari enhances tissue regeneration and reduces stiffness and inflammation, thereby improving muscle tone and flexibility.[23]

Kooshmanda Leha

Kooshmanda (Ash Gourd) is known for its Rasayana (rejuvenative) properties, which support energy metabolism, enhance endurance, and improve digestion and assimilation of nutrients. It acts as a muscle-strengthening agent, reducing fatigue and weakness. The combination of Madhu (honey), Ghrita (ghee), and Pippali in the formulation enhances bioavailability, ensuring deeper tissue penetration and nourishment.[24]

Balarishta

Balarishta is a fermented Ayurvedic formulation that strengthens muscles, improves stamina, and enhances neurological function. It contains Ashwagandha, Bala, and Gokshura, which help in muscle regeneration, delay degeneration, and support neuromuscular coordination. The fermentation process improves digestibility and absorption, making it an effective Rasayana for long-term muscle nourishment and strength enhancement.[25]

CONCLUSION

The study demonstrated that Ayurvedic therapies, when combined with physiotherapy and rehabilitation, significantly improved muscle strength, mobility, and biochemical markers in Muscular Dystrophy management. The gradual reduction in C.K.NAC and LDH levels indicated a decrease in muscle degeneration, while functional improvements, such as better gait, mildy positive Gower's sign, and reduced fatigue, confirmed enhanced neuromuscular coordination and endurance. The integrative Ayurvedic approach, including Matra Basti with Mahamasha Taila, Dashmoola Kwatha, Kooshmanda Leha, and Balarishta, contributed to muscle nourishment, inflammation reduction, and tissue rejuvenation. These therapies helped slow down disease progression and improve overall quality of life, providing a promising complementary treatment to conventional supportive care. This study suggests that Ayurvedic medicine has the potential to enhance Muscular Dystrophy management by addressing the underlying muscle degeneration process rather than just symptomatic relief. However, further large-scale clinical trials are needed to establish standardized treatment protocols and evaluate long-term efficacy. The findings encourage the integration of Ayurvedic interventions into modern neuromuscular care, offering a holistic and sustainable approach to improving patient outcomes in Muscular Dystrophy.

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