Evaluation of Clinical Features, Quality of Life and Fatigue in Children with Myotonic Dystrophy Type 1

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INTRODUCTION

Myotonic dystrophy type 1 (DM1) is a multi-system neuromuscular disease with variable severity and broad clinical spectrum that affects all ages. It results from an autosomal dominant expansion of a CTG trinucleotide repeat in the non-coding region of the *DMPK* gene. Characterized by progressive muscle weakness and myotonia, DM1 significantly impacts the physical, cognitive, and social domains of affected individuals. Despite the prevalence and the multi-systemic impact of the disease, there remains a substantial gap in comprehensive evaluation of the clinical spectrum and the corresponding quality of life (QoL) in the pediatric population.

OBJECTIVES

This study aims to investigate the clinical features and QoL of children diagnosed with DM1, utilizing standardized tools that reflect their physical, emotional, and social well-being.

METHODS

This cross-sectional study reviewed the clinical features of 18 children and adolescents diagnosed with DM1, followed between January 2020 and January 2024. Pediatric Quality of Life (PedsQL) Inventory 4.0 Generic Core Scales, Neuromuscular Module (version 3.0), Multidimensional Fatigue Module (version 3.0), and parent-proxy reports were used to assess the patients' generic quality of life, neuromuscular-specific quality of life and fatigue, respectively. On a 0 to 100 scale, higher scores indicate better health-related quality of life.

RESULTS

Eighteen patients (from 14 families), with a median age of 14 years (range 5-20), were included **(Table 1).**

- Congenital (CDM1; n=3)
- Childhood (ChDM1; n=9)
- Juvenile DM1 (JDM1; n=6)

The most common presenting symptoms:

- Muscle weakness and stiffness in the hands,
- Motor delay,
- Gait abnormalities,
- Speech disorders.

Seven patients (39%) had a history of preterm birth, and seven had a history of mechanical ventilation at birth. Fourteen patients (78%) had learning difficulties or attention deficit hyperactivity disorder.

Table 1. Clinical features of the patients with DM1

Patient Number	*Age at last appointment (years)*	*Type*	*Sex*	*Sex of parent with DM1*	*Age at symptom onset (years)*	*Age at diagnosis*	*Symptoms reported at the time of diagnosis*	*Weakness*	*Facial weakness*	*Delayed gross motor milestones*	*Fine motor difficulties*	*Myotonia*	*Speech delay*	*Intellectual function and behaviour*	*Other system involvement*
1	5	CDM1	F	-	Neonatal	7 months	Hypotonia	+	+	+	+	+	+	GDD	Asthma, strabismus, visual acuity problems, umbilical hernia, biotinidase deficiency
2	5	CDM1	F	F	Neonatal	Neonatal	Hypotonia, contractures	+	+	+	-	-	+	GDD	Visual acuity problems, Diaphragmatic eventration, VSD, swallowing problem
3	7	CDM1	F	F	Neonatal	Neonatal	Hypotonia	+	+	+	+	+	+	Moderate-severe ID	Strabismus, constipation, recurrent respiratory tract infections
4	5	ChDM1	M	F	Family screening	3 months	Family screening	-	-	-	-	-	-	Normal	-
5	8	ChDM1	F	F	8	8 years	Learning difficulty, stiffness in the hands	-	+	-	-	+	-	Mild ID	Strabismus,
6	10	ChDM1	M	F	2	10 years	Global developmental delay (fine motor and speech development)	+	+	-	+	+	+	Mild ID	Visual acuity problems, cryptorchidism
7	11	ChDM1	F	F	Family screening	7 years	Family screening	-	-	-	+	+	+	Mild ID, DEHB	-
8	13	ChDM1	M	F	3	13 years	Global developmental delay (speech and gross motor)	-	+	+	+	+	+	Normal	Strabismus, swallowing and chewing problems
9	14	ChDM1	M	F	3	13 years	Gait disturbance, weakness	+	+	+	-	+	-	Learning difficulty	Chewing problem
10	14	ChDM1	F	M	5	10 years	Contraction of the hands, failure to thrive	-	+	+	+	+	+	Mild ID	Visual acuity problems, amblyopia,
11	14	ChDM1	F	M	5	10 years	Contraction of the hands, failure to thrive	-	+	-	+	+	+	Learning difficulty	Visual acuity problems, amblyopia
12	20	ChDM1	M	M	6	17 years	Difficulty in squeezing and opening the hands, fatigability, low school performance	-	+	-	+	+	-	Mild ID	-
13	14	JDM1	M	M	11	11 years	Contraction of the hands	+	+	-	+	+	-	Learning difficulty	Intraventricular conduction defect
14	16	JDM1	M	M	12	16 years	Contraction of the hands	-	+	-	+	+	-	Normal	Primary adrenal insufficiency
15	15	JDM1	F	M	13	15 years	Difficulty in squeezing and opening the hands	-	+	-	+	+	-	Learning difficulty	Trace mitral regurgitation
16	17	JDM1	F	M	13	16 years	Gait disturbance	+	+	+	+	+	+	Moderate ID	-
17	17	JDM1	F	F	14	16 years	Difficulty in squeezing and opening the hands, difficulty climbing stairs	-	+	-	-	+	-	Normal	Trace mitral regurgitation, constipation
18	17	JDM1	F	F	17	17 years	Contraction of the jaw while speaking	-	+	-	-	+	-	Learning difficulty	-

RESULTS

Table 2. PedsQL quality of life reports by parents (n=13)

Questionnaire and subscales	*CDM1 Mean score (range) (n=3)*	*ChDM1 Mean score (range) (n=7)*	*JDM1 Mean score (range) (n=3)*
Quality of Life			
Total	60,9 (53,3-70,7)	60,1 (42,4-84,4)	54 (37-63)
Physical	72,9 (65,6-81,3)	59,8 (43,8-84,4)	61,5 (46,9-75)
Psychosocial	54,4 (46,7-65)	60,2 (40-83,3)	50 (31,7-61,7)
Neuromuscular			
Total	41,8 (25-59,4)	71,4 (52-88)	54,3 (40-71)
About Neuromuscular Disease	46,6 (29,4-64,7)	71 (48,4-91,2)	52,9 (36,8-69,1)
Communication	13,9 (0-41,7)	63,1 (25-100)	58,3 (41,7-83,3)
Family Resources	41,7 (25-50)	77,9 (55-100)	56,7 (50-70)
Fatigue			
Total	37,5 (26,4-50)	73 (58,3-87,5)	34,3 (6,9-55,6)
General Fatigue	37,5 (29,2-50)	68,4 (50-83,3)	33,3 (0-50)
Sleep/Rest Fatigue	41,7 (25-50)	83,3 (62,5-100)	22,2 (4,2-41,7)
Cognitive Fatigue	33,3 (20,8-50)	67,3 (50-87,5)	47,2 (0-75)

RESULTS

The PedsQL modules were administered to 7 children and 13 parents.

Although the sample size is small, the parental reports reveal distinct profiles of QoL and fatigue among children with different types of DM1 **(Table 2)**.

Fatigue remains a profound concern, especially for the CDM1 and JDM1 groups, where total fatigue scores are notably low. The subtype analysis of fatigue further underlines the necessity for specific interventions, as the sleep/rest fatigue in JDM1 indicates severe impairment, with a mean score of 22.2, suggestive of critical issues in neuromuscular disease related sleep disorders.

CONCLUSIONS

The findings emphasize the wide spectrum of clinical findings in DM1 and the need for a multi-faceted approach to care, integrating physical, emotional, social, and neuromuscular interventions tailored to the patient's age and specific DM1 type.

Support programs should incorporate strategies for managing fatigue.

Evaluation of quality of life should be a part of routine clinical evaluation in DM1.

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Contact information and permission to use PedsQL questionnaires:

https://eprovide.mapi-trust.org/instruments/pediatric-quality-of-life-inventory#need_this_questionnaire

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