AWARENESS AND USE OF GROSS MOTOR FUNCTION MEASURE (GMFM-66) FOR CEREBRAL PALSY AMONG PHYSIOTHERAPISTS

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خلاصہ

PalsyCerebral (سی پی) ایک غیر ترقی پسند اعصابی پریشانی ہے جو ایک نوزائیدہ بچے کی قبل از پیدائش، پیدائشی اور نفلیاتی زندگی کے دوران موٹر اور دماغی خرابی کا باعث ہوتا ہے. سی پی کا اندازہ کرنے کے لئے (جی ایم ایف ایم- 66) سب سے زیادہ استعمال ہونے والا ٹول ہے جس کا تجزیہ گراس نے کیا۔ موٹر قابلیت کا تخمینہ لگانے والا (جی ایم اے ای) ، ایک کمپیوٹرائزڈ بیسڈ سافٹ ویئر۔ مقابل: سی پی بچوں میں جی ایم ایف ایم- 66 کے بارے میں شعور اور استعمال کا اندازہ لگانا: کراچی پاکستان میں فزیو تھیراپسٹوں کے مابین ایک سروے کیا گیا جس میں ڈیٹا اکٹھا کرنے کے لئے کراس سیکشنل (از خود رپورٹ شدہ) سوالنامے کے سروے کا ڈیزائن استعمال کیا گیا ہے اور خود زیر انتظام سوالنامہ استعمال کیا گیا تھا جس نے مطالعے کے مقصد کو واضح کرنے اور رضامندی لینے کے بعد شمولیت کے معیار کو پورا کیا۔ غیر امکان احتمال نمونے لینے کی تکنیک استعمال کی گئی تھی اور کے نمونے کے سائز 194 تھا حساب کتاب۔ مطالعہ کی ترتیبات میں جناح پوسٹ گریجویٹ ہسپتال، انسٹی ٹیوٹ آف فزیکل میڈیسن اینڈ ری ہیبلٹیشن ڈی یو ایچ ایس، ڈاکٹر ضیاء الدین اسپتال، ہل پارک جنرل ہسپتال، سول اسپتال کراچی، سروسز ہسپتال، رابعہ مون ٹرسٹ، لیاقت نیشنل اسپتال، آغا خان یونیورسٹی ہسپتال، باقائی انسٹی ٹیوٹ آف فزیکل شامل ہیں تھراپی۔ ڈیٹا کا تجزیہ ایس پی ایس ایس ورژن 23.0 کے ذریعہ کیا گیا تھا۔ تمام متغیر متغیرات کے لFre فریکوئینسی اور فیصد کو لے لیا گیا ہے۔ وضاحتی اعداد و شمار کو فزیو تھیراپیسٹس کے مابین سی پی کے لئے مجموعی موٹر فنکشن ماپ جی ایم ایف ایم- 66 کے بارے میں بیداری اور استعمال کی جانچ کرنے کے لئے اہمیت کے امتحان کے طور پر لاگو کیا گیا ہے ۔ نتیجہ سے پتہ چلتا ہے کہ آدھے فزیو تھیراپسٹ سی پی کی تشخیص کے لtools ٹولز کا استعمال کرتے ہیں ان میں 61.3٪ فزیو تھیراپسٹ GMFM-66 کے بارے میں جانتے ہیں اور صرف 45.8٪ فزیو تھیراپسٹ GMFM-66 کو اپنے کلینیکل پریکٹس میں استعمال کرتے ہیں۔ اس حوالے سے ہمارا مطالعہ ظاہر کرتا ہے کہ بہت سارے جسمانی معالجین GMFM-66 کے بارے میں جانتے ہیں لیکن ان میں سے بہت سے محکمے میں دستیابی کی کمی کی وجہ سے یا وقت استعمال کرنے کے طریقہ کار کی وجہ سے اس کا استعمال نہیں کر رہے ہیں۔

Abstract

Cerebral Palsy (CP) is the non-progressive neurological disturbance which leads to motor and mental impairment during the pre-natal ,natal and post-natal life of an infant .To evaluate the CP (GMFM-66) is the most commonly used tool which analyzed by Gross motor ability estimator (GMAE), a computerized based software. A cross-sectional (self-reported) questionnaire survey design has been used for data collection and a self-administered questionnaire was used who fulfilled the inclusion criteria after elucidating the aim of the study and taking consent. Non probability purposive sampling technique was used and sample size of 194 was calculated. Study settings includes Jinnah Post Graduate hospital, Institute of Physical Medicine and Rehabilitation DUHS, Dr. Ziauddin hospital, Hill Park General Hospital, Civil Hospital Karachi, Services Hospital, Rabia Moon Trust, Liaquat National Hospital, Aga Khan University Hospital, Baqai Institute Of Physical Therapy. Data was analyzed by SPSS Version 23.0. Frequencies and percentages has been taken out for all categorical variables. Descriptive statistics has been applied as test of significance to evaluate the awareness and use of gross motor function measure GMFM-66 for CP among physiotherapists. The result shows that half of the physiotherapists use tools to evaluate CP among them 61.3% of physiotherapists are aware about GMFM-66 and only 45.8% physiotherapist use GMFM-66 in their clinical practice. Our study shows that many physical therapists are aware about the GMFM-66 but many of them are not using it due to lack of availability in department or due to time consuming procedure.

Key Words: Cerebral palsy, gross motor function measure-66 , demographic data

Introduction

Cerebral palsy is a frequent physical disorder in early childhood (Reid *et al.,* 2016). Cerebral palsy is a broad term explaining many dysfunctions arising in early stages of life that has characteristics of motor impairments and brain abnormality can arise pre, pre and post natal (Herskind., 2015, Anttila., *et al.,* 2008, Morgan *et al.,* 2016). Diagnosis of CP is based on history and examination rather than laboratory tests. Physical therapy is the best mode of treatment for a CP child because they have motor dysfunctions. CP has its subtypes that can be describe according to functional level and the body part involved. Physical and mental disabilities of CP child should always be assessed (Rathia *et al.,* 2015). The incidence of CP is nearly 1.5-5.6 per 1000 live birth in developing countries in preterm and very preterm babies. Where as in developed world the rate of CP cases reported are 2-2.5 per live birth (Mc Intyre *et al.,* 2013). In Canada 2.57, in Australia 2.2, in China 1.6, in UK 2.45, in Turkey 1.1 and in USA 3.34 infant suffer from CP per 1000 live birth these are the ratios in developed world (Ko & Kim., 2013).

Gross Motor Function Merasure-66 (reliability & validity)

Physical therapy (PT) for cerebral palsy children includes a broad spectrum of therapeutic techniques which differs in its features (Rahlin *et al*., 2020).Among all other professions related to health care, physiotherapist need a continuous assessment of their patient to find out that their treatment is either effective or not and for that a valid and reliable outcome tools are required. The Gross Motor Function Measure (GMFM) is an instrument that has been designed to evaluate the alteration in gross motor function in cerebral palsy children between the age group of 5 months to 16 years (Adrienne.,2017) . Numbers of outcome tools are available to evaluate cerebral palsy child but GMFM -66 is more valid than other because it was especially developed to evaluate cerebral palsy children (Beckers *et al.*, 2015). According to a study by (Dianne *et al.,* 2020) the test-retest reliability was found to very high (intra class correlation coefficient 5.99).This research showed that the GMFM-66 has high-quality psychometric properties. It is a comprehensive tool which has got five categories (lying and rolling; sitting; crawling and kneeling; standing; walking, running and jumping) with total 66 items. For scoring every item should be allowed 3 trails where 0-4 points are given to each item that is 0= task cannot be initiated, 1=task initiated, 2=task complete partially, 3=complete task, NT=not tested. To calculate the total score a computerized program called the gross motor ability estimator (GMAE) is required which calculate the score at confidence interval of 95% (Dianne., 2000). GMFM-66 is an evaluating tool that measures the treatment outcome provided by the physiotherapist to a CP child. A study conducted on CP child < 3 years old, result reveals the significant intra-inter rater reliability score with ICC=0.966 and ICC=0.97 respectively (Wei *et al.,* 2006).

Gross motor function measure is a friendly user tool for the patient diagnosed as cerebral palsy (Beckers and Bastiaenen., 2015). In another study it was concluded that GMFM-66 is more sensitive to comprehend motor developmental assessment of child with enhanced ability to evaluate the scoring (Dianne J Russell., 2000). Another study gave the reliability and efficacy of GMFM between 75-100% (Alotaibi *et al.,* 2014). A study also showed that GMFM has been commonly used internationally for clinical, research and administrative purpose (Rosenbaum *et al.,* 2008). It illustrate how reliable and valid the tool is in disability field of cerebral palsy. This tool helps physiotherapist to delineate the functional performance ability of a CP child to their parents. According to a study for the comparison of reliability and validity of different evaluating tool for cerebral palsy showed that the GMFM is the most valid scale in evaluating the motor functional ability of a CP child (Mc Carthy *et al.*, 2002).

Materials and Methods

A self-administered questionnaire was distributed among Physiotherapists, who fulfilled the inclusion criteria of the study. Sample size of 194 calculated through Open Epi version 3.0 with a hypothesized frequency of 85.2% (use for the evaluation purpose), confidence limits of 6%, data effect of 1% and confidence level 95%. Non Probability Purposive Sampling Technique was implemented. Self-design questionnaire were distributed among 194 physiotherapists of different hospitals, clinics and institutes of Karachi. The data was collected from Jinnah Post Graduate Hospital , Institute of Physical Medicine and Rehabilitation , Ojha Campus DUHS , Patel Hospital , Dr. Ziauddin Hospital KPT (keemari), Dr. Ziauddin Hospital Clifton, Hill Park General Hospital, Ashfaque Memorial Hospital, Eclampse , NICV, Darul Sehat Hospital, Civil Hospital Karachi, Services Hospital, Darul Sukoon, Ibn-e-Seena Hospital, Rabia Moon Trust, Liaquat National Hospital, Aga Khan University Hospital with permission letter to the concern person of the department to allow us to collect data required for our study form their employees.

Questionnaire And Consent: The questionnaire of our study was consisted of 2 parts, first part was comprised of demographic data which included age, gender, area of work, year experience, institute, qualification, contact

number and email I'd. The second part contained 17 questions both open and close ended questions regarding the awareness and use of gross motor function measure (GMFM-66) in the professional practice of the respective physiotherapist. Inform consent was taken to make the participation voluntary in which study aim and objective were mentioned. The questions were framed into three main categories:
(1) Any tool used for assessing cerebral palsy child.
(2) Awareness of GMFM-66.
(3) Use of GMFM-66.
The survey's result was structured by using the software SPSS 23.0. Merely the key questions were chosen to concern the objective of our study. The questionnaire was self-administered and the related pilot- study was conducted among the graduated physiotherapists of institute of physical medicine and rehabilitation at Dow University of health and sciences. The time required to fill the questionnaire was likely 10-15 minutes maximum. Our study's target population contained the health professionals who had done their graduation in physiotherapy.

Results and Discussion

The data was analyzed by using the SPSS, version 23. Descriptive analysis (mean and standard deviation) was reported for age in years and median with range given for experience in years. Count and percentages were reported for gender and information on tools used in assessing cerebral palsy child. Further cross-tabulation was done with information on assessing tools. In the present study, 59.2% were female respondents, while 50% were assessed by the tool to assess cerebral palsy child, out of them 61.8% commonly used gross motor function measure (GMFM). While 23.5% used movement assessment of infants, while 14.7% used other. The mean age of the sample was 29.76 ±5.92 years and the median of the experience was 4 years with range of 27,(Table -1).

Table 1. Baseline Sample Information (n=194)

Characteristics		**N**	**%**
Gender	Male	75	40.8
	Female	109	59.2
Do you use any tool to assess cerebral palsy child?	Yes	97	50.0
	No	97	50.0
If yes then which of the following outcome measuring tool you use?	Gross motor function measure (GMFM)	42	61.8
	movement assessment of infants (MAI)	16	23.5
	Other	10	14.7
Age in Years	(Mean, SD)	29.76	5.92
Experience in Years	(Median , Range)	4	27

Our study showed that the source of getting knowledge about GMFM-66 through colleague is 30, Master Program is 38 and through internet resource is 43 whereas according to Deville *et al.,(2015)* 15% of therapists got knowledge about GMFM-66 through colleagues, 4% through Masters Program and 15% through researches. Those who haven't heard about GMFM-66 showed very positive response to get knowledge regarding this tool. Those who accepted that they have knowledge regarding GMFM- 66 among them half of population told the correct number of versions and few of them don't know. Primary purpose of the use GMFM tool by physiotherapists shown through our study is evaluation (67.5 %), diagnostic (24.8%) and prognostic (77%) whereas the study of Beckers and Bastiaenen., (2015) shows that therapists consider this tool as evaluative (85), diagnostic (7.4) and prognostic (5.6%).

Among GMFM users, 90.5% samples heard about GMFM-66. Among MAI users, 37.5% users heard about GMFM-66 , among MAI users 90% sample agreed to know about GMFM-66, in the data 36.8% users of GMFM got information on GMFM-66 from their colleagues, 83.3% MAI users got information on it in Masters program. 68.4% GMFM users said GMFM-66 has two versions, 77.8% other users did not know about the GMFM-66 versions. 71.1% GMFM users considered GMFM-66 as evaluating tool and 57.1% users of MAI considered it as diagnostic tool, only 10.5% GMFM users has certificate program regarding GMFM-66, and 28.6% MAI users attend that courses. (Table-2)

Table 2. Responses on GMFM with Measuring Tool

Characteristics		Gross motor function measure (GMFM) (n=42)		movement assessment of infants (MAI) (n=16)		Other (n=10)	
		N	%	n	%	n	%
Have you ever heard about gross motor function measure (GMFM-66)?	Yes	38	90.5	6	37.5	9	90
	No	4	9.5	10	62.5	1	10
Would you like to get knowledge / training on gross motor function measure (GMFM-66)?	Yes	4	100	9	90	2	100
	No	-	-	1	10	-	-
Through which source did you get information about gross motor function measure (GMFM) tool	Colleagues	14	36.8	1	16.7	2	22.2
	Master program	11	28.9	5	83.3	1	11.1
	Internet resources	10	26.3	-	-	6	66.7
	GMFM self-instructional training	3	7.9	-	-	-	-
How many version it has?	One	1	2.6	-	-	-	-
	Two	26	68.4	3	50	2	22.2
	Three	1	2.6	1	16.7	-	-
	Don't know	10	26.3	2	33.3	7	77.8
How do you consider gross motor function measure (GMFM-66)?	Diagnostic tool	9	23.7	3	42.9	1	11.1
	Evaluating tool	27	71.1	4	57.1	6	66.7

The total sample size of our study is 194 among those 40% were male therapists and 59% were females. Whereas in study by Beckers and Bastiaenen (2015) the sample size was 56 in which 10% were males and 89% were female therapists. The mean age included in our survey was 29.76 with year of experience of median 4. Whereas the study has median of age 39 with year of experience of median 7. Through study we came to know that half of the population doesn't use any tool and the other half is using tool for assessing CP child. Majority of the population who are using tool in their practice is GMFM-66 and few of them are using MAI or other. Our study shows that 89.5% of therapists using GMFM in their clinical practice whereas in the study by (Russell *et al.,* 2010) 80% therapists are using in their clinical practice.

Through our survey we came to know that 15.35 of physical therapists have attended conferences and workshops to gain knowledge about GMFM-66 whereas according to the researchers Deville *et al.,* 23% of physiotherapists attended seminars or conferences. We came to know that 119 out of total participants are aware about GMFM-66 and 2/3rd of them are using it in their practices whereas the study of Russell J.D *et al*., (2010) shows that 114 participants were aware among them less than half were using it clinically. Two-third of the population are not using it due to lack of availability in their institute whereas other are not using it due to lack of time and lack of knowledge, so increase in the time slot of physiotherapist involved in paeds rehab would make assessment better by using GMFM-66 as a result we can get a written state of disability of a CP child that has a good chance to decrease the cases of disabilities. The purpose of using this tool among physiotherapists is mainly in their clinical practice and very few of them are using it in teaching and research. Less than half of the population uses this tool in re-evaluation with duration of one month and one-third of them use it with duration of a week. Physiotherapists who are using this tool marked that they have found it effective and useful, some declared it very effective, few of them take it as normal and very few of them consider it as an ineffective tool and in Alotaibi M *et al., (2014)* also concluded it as an effective tool in his research.

Table 3. Responses on GMFM with Measuring Tool (Continued)

Characteristics		Gross motor function measure (GMFM) (n=42)		Other (n=10)	
		n	%		%
Reason of not using gross motor function measure (GMFM-66)?	Lack of knowledge	-	-	0	11.1
	Lack of time	-	-		22.2
	Lack of patient cooperation	-			22.2
	Lack of availability in institute	3	100	0	44.4
For which purpose have you used it?	Research	3	8.6		-
	Clinical practice	32	91.4	00	-
	Teaching	-	-		-
	Other	-	-		-
How often you use it?	Once in a week	10	28.6	0	-
	Once in a two week	6	17.1	0	-
	Once in a month	13	37.1		-
	Other	6	17.1		-
How do you find it in CP?	Very effective	12	34.3		-
	Effective	19	54.3	00	-
	Normal	3	8.6		-
	Not effective	1	2.9		-
Do you find it helpful in modifying your treatment plan by outcome of this measuring tool?	Yes	34	97.1	00	-
	No	1	2.9		-
Will you discuss it with your other colleagues?	Yes	35	100	0	-
	No	-	-	0	-
Will you use it in your future patient treatment?	Yes	34	100	00	-
	No	-	-		-
Do you encourage other physiotherapists and staff to use this evaluating tool on CP children?	Yes	35	100	00	-
	No	-	-		-

Conclusion

Our study shows that many physical therapists are aware about the GMFM-66 used in cerebral palsy child evaluation, but the results point out that many of them are not using GMFM-66 due to lack of availability or due to time consuming procedure. Therefore we can conclude that the availability and sufficient time slot for physiotherapists can turn the outcome better of cerebral palsy related disabilities.

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References

Adrienne, H. (2003).The Gross Motor Function Measure (GMFM). J.physiotherapy.63 (3).

Avery, L.M., Russell, D. J, Raina, P.S., Walter, S.D. and Rosenbaum, P.L. (2003). Rasch analysis of the Gross Motor Function Measure: validating the assumptions of the Rasch model to create an interval-level measure. Arch Phys Med Rehabil.84 (5):697–705.

Anttila, H., Roma, I. A., Suoranta, J., Makela, M. and Malmivaara, A. (2008). Effectiveness of physical therapy intervention for children with cerebral palsy:a systemic review.BMC pediatrics.24;8(4):1-10.

Alotaibi, M., Long, T., Kennedy, E. and Bavishi, S. (2014). The efficacy of GMFM 66 to detect changes in gross motor function in children with CP: a literature review. 36(8);617-27.

Beckers, L. and Bastiaenen, C .(2015). Application of the gross motor function measure-66(GMFM-66) In Dutch Clinical Practice: A survey study.BMC.15:146.

Brunton, L. K. and Barlett, D. J. (2011). Validity and reliability of two abbreviated versions of the GMFM. Physical Therapy.91(4).

Dianne, J. R. (2000). Improved scaling of the gross motor function measure for children with cerebral palsy: Evidence of reliability and validity. APTA.80:873-885.

Deville, C., Ewan, M. c. I., Arnold, H.S., Jones, M. and Zhao, Y. D. (2015). Knowledge translation of the gross motor function classification system among pediatric physical therapist. Pediatr phys ther. 27(4):376-384.

Dianne, J. R., Lisa, M. A., Peter, L. R., Parminder, S. R., Stephen, D. W. and Robert, J. P.(2000) Improved Scaling of the Gross Motor Function Measure for Children With Cerebral Palsy: Evidence of Reliability and Validity .Physical Therapy.80 (9) 873–885.

Herskind, A., Greisen, G. and Nielsen, G. B. (2015). Early identification and intervention in cerebralpalsy. Dev Med Child Neurol. 57(1):29–36.

Josenby, A. L., Jomlo, G. B., Gummesson, C. and Nordmeor, K. E. (2009). Longitudinal construct validity of the GMFM-88 total score and goal total score of the GMFM-66 score in a 5 year follow up study.Physical therapy .89(4).

Ko, J. and Kim, M. Y. (2013). Reliability and responsiveness of the gross motor function measure-88 in children with Cerebral Palsy. Phys Ther. 93(3):393-400.

Mc Carthy, ML., Silberstein, CE., Atkins, EA., Harryman, SE., Sponseller, PD. and Miller NAH.(2002). Comparing reliability and validity of pediatric instruments for measuring health and well-being of children with spastic cerebral palsy. Dev Med Child Neurol.44:468-476.

McIntyre, S., Morgan, C., Walker, K. and Novak, I.(2013). Cerebral Palsy –Don't Delay .Dev Disabil Res Rev. 17(2):114-29.

Morgan, C., Darrah, J., Gordon, A. M., Harbourne, R., Spittle, A., Johnson, A. and Fetters L.(2016). Effectiveness Of Motor Interventions In Infants With Cerebral Palsy: A Systematic review. Dev Med Child Neurol. 29;58(3).

Panteliadis, C. P., Hagel, C., Karch, D. and Heinemann, K. (2015). A Lifelong Challenge Asks for Early Intervention. Open Neurol J. 9: 45-52.

Pervin, R., Ahmed, S., Hyder, R. T., Yasmeen, B. H. N., Rahman, M. and Islam, F. (2013). Cerebral palsy-an update.NIMCJ Nor Inte Med Col Jou. 5(1):293-96.

Reid, S. M., Meehan, E., Mcintyre, S., Goldsmith, S., Badawi, N. and Reddihough, D. S. (2016). Temporal trend in Cerebral Palsy By Impairment Severity And Birth senstation.DMCN. 13; 58(2):25-353

Rathia, S., Kori, V. K, S. R. and Patel K.S.(2015). A Review On Yoga Basti . In The Management of Cerebral Palsy.PMJ.3(3).

Rahlin, M., Duncan, B., Howe, CL. and Pottinger. (2020). How does the intensity of physical therapy affect the Gross Motor Function Measure (GMFM-66) total score in HL. Children with cerebral palsy? A systematic review protocol. BMJ Open.10.;10:e036630.

Rackauskaite, G., Uldall, P. W., Bech, B. H. and Ostergaadr, J. R. (2015). Management of Cerebral Palsy Varies By Healthcare Region.DMJ.62(11).

Rosenbaum, P. L., Palisano, R. J, Bartlett, D. J., Galuppi, B. E. and Russell, D. J.(2008). Development of the gross motor function classification system for cerebral palsy. Developmental medicine and child neurology.50:249-253.

Russell, D. J., Rivard, L. M., Walter, S. D., Rosebaum, P. L., Roxborough, L., Cameron, D., Darrah, J., Bartlett, D. J., Hanna, S. E. and Lisa, M. A. (2010). Using knowledge brokers to facilitate the uptake of pediatric measurement tools into clinical practice: a before-after intervention study. Implementation science.5(92).

Shi, Wei, Wang Su-Juan, Liao Yuan-Gui, Yang Hong, Xu Xiu-Juan. and Shao Xiao-Mei.(2006). Reliability and validity of the GMFM-66 in 0-to-3 year old children with cerebral palsy.AJPM&R.85(2):141-147.

Wang, HY. and Yang, YH. (2006). Evaluating the responsiveness of 2 versions of the gross motor function measure for children with cerebral palsy.ARMD.87.