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Frequency and Associated Risk Factors of Bowel and Bladder Problem Among Children with Spastic Cerebral Palsy

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ABSTRACT

Background: Cerebral paralysis (CP) is a neuro-developmental condition starting in childhood and continuing throughout life. Bowel and bladder problems are a very common problem in children with cerebral palsy, and it affects 1 in every 5 children with cerebral palsy. **Objective:** To find out the frequency and associated risk factors of bowel and bladder problem in spastic cerebral palsy. **Methodology:** A cross-sectional survey in Peshawar was conducted including 139 participant, age 5-12 years and spasticity level I-IV with spastic cerebral palsy Data was collected using convenience sampling technique. Children with any neurological disease affecting bowel and bladder issues and children with renal and genitourinary surgery were excluded. Tools used for data collection were, Gross Motor Functional Classification System for functional limitations, and Childhood bowel and bladder dysfunction questionnaire (CBBDQ) for bowel and bladder problems in children. Data was analyzed using SPSS version 22. **Results:** The mean age of the 139 participants was 8.33±2.29 years, with 83 males and 56 females. Bowel and bladder issues affected 68.34% of the patients. Bowel and bladder problems were significantly correlated with age group, CP type, CMFCS level, speech issue, and spasticity level ($p<0.05$). However, there was no significant association between bowel and bladder problems and gender, caregiver education status, Socio-economic status, positive UTI history, toilet training, use of medications and BMI ($p>0.05$). **Conclusion:** The study concluded that there is high frequency of bowel and bladder problems in children with spastic cerebral palsy. The significant risk factors associated with bowel and bladder problems were type of CP, level of spasticity, GMFCS level, speech problem and age group.

INTRODUCTION

Cerebral paralysis (CP) is a neuro-developmental condition starting in childhood and continue throughout the life(1). Cerebral palsy is not merely a particular sickness element, it is a bunch of circumstances with changeable seriousness and shares some advance characteristics (2). Presentation of cerebral palsy can be global psychological and physical dysfunction or distant impairment of movement, perception, development, or hearing(3). Disturbance in responding, brain or behavior, lack of emotions, epilepsy and spinal cord problems can lead to the movement issues of cerebral palsy(4). It is certainly not a lonely sickness but rather a heterogeneous clinical issue coming about considering injury to the developing brain(5)

The frequency of cerebral palsy mostly exists in childhood. Records are based on people with cerebral palsy, predominantly in Australia and Europe, have discovered the prevalence of cerebral palsy ranges from 1.5 to 2.5 per 1,000 live births (8). However, prevalence rates in recent studies in the United States (9), Taiwan (10), and Egypt (11) found that more than 3 out of every 1,000 births to people living with the age of 4-48 years. Worldwide the prevalence of cerebral palsy is about 221 per 100,000 live births(6). In Pakistan the prevalence of cerebral palsy in Sindh was 5.5/1000 live birth with age group under 2 years and in KPK it was 1.22/ 1000 live birth with age group 9-10 years.(7, 8).

The main etiological factors associated with CP formation vary in terms of their relationship with the time of childbirth, these factors include congenital asphyxia, premature pregnancy, birth defects, maternal and drug abuse, internal infections, and kernicterus(5). Among the most common etiologic factor, 32.4% was Birth asphyxia followed by 26.5% prematurity(9). Preterm birth of an infant is considered as one of the significant risk factor of cerebral palsy. During birth the

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declining of the gestational age, the risk of cerebral palsy increases steadily, and from the 38th week of pregnancy, the perceptible risk increased slightly more(10).

About 70-80% of cerebral palsy children, present with characteristics of spasticity(11).General body weakness is the most important side effect present with the use of these medications which further effect the performance of cerebral palsy children(12). Urinary incontinence and fecal incontinence are most prevalent bowel and bladder issue between the presence of CP in teenagers and infants(13). Neurogenic bladder is a typical issue among kids with CP(9). Manifestations incorporate pressure incontinence, spilling, waking hours incontinence, nighttime incontinence, and urgency to void(14).

Urinary Incontinence is a usual problem which originates social discomfiture for people and seriously affects the children along with the family's social life(15). Voiding complaint was reported of Approximately 50% cerebral palsy children(15). In urinary tract symptom common most problem is Urinary incontinence which is prevalent in 20-94% range.

A study conducted in 2013 by Gökhan Gündoğdu et.al. Relationship of bladder dysfunction with upper urinary tract deterioration in cerebral palsy, stated that for the medical doctors it is difficult to protect the function of renal because of the presence of bladder dysfunction in the patients of cerebral palsy(16).

Another study conducted in 2017 by Bulent Elbasan et al. the effects of reflexology on constipation and motor functions in children with cerebral palsy claims that the problem of constipation in cerebral palsy patients can result in a decrease or limit of the volume of bladder in cerebral palsy children(17).

The bowel and bladder problem in children with cerebral palsy affect several aspect of their life as many times it is the reason for their isolation and with drawl from society. This study will explore the frequency of bowel and bladder problem in both male and female children of cerebral palsy. Also, it will help the clinicians and care givers to know about the most common risk factors for bowel and bladder problems in this population and will help them to adapt to the environment and treatment strategies to minimize the impact of these risk factors.

MATERIAL & METHODS

From February 2021 to July 2021, 139 people participated in the cross-sectional survey at Lady Reading Hospital in Peshawar, according to the epitool sample size calculation. The non-probability convenience sampling method was used to collect the data.. Inclusion criteria required participants to be, both male and female children age 5-12 years of age diagnosed spastic cerebral palsy with spasticity level 1 to 4 on modified Ashworth scale. Exclusion criteria include children with other neurological diseases influencing incontinence e.g. spina bifida, meningitis, and hydrocephalus etc. and history of genitourinary or renal surgery.

Informed consent was taken from the participant care givers explaining the purpose and procedure of the study before participation in the study. The demographic data of the participants was collected using a simple demographic questionnaire including gender, age, weight, height, and socioeconomic status of the participants. To gauge the individuals' level of spasticity, a modified Ashworth scale was employed. The gold standard clinical technique, the modified Ashworth scale, is used extensively to measure increased muscular tone and grade muscle spasticity. MAS has a 0.92 intraclass correlation value (ICC) (18). The five grades on this scale range from 0 to 4, with 0 denoting normal muscular tone and 4 denoting considerable muscle stiffness (18). Childhood bowel and bladder dysfunction questionnaire was used to assess bowel and bladder dysfunction which is 18 items questionnaire. The Cronbach alpha value for bowel and bladder sub scales is 0.74 and 0.71(19). Gross motor function classification scale was also used to assess the functional level of the children and was developed classify children with cerebral palsy on the basis of their functional abilities and limitations(20) It includes five levels, which represent difference in gross motor function development and are important in daily lives of cerebral palsy children(20). The inter-rater reliability (ICC) of the original GMFCS 0.75 for children age 2-12 years(21). All statistical analyses were performed through SPSS version 22. Descriptive statistics were used for demographics. Chi square test, independent sample t Test and ANOVA were used to find out the Association between risk factor and bowel and bladder problem.

RESULTS

The demographic data of the participant was analyzed which added great insight to the study population. The mean age of participants was 8.33 years with standard deviation 2.02 years. Among 139 participants 83 (59.71%) were males and 56 (40.29%) were females. Participants' average height was 3.72±.71 and their average weight was 24.78±7.91 kg. In terms of BMI, 13 (9.4%) were obese, 10 (7.2%) were overweight, 46 (33.1%) were normal, and 70 (50.4%) were underweight.

The socioeconomic status categorized as upper, middle, and lower showed a frequency of 12 (8.6%) as upper class, 69 (49.64%) as middle, 58(41.73%) as lower class. The education status of caregivers showed 74 (53.24%) as educated and 65(46.76%) as uneducated.

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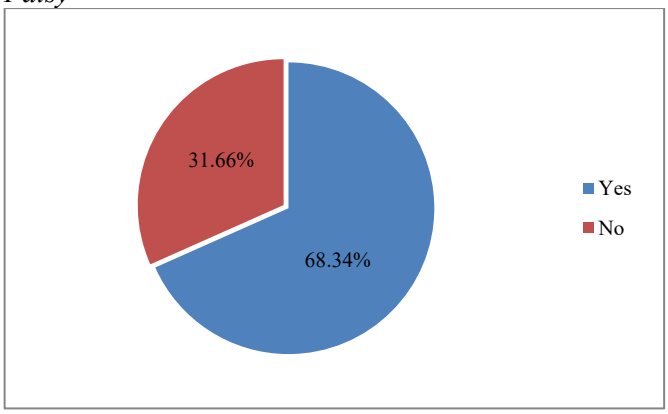
Figure 1

Frequency of Bowel and Bladder in Spastic Cerebral Palsy



The frequency of spasticity level on modified Ashworth scale was 13 (9.35%) participants with level 1, 39(28.06%) participants as level +1, 47(33.8%) participants as level 2, 31 (22.3%) participants as level 3, and 9 (6.47%) participants as level 4. The participants with GMFCS level II were 39 (28.06%), level III was 46(33.81%), level IV was 28(20.14%) and level V were 26(18.71%). The participants presenting spastic hemiplegia were 41 (29.5%), spastic diplegia 25(18.0%), spastic monoplegia was 3(2.2%), spastic triplegia 4(2.9%), and spastic quadriplegia 66 (47.5%). The participants using no medication were 7(5.0%), using anticholinergic medicine were 41(29.5%), using anticonvulsant medicine were 66(47.5%), using urologic medicine were 10(7.2%) and using antispastic medicine were 15(10.8%).

Similarly, there was no significant association between CBBDQ and is your child trained to use toilet (p=0.985). The analysis showed that there is no association between CBBDQ and speech problem (p=.006).(Table 1)

Table 1

Association of Toilet Training and Speech Problem with CBBDQ scores

		CBBDQ scores		p-value
		Mean	SD	
Is your child trained to use toilet?	Yes	47.15	8.14	0.985
	No	47.19	11.33	
Does your child have speech problem?	Yes	49.62	7.96	0.006
	No	44.07	11.11	

The independent test was used to determine association between CBBDQ and age group of the study population, according to which the .score of CBBDQ for age group 5-8 years was greater than for the age group 9-12 years and the difference was statistically significant (p<0.01). likewise, the mean score of CBBDQ for both male and female was non-significant and the mean score of CBBDQ was also non-significant for education status of caregivers i.e., educated vs uneducated (p=0.241) (table 2).

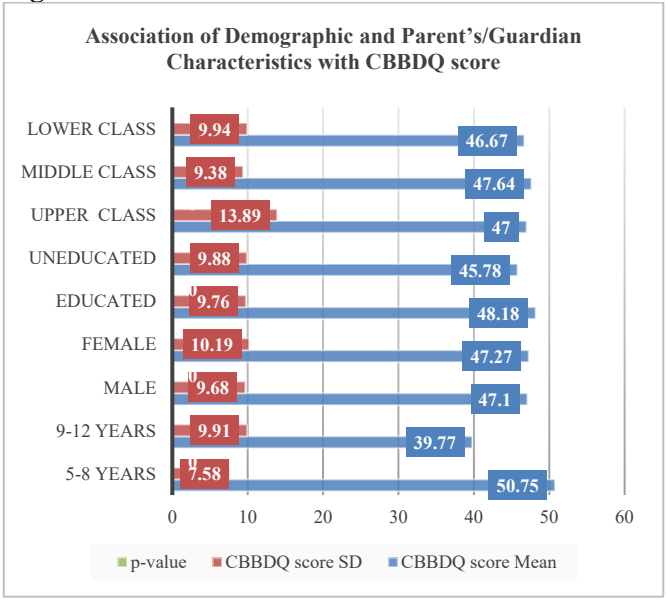
Table 2

Association of Demographic and Parent's/Guardian Characteristics with CBBDQ score

Variable		CBBDQ score		p-value
		Mean	SD	
Age group	5-8 years	50.75	7.58	0.000**
	9-12 years	39.77	9.91	
Gender	Male	47.10	9.68	0.936**
	Female	47.27	10.19	
Guardian/Caregiver Education Status	Educated	48.18	9.76	0.241**
	Uneducated	45.78	9.88	
Socio-economic Status	Upper class	47.00	13.89	0.898¶
	Middle class	47.64	9.38	
	Lower class	46.67	9.94	

** Independent test, ANOVA

Figure 2



Analysis showed that there was no significant association of CBBDQ and spastic hemiplegic and spastic triplegic type of cerebral palsy(p>0.05). However, results showed significant association between CBBDQ and spastic diplegic and spastic quadriplegic type of cerebral palsy (p<0.05). There was statistically significant association of GMFCS and spasticity level with CBBDQ (p<0.05) while no significant association between use of medication and CBBDQ (p>0.05). (Table 3)

Table 3

Association of types of CP, GMFCS, MAS and use of Medication with CBBDQ score

Type of Spastic CP		CBBDQ score		p-value
		Mean	SD	
Spastic Hemiplegia	No	47.82	9.66	0.240
	Yes	45.00	10.30	
Spastic Diplegia	No	48.28	8.65	0.014
	Yes	41.69	13.34	
Spastic Triplegia	No	47.42	9.66	0.241
	Yes	41.50	13.53	
Spastic Quadriplegia	No	43.40	11.65	0.001
	Yes	50.15	6.87	
Gross Motor Function	Level II	38.68	7.87	0.000
	Level III	45.44	10.20	

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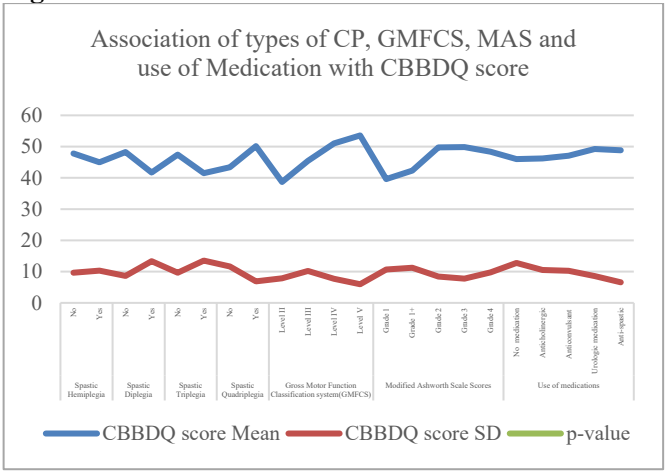
Classification system(GMFCS)	Level IV	51.00	7.69	
	Level V	53.57	5.97	
Modified Ashworth Scale Scores	Grade 1	39.63	10.66	0.005
	Grade 1+	42.33	11.25	
	Grade 2	49.76	8.45	
	Grade 3	49.84	7.76	
	Grade 4	48.38	9.75	
Use of medications	No medication	46.00	12.79	0.907
	Anticholinergic	46.19	10.54	
	Anticonvulsant	47.07	10.26	
	Urologic medication	49.22	8.58	
	Anti-spastic	48.82	6.57	

Figure 3



The link between CBBDQ and BMI cutoffs was examined using ANOVA, and the findings indicated that there was no significant correlation between CBBDQ and any of the BMI categories—underweight, normal, overweight, and obese (p=0.723) (Table 4).

Table 4

Association of BMI cut-offs with CBBDQ score

		CBBDQ score		p-value
		Mean	SD	
BMI cut-offs	Underweight	46.07	11.50	0.723
	Normal	48.24	7.96	
	Overweight	45.67	10.71	
	Obese	48.78	8.71	

DISCUSSION

The current study reports that there is high frequency of bowel and bladder problems in children with spastic cerebral palsy. Similarly another study conducted by kharrat Dr et.al in 2015 also reported high frequency of urinary problem in children with cerebral palsy(22). Likewise, another study conducted by Emmanuel et.al in 2013 also reported that the urinary problems are highly frequent in children with all types of cerebral palsy(23). Christina M. Marciniak, MD et.al in 2012 stated that bowel and bladder related symptoms are more frequent and affect the quality of life in children with cerebral palsy(24)

The present study reported that there was significant association between bowel and bladder problem and age of participants similarly another study conducted by A.J wright in 2016 that most of incontinent children become continent at the age of 5 years and there is no association between these two, the participants of this study were followed from the age of 15 months to the age of 17 years and the questionnaires were filled by parents at 2,3,7, and 17 years of age. And control group was used for comparison (25) .

The current study reported that most patient who had bowel and bladder problem had spasticity level III and showed statistically significant association with bowel and bladder problem likewise, another study conducted by Bieke Samijn et al. in 2017 reported that spasticity is significantly associated with bowel and bladder problem in children with cerebral palsy especially in the diplegic cerebral palsy children(26). Another study reported that there is significant association among spasticity and bladder control and by reducing spasticity bladder storage characteristics can be increased(27). Similarly, another study conducted by Awan, WA et.al in 2019 reported that increased in the level of spasticity is associated with decrease in defecation frequency which is consistent with the findings of the current study(28).

Toilet training is a fundamental milestone for both parents and children as it lets the youngster to change to a more independent phase of life. Toilet training in the present study was not associated significantly with bowel and bladder dysfunctions. Initial toilet training has sharp benefits, although it needs cultural norms and time that do not impose youngsters to urinate or defecate in a toilet. Another study conducted by RH Largo, also reported that there is no significant association between toilet training and bowel and bladder problem (29). Likewise, another study conducted by A.Richard et.al stated that almost half of the cerebral palsy patients achieve bowel and bladder continence and are able to be toilet trained later than life than typically developing children(30).

The results from the current study showed that patient with GMFCS level IV more frequently suffer from bowel and bladder dysfunction and there is significant association between GMFCS and bowel and bladder dysfunction. likewise, another study conducted by S ÜNSAL, C Culha et.al in 2009 stated that there is significant association between bowel and bladder and GMFCS and greater the severity of disability greater is the bowel and bladder dysfunction(31). Impaired mobility increases the time it takes to approach the bathroom, and children beside GMFCS levels V and IV have less ambulation choices, demonstrating a higher chance of incontinence, which is consistent with the conclusions of this study(32)

The current study reported that there is a significant association between bowel and bladder problem and speech problem. Similarly, another study conducted in 2009 by Richardson et.al also reported that children who

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are able to communicate are continent when compared to children who are not able to communicate however the finding of this study was based on objective measure rather than subjective measure the current study (33).

The current study reported that there is no significant association between bowel and bladder problem and BMI, which is supported by the finding from the study of Awan WA et.al reported that there is no significant association between BMI and defecation frequency(28). Similarly, another study conducted by Thomas W et.al in 2018 also reported that there is no significant association between BMI and bowel and bladder problem in children with cerebral palsy(34).

CONCLUSION

The study concluded that there is a high frequency of bowel and bladder problems in children with spastic cerebral palsy. The significant risk factors associated with bowel and bladder problems were type of CP, level of spasticity, GMFCS level, speech problem, and age group. However, gender, guardian/caregiver education status, socio-economic status, Positive UTI history, toilet training, use of medications and BMI cut-offs showed no association with bowel and bladder problems.

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