DISABILITY, CBR & INCLUSIVE DEVELOPMENT

Original Research Article

Investigation of Spoon-feeding Skills in Children with Cerebral Palsy and Typically Developing Children: A Comparative Study

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ABSTRACT

Aim: Mastering spoon feeding is a key developmental milestone typically achieved by age two, yet evidence comparing these skills between children with CP and typically developing (TD) peers is scarce, particularly in socio-culturally diverse contexts like India. This study aimed to compare spoon-feeding skills, including utensil use, in children with CP and TD children.

Methods: A validated questionnaire was developed to assess positioning, spoon characteristics (handle length, bowl depth), placement, normal/abnormal oral motor patterns, reflexes, and mealtime behaviours. Video recordings of naturalistic spoon-feeding sessions from 17 children with CP and 22 age-matched TD children (2-10 years) were analysed. The data were subjected to statistical analysis using chi-square tests.

Results: Significant inter-group differences were found in positioning, spoon characteristics, and spoon placement. All normal patterns except for maintained lip closure during swallowing differed significantly. Significant abnormal patterns included suckle-swallow, anterior spillage, head extension, tongue protrusion, and clearing with teeth. Mealtime problem behaviours did not differ significantly.

Conclusions: This study profiles distinct spoon-feeding patterns in children with CP versus TD children. These findings underscore the need to target these specific skills during feeding therapy for the CP population.

Limitations: The generalizability of findings is limited by the small sample size. Future research should explore regional variations within India and investigate how food consistency influences spoon placement.

Keywords: India, developing nation, utensil, culture, practice, CP, TD

INTRODUCTION

A child's feeding development is a gradual process marked by several milestones. These include breast or bottle feeding, followed by eating from a spoon, biting and chewing and drinking from a cup or a straw. Initially, feeding is a joint activity between the parent and the child. However, as the child grows, independent feeding gradually

takes over. The feeding process is further influenced by several factors, such as caregiver demandingness/ responsiveness (Patrick et al., 2005), the child's receptiveness, the type of utensils, and the foods provided.

Spoon feeding emerges as one of the early feeding skills in infants, typically appearing during the first months of life. Between 5 and 7 months, infants begin to learn to obtain semi solid food from a spoon, progressing to the point where, by 8 months, they can efficiently remove food from the spoon by coordinating movements of their upper lip (i.e. upper lip moves down to spoon) and lower lip (i.e. lower lip moves inwards), as documented by Pridham (1990). Between 9 and 18 months, self-feeding using a spoon emerges, where children initially typically use a palmar grasp to hold a spoon, progressing to a digital grasp and an inverted wrist, and gradually learning to supinate the forearm (Negayama, 1993; Schuberth et al., 2013; van Roon et al., 2013). By the age of 24 months, infants typically develop the ability to feed themselves from a spoon with coordinated tongue movements to clear their lips (Willging et al., 2020). A study by Van den Engel-Hoek (2014) on 39 healthy infants in the Netherlands and Germany found that the acquisition of spoon feeding took 5.7 weeks (SD 2.1). Toyama and Ogiwara (2019) analysed spoon manipulation in 5-year-old children and adults eating curry and rice. It was found that infants' operations were monotonous, in comparison to adults, who could gather, shape, and balance curry sauce and white rice. In essence, adequate spoon feeding necessitates the stabilisation of the jaw, the capacity of the upper lip to descend and clear the spoon, the lower lip to provide stability under the spoon, and the development of mature tongue movements to transfer food or liquid efficiently.

Feeding development can be impaired due to structural deficits, sensory processing disorders, gastrointestinal issues, prematurity, developmental delays, neurological conditions, metabolic factors, behavioural factors, psychological factors, environmental factors, and medical conditions (Overland, 2011; Prathima et al., 2015; Ramos et al., 2017). Cerebral palsy (CP) is one of the neurological conditions that can hinder feeding development. CP is a group of non-progressive conditions that affects motor control, range, strength, and coordination (Smithers-Sheedy et al., 2013; Benfer et al., 2014). Oropharyngeal dysphagia affects 85% of preschool children with CP, affecting motor and sensory abilities (Benfer et al., 2013).

Gisel et al. (2000) reported that children with CP and TD significantly differed on all skills, including spoon feeding ability, using the Functional Feeding Assessment- modified (FFAm, Kenny et al., 1989; Gisel, 1994). The FFAm consists of eight domains of feeding, namely spoon feeding, biting, chewing, cup drinking, straw drinking, swallowing, associated movements and drooling during eating. Associated oral motor behaviours for each feeding domain are categorised as either "normal" or "abnormal" patterns. The competence scores (%) of normal and abnormal patterns of each feeding domain were compared between groups. Results showed significant differences in competence scores in spoon feeding (normal and abnormal), biting (normal), cup drinking (normal), and swallowing (abnormal). It was found that in the normal patterns of spoon feeding, controls had a higher competence (99.0 ± 2.0) than the CP group (93.0 ± 12.0). In the abnormal patterns, the control group had a higher competence (100.0 ± 0.0) than the CP group (91.0 ± 11.0).

Selley et al. (2000) reported a 78% malfunction in the anticipatory phase, 61% with incompetent lips, 46% exhibiting uncontrolled jaw movements, and 39% displaying poor head posture in the delivery phase. Children with CP had a fourfold increase in the duration of lip-to-spoon contact compared to typically developing children. Over 50% of children with CP required multiple swallow attempts, and 68% exhibited abnormal tongue function.

Yilmaz et al. (2004) studied functional eating abilities in individuals with CP aged 4 to 25. They reported that the lowered spoon-feeding score in the moderate to severe younger group was due to the continuance of a suckle-swallow pattern and mothers' inclination to slant the spoon into their children's mouths without allowing them to utilise their lips. Individuals with CP were also unable to draw the upper lip down and forward over the spoon and pull the lower lip inward. The most affected skills were the ability to keep the lips closed, to move food and liquids to the back of the mouth, and to maintain a closed lip position during swallowing. Individuals in the severe group frequently lost liquids and food. An impaired oral phase can lead to poor growth and nutrition, premature spillage, piecemeal deglutition, and oral residue, all of which can affect mealtime safety (Benfer et al., 2014).

In the Indian context, Gangil et al. (2001) stated that 14% of the caregivers observed a lack of lip closure around a spoon during feeding. Prathima et al. (2015) investigated eating challenges in 74 children with CP (age: 1.2 to 9.6 years). They reported that feeding problems affected 63.5% of the children, and difficulty with self-feeding using a spoon was observed in 72.85% of the children with CP.

However, studies investigating and profiling the spoon-feeding skills in terms of position adopted during spoon feeding, spoon characteristics and placement, along with the skills involved in spoon feeding in children with CP, are sparse. Such studies in Indian children with CP are also limited. Since there may be socio-cultural variations in feeding practices across different countries, conducting such studies in India can provide valuable insights into the spoon-feeding patterns of Indian children with CP and TD children. By conducting research that directly compares spoon usage and feeding patterns in children with CP and TD children in India, SLPs can gain important insights regarding the choice of intervention strategies to improve feeding outcomes in the clinical population. Such studies will also help in developing treatment programs that will address the specific spoon-feeding difficulties in these children. This study aimed to compare spoon-feeding skills in children with CP with those of TD children.

METHODS

Ethical approval

This study was conducted in line with the principles outlined in the Declaration of Helsinki. The study was granted approval by the Institutional Review Board of of the All India Institute of Speech and Hearing (SH/IRB/M.1-12/2024-25, dated 23 December 2024). Consent to participate in the study was obtained in advance from the legal guardians of all participants.

Development of the Questionnaire

A questionnaire was developed to identify all aspects related to spoon feeding. This was based on the existing books and internet sources. The questionnaire was organised under seven different sections, namely (i) demographic details, (ii) body position during spoon feeding, iii) spoon characteristics, iv) placement of spoon, v) normal patterns of spoon feeding, vi) abnormal patterns during spoon feeding and (vii) mealtime problem behaviours exhibited, if any, during spoon feeding. The section on spoon characteristics included the material and dimensions of the spoon. The Placement of Spoon section documented the positioning of the spoon in the child's mouth. The Normal and Abnormal Patterns During Spoon Feeding section categorised appropriate (e.g., lip closure on the spoon) and inappropriate (e.g., suckle-swallow reflex) oral motor feeding behaviours exhibited by the child. The final section, Mealtime Problem Behaviours, identified any problematic reactions to spoon feeding. However, as the analysis was based on video

recordings, it may not fully represent the child's typical response to spoon feeding at home.

The questionnaire was content-validated for appropriateness, coverage of related parameters and rating scale by four expert Speech-Language Pathologists with more than five years of experience in the area of paediatric feeding disorders, using a 5-point rating scale (1 indicates 'very poor', two indicates 'poor', 3 indicates 'fair', 4 indicates 'good' and 5 indicates 'excellent'). The questionnaire was rated to have good to excellent appropriateness and coverage of parameters by all four validators. Since there were no suggested changes, the final checklist consisted of 52 items (5 related to demographic details, three related to feeding position, five related to spoon characteristics, one related to spoon placement, 14 related to normal patterns, 15 related to abnormal patterns and nine related to mealtime problem behaviours). The ratings used in the questionnaire were similar to those used in FFAm. The normal patterns were rated as adequate, poor, absent, or unable to determine. The abnormal patterns were rated as absent, inconsistent, present or unable to determine. Mealtime problem behaviours were rated as either present or absent. Items such as the position of a spoon in the mouth, its material, and its dimensions were documented after viewing the video.

Participants

Spoon-feeding of seventeen children with CP, aged 2-10 years, was video recorded for analysis. For comparison, twenty-two spoon-feeding videos of TD children who were age and gender matched to the clinical group were also recorded, forming the control group. TD participants were screened using the WHO 'Ten Questions Screen' checklist (Singhi et al., 2007) to exclude those with seizure disorders or hearing, vision, motor, speech, or cognitive impairments. The participants in the clinical group were selected through convenience sampling from patients referred to the Centre for detailed feeding and swallowing evaluation. In contrast, those in the control group were recruited from in and around Mysuru.

Setting

All assessments were conducted in a quiet room at our Centre.

Procedure

For all participants, the parent or caregiver was instructed to spoon-feed their child using their customary food/liquid, usually fed with a spoon, bringing their regular utensils and maintaining their typical feeding position to replicate natural feeding conditions. The testing duration was approximately 15 minutes, and the testing was completed in a single day. The entire session was video recorded using a Sony Handycam model HDR-PJ540E.

Analysis

Two of the researchers (first and second authors) jointly analysed all the videos for all sections of the developed questionnaire. The data were tabulated and were subjected to further statistical analysis using IBM Statistical Package for Social Sciences (SPSS) software (Version 25). The chi-square test was used to check if there was a significant difference between the groups for each parameter. To assess inter-rater reliability, videos of 10% of the sample from each group were analysed and rated by five different speech-language pathologists. This data was then tested for reliability, and Cronbach's alpha was derived.

RESULTS

The results obtained for each section of the developed checklist are summarised below.

Demographic Characteristics of the Study Participants

The study included children aged 2-10 years, with nearly comparable age distributions in both groups, with a majority (66.7% CP, 60.9% TD) falling within the 2-5.11 years age range. Both groups showed comparable gender distributions, with males representing 55.6% of the CP group and 56.5% of the TD group.

Notable differences were found in feeding independence, where 94.1% of children with CP were dependent feeders compared to 100% independence in the TD group (χ^2 = 41.0, $p < 0.001$). Food consistency preferences also differed significantly between groups: semisolids were most common in the CP group (58.8%), while solids predominated in the TD group (56.5%). Both groups included all three food consistencies (liquids, semisolids, and solids) in their spoon-feeding repertoire, though liquid consumption was relatively low in both groups (CP: 11.8%, TD: 13.0%) [see Table 1].

Table 1: Demographic Details of the Participants

Demographics		Group	
		CP (in %)	TD (in %)
Age	2 to 5.11 years	66.7	60.9
	6 to 10 years	33.3	39.1
Sex	Male	55.6	56.5
	Female	44.4	43.5
Feeding dependency	Independent	5.9	100.0
	Dependent	94.1	0.00
Food consistency	Liquid	11.8	13.0
	Semisolid	58.8	26.1
	Solid	29.4	56.5

Body posture during spoon feeding

The chi-square test revealed significant differences between the feeding posture of neurotypicals and children with CP ($p < 0.01$) during spoon feeding [see Table 2].

Among TD children, 91.3% maintained an upright head position and 95.7% an upright trunk position. However, in children with CP, this postural control was less common, with 44.4% and 66.1% maintaining upright head and trunk position, respectively. The most pronounced difference was in hip positioning, where only 27.8% of children with CP demonstrated proper hip flexion with buttocks back in the seat compared to 100% of TD children.

Table 2: Comparison of Body Posture during Spoon feeding between Children with CP and TD Children

Parameter		Group		Chi-square
		CP (%)	TD (%)	(N, df)
Head position	Upright	44.4	91.3	10.710 (41,1)**
	Others(Upright/Forward/ Backward/Sideways/ Variable/Inconsistent)	55.6	8.7	

Trunk position	Upright	61.1	95.7	7.671 (41,1)**
	Others (Upright/Forward/ Backward/Sideways/ Variable/Inconsistent)	38.9	4.3	
Hips flexed, buttocks back into the seat	Yes	27.8	100.0	24.323 (41,1)***
	Others (No/Not sure)	72.2	0.0	

Note.
**<0.01; ***0.000

Spoon characteristics

The two groups exhibited similar trends in spoon characteristics, such as material, handle size, and handle thickness. In both groups, children used steel spoons with long (adult-sized) and thin handles. However, other features, such as spoon size and bowl depth, differed between the groups. Children with CP tended to be fed using teaspoons with shallow bowls, while TD children used tablespoons with deeper bowls during spoon feeding.

The chi-square test revealed a significant difference ($p < 0.05$) in handle length and bowl depth ($p = 0.000$) of the spoon between groups [see Table 3].

Table 3: Comparison of Spoon Characteristics Used during Feeding between Children with CP and TD Children

Parameter		Group		Chi-square (N, df)
		CP (%)	TD (%)	
Spoon material	Plastic	0.0	4.5	0.793 (41,1)
	Steel	100	95.5	
Spoon size	Teaspoon (5ml)	70.6	18.2	0.681 (41,1)
	Tablespoon (15ml)	29.4	81.8	
Spoon handle length	Short (child-sized)	41.2	13.6	3.815 (41,1)*
	Long (adult-sized)	58.8	19	
Spoon handle thickness	Thin	88.2	81.8	0.303 (41,1)
	Thick	11.8	18.2	
Spoon bowl depth	Shallow	94.1	31.8	15.384 (41,1)***
	Deep	5.9	68.2	

Note. *<0.05; **<0.01; ***0.000

Spoon placement

Children with CP frequently used inadequate spoon placement techniques, such as placing the spoon between the teeth, scraping against the upper lip and teeth, or dumping food into the mouth. In contrast, TD children demonstrated better placement, with 45.5% positioning the spoon correctly on the lower lip or anterior tongue compared to only 17.6% in the CP group.

However, despite this observed trend, the chi-square test did not reveal a statistically significant difference in spoon placement between the groups (p = 0.06) [see Table 4].

Table 4: Comparison of Spoon Placement during Feeding in Children with CP and TD Children

Spoon Placement	Group		Chi-square (N, df)
	CP(%)	TD(%)	
On the lower lip/ anterior tongue	17.6	45.5	3.33 (41,1)
Others (between teeth/ scrape on upper lip or teeth/ dumping in mouth)	82.4	54.5	

Normal Spoon-Feeding Patterns

Analysis of normal spoon-feeding patterns revealed significant differences between children with CP and TD children. While TD children demonstrated adequate performance (>90%) in most feeding patterns, four specific skills showed lower proficiency: bringing the upper lip down and forward over the spoon (54.5%), pulling the lower lip inward under the spoon (59.1%), keeping lips closed during swallowing (68.2%), and clearing excess food off lips with tongue (45.5%).

In contrast, children with CP showed markedly impaired performance across all normal feeding patterns. Only two skills - alerting to the spoon (70.6%) and jaw closing (64.7%) - were adequate in more than half of CP cases, while most other skills were either emerging or absent in the majority of participants.

Chi-square analysis demonstrated statistically significant group differences ($p < 0.05$) for all oral motor skills except maintaining lip closure during swallowing ($\chi^2 = 3.819$, $p > 0.05$) [see Table 5].

Table 5: Normal Patterns Exhibited during Spoon-feeding in Children with CP and TD Children

Parameter	CP (%)			TD (%)			χ^2
	Adequate	Emerging	Absent	Adequate	Emerging	Absent	
Alerting to spoon	70.6	17.6	11.8	100	-	-	7.422*
Holds head steady, slightly forward in midline	52.9	11.8	35.3	95.5	-	4.5	9.893**
Bring the head forward to the spoon	41.2	11.8	47.1	95.5	4.5	-	14.938 **
Graded jaw opening	17.6	64.7	17.6	95.5	4.5		24.597***
Keeps tongue still on the floor of the mouth	35.3	17.6	47.1	100	-	-	19.828***
Bring the upper lip forward and down over the spoon	5.9	23.5	70.6	54.5	18.2	27.3	10.845**
Pulls the lower lip inwards under the spoon	-	5.9	94.1	59.1	22.7	18.2	22.597***
Holds jaw stable	23.5	52.9	23.5	90.9	9.1		18.789***
Keeps lips closed during swallowing	47.1	11.8	41.2	68.2	18.2	13.6	3.819

Jaw closing	64.7	23.5	11.8	100	-	-	9.176*
Normal swallow	17.6	23.5	58.8	100	-	-	28.264***
Clears excess food off the lips with the tongue	-	-	100	45.5	4.5	50	11.839**
Head - jaw dissociation	29.4	58.8	11.8	95.5	4.5	0	18.879***

Note. *<0.05; **<0.01; ***0.000

Abnormal Spoon-feeding Patterns

Children with CP exhibited significantly higher frequencies of abnormal spoon-feeding patterns compared to TD children. In the CP group, suckle swallow (82.4%), anterior spillage (70.6%), and head extension (41.2%) were prevalent (>40%), while bites spoon (29.4%), jaw assist to clear (29.4%), and tongue protrusion (29.4%) occurred in approximately 30%. In contrast, the TD group showed high rates of bite of the spoon (45.4%) and clearings with teeth (50%), with jaw assisting to clear (27.3%) occurring at a similar frequency to the CP group. Notably, patterns such as gag (CP: 5.9%; TD: 4.5%), jaw assist to clear (CP: 29.4%; TD: 27.3%), and chin tuck (CP: 11.8%; TD: 10%) did not differ significantly between groups.

Chi-square test revealed statistically significant differences for suckle swallow and anterior spillage ($p=0.000$), head extension ($p<0.01$), tongue protrusion and clears with teeth ($p<0.05$) [see Table 6].

Table 6: Frequency of Abnormal Spoon-Feeding Patterns in Children with CP and TD Children

	Parameter	CP (%)		TD (%)		χ^2
		Absent	Present	Absent	Present	
Spoon feeding	Suckle swallow	17.6	82.4	95.5	4.5	24.529***
	Bite reflex	88.2	11.8	100	-	2.728
	Bites spoon	70.6	29.4	54.5	45.4	1.043
	Gag	94.1	5.9	95.5	4.5	0.035
	Jaw thrust	100	-	100	-	-
	Force jaw abduction	94.1	5.9	100	-	1.328
	Jaw clench	100	-	100	-	-
	Jaw assist to clear	70.6	29.4	72.7	27.3	0.22
	Lip retraction	94.1	5.9	100	-	1.328
	Anterior spillage	29.4	70.6	86.4	13.6	13.142***
	Tongue thrust	94.1	5.9	100	-	1.328
	Tongue protrusion	70.6	29.4	95.5	4.5	4.555*
	Clears with teeth	82	18	50	50	4.362*
	Head extension	58.8	41.2	95.5	4.5	7.892**
	Chin tuck	88.2	11.8	90	10	0.074

Note. *<0.05; **<0.01; ***0.000

Mealtime Problem Behaviours

The analysis revealed distinct patterns of mealtime problem behaviours between the two groups. Among children with CP, messy eating was the most prevalent behaviour (76.5%), followed by head turning away from food and lack of interest during mealtimes (11.8% each), and spitting food (5.9%). In contrast, TD children primarily exhibited distractive feeding (e.g., using phones) and getting out of their seats (4.5% each). Notably, several behaviours (crying/screaming, throwing food/utensils, and falling asleep) were absent in both groups.

While observable differences existed in the frequencies of certain behaviours between groups, chi-square tests indicated no statistically significant differences ($p > 0.05$)in any of the mealtime problem behaviour parameters [see Table 4].

Table 7: Frequency of Mealtime Problem Behaviours during Spoon feeding in Children with CP and TD Children

Parameter	Spoon feeding				χ^2
	CP (%)		TD (%)		
	Present	Absent	Present	Absent	
Head turn	11.8	88.2	-	100	2.72
Cries or screams	-	100	-	100	-
Spit food	5.9	94.1	-	100	1.32
Throws food and utensils	-	100	-	100	-
Get out of the seat	-	100	4.5	95.5	0.79
Lack of interest	11.8	88.2	-	100	2.72
Messy eater	23.5	76.5	-	100	5.76
Falls asleep	-	100	-	100	-
Distractive feeding	-	100	4.5	95.5	0.79

Reliability

To evaluate the reliability of the newly developed questionnaire, Cronbach's alpha was calculated. The overall alpha coefficient was .979, indicating a very high level of internal consistency between items.

DISCUSSION

This study aimed to compare spoon-feeding skills in children with cerebral palsy (CP) and typically developing (TD) children, providing insights into the variations in feeding patterns and the challenges in children with CP. The results highlight significant differences between the two groups across multiple parameters of spoon feeding: body posture, spoon characteristics, and normal and abnormal patterns.

Proper postural alignment is crucial for effective swallowing and oral motor skills (Overland, 2011; Prathima et al., 2015). The findings demonstrated that most TD children maintained their optimum position. A few did not maintain adequate head-trunk position despite mature sitting because of their behaviour to stoop and eat. Children with CP were often fed in a supine position by their caregivers as this position reduces gravity, minimises abnormal reflexes, and allows caregivers easier access to feeding. However, this position poses a significant risk for the aspiration of food (Arvedson & Brodsky, 2020).

The consistency of food consumed using the spoon varied. Semi-solid consistencies predominated in the CP group's diet due to safety considerations, as these textures pre-

sent lower aspiration risk for children with unmastered chewing skills. Spoon feeding of liquids was also used, as this method allows better volume control compared to cup drinking, thereby reducing choking hazards. Within the Indian cultural context, spoon feeding of solid foods was commonly observed in the TD group, particularly for rice-based preparations such as lemon rice and khichdi, which are traditionally consumed with a spoon or hands.

The analysis of spoon-related characteristics, including material, size, handle dimensions (length and thickness), and bowl depth, revealed significant differences between groups, particularly in handle length, bowl depth, and placement. While the majority of Indian caregivers in both groups used steel spoons (both teaspoons and tablespoons), the suitability of these utensils varied based on the child's feeding abilities. TD children could adapt their oral structures to accommodate adult-sized spoons, but children with CP often struggled to clear food efficiently from larger tablespoons, leading to spillage and incomplete intake. Notably, spoon handle and thickness did not play a significant role for children with CP, as they were dependent feeders relying on caregiver assistance. However, bowl depth emerged as a critical factor: caregivers of children with CP predominantly used shallow-bowled spoons, whereas those in the TD group favoured deeper bowls. Using a shallow spoon promotes active cheek and lip movements (Alexander, 1987). These findings underscore the importance of spoon selection in clinical counselling for caregivers of children with CP. Educating families about adaptive spoons could lead to greater independence and self-confidence in children with CP.

Spoon placement patterns observed in both groups included positioning between the teeth, on the tongue, scraping along the upper lip/teeth, and placement on the lower lip. While the recommended ideal placement is on the lower lip or anterior tongue (Stainback et al., 1976; Hall, 2001), TD children frequently exhibited non-optimal techniques such as scraping the spoon against the teeth or placing it between the upper and lower incisors. These suboptimal patterns among TD children may reflect learned behaviours acquired through home feeding practices. Notably, carers of children with CP also utilised similar placements, as many children with CP had difficulties in using their lips to clear the spoon. This likely stems from compensatory strategies adopted due to the children's impaired lip function, which hinders effective spoon clearance. The persistent use of improper techniques may exacerbate spoon-feeding difficulties over time (Almond et al., 1994; Arvedson et al., 2020). Both the CP and TD groups used wrong spoon placements, and this could be the primary reason why a significant difference was not found between the TD and CP groups for spoon placements. The absence of a significant difference in spoon placements between the TD and CP cohorts can be primarily attributed to the observation that both groups employed inappropriate spoon placements, as described.

Most TD children exhibited normal feeding patterns, including graded jaw opening, lip movements, and normal swallowing during spoon feeding. Interestingly, only half of the TD children exhibited adequate lip movements on the spoon and cleared excess food from their lips using the tongue. This deviation from expected patterns was because many children ate from spoons by scraping on their teeth or lips, which restricted their need to use upper and lower lip movements as specified in the assessment tool, and most of the children cleared excess food from their lips using their teeth. In contrast, children with CP showed deficits in these areas, corroborating existing evidence of impaired oral motor coordination, lip movements and jaw stability in children with CP (Andrews et al., 2012; Benfer et al., 2013; Yilmaz et al., 2004). The prevalence of TD children clearing using teeth versus lips for spoons could be examined by using various food consistencies for each child in future studies.

The CP group demonstrated higher frequencies of abnormal patterns compared to the TD group, including suckle-swallow, anterior spillage, tongue protrusion, clearing with teeth, and head extension. This aligns with reported literature (Bahr, 2003; Bebayal et al., 2024; Ganz, 1988; Sheppard, 1964). While these patterns are well-documented in CP populations (Bahr, 2003; Ganz, 1988), their presence in some TD children (4.5-13.6%) suggests potential undiagnosed oral myofunctional disorders (Merkel-Walsh, 2020). Other patterns like gagging and jaw-assisted clearing (which also implies using the teeth for clearing) and chin tuck occurred comparably in both groups. The gagging could be due to a dislike of the food, fear of the food due to a history of force feeding, or hypersensitivities to the spoon or texture properties of food (Ernsperger & Stegen-Hanson, 2004). Jaw-assisted clearing and chin tuck could be compensatory strategies adopted in the CP group (Gellert-Jones, 2020) and learned behaviours in TD counterparts.

Interestingly, no significant differences between-group differences emerged in mealtime problem behaviours. TD children were distracted or left their seats, potentially due to sensory preferences or typical developmental restlessness (Little et al., 2017; Fathima et al., 2024). Conversely, children with CP exhibited behaviours like messy eating, lack of interest, spitting food, turning head away and sleeping during feeding, likely stemming from motor impairments or negative feeding histories (Reilly, 1993; Serel Arslan et al., 2018).

In conclusion, this study demonstrates significant differences in spoon-feeding skills between children with CP and TD children. It underscores the importance of understanding these differences to tailor interventions that can enhance feeding outcomes for children with CP. Additionally, the research reveals that various factors, such as feeding positions and spoon characteristics, substantially influence feeding efficacy. Notably, the presence of certain atypical patterns in both groups suggests that clinical diagnoses of feeding disorders should not rely solely on normative benchmarks but rather incorporate comprehensive functional assessments. Overall, this study contributes valuable insights that have direct implications for therapeutic practice to enhance the feeding experiences of children with neurodevelopmental disorders.

Limitations and Future Research

This study was limited by its retrospective design and small sample size, which may restrict the generalizability of the findings. Additionally, cultural differences in feeding practices across various states of the country were not explored, which could influence feeding behaviours and utensil use. Future research should focus on studies with larger samples and include diverse populations to better understand the interplay of cultural factors and feeding development in children with CP. Future studies could be carried out to investigate what factors the placement of the spoon changes, such as food consistencies or types of spoons.

Data Availability Statement

The data will not be shared due to ethical concerns. Only the output of data analysis is made publicly available for readers.

Statements & Declarations

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entity with any financial interest or non-financial interest in the subject matter or materials discussed in this manuscript.

Author Contributions

KBJ and MK are responsible for the conception of the study. Data acquisition and analysis were performed by KBJ and MK. The method section of the manuscript was written by MK, and the introduction and discussion sections were written by KBJ. NS edited the manuscript critically and reviewed the final manuscript.

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