

# Efficacy of a Low-cost Multidisciplinary Team-led Experiential Workshop for Public Health Midwives on Dysphagia Management for Children with Cerebral Palsy

Shyamani Hettiarachchi<sup>1\*</sup>, Gopi Kitnasamy<sup>2</sup>, Raj Mahendran<sup>2</sup>,  
Fathima Shamra Nizar<sup>2</sup>, Chamara Bandara<sup>2</sup>, Paramaguru Gowritharan<sup>3</sup>

1. Department of Disability Studies, Faculty of Medicine, University of Kelaniya, Sri Lanka, & School of Social Work and Social Policy, Trinity College Dublin, The University of Dublin, Ireland

2. Cerebral Palsy Lanka Foundation, Sri Lanka

3. District General Hospital, Mannar, Sri Lanka

## ABSTRACT

**Purpose:** Over the past decade there has been a growing focus on offering appropriate training to healthcare professionals and caregivers to support safe feeding practices for children with cerebral palsy. Early and consistent multidisciplinary intervention is required to minimise the risks of aspiration pneumonia. The high incidence of complications from aspiration pneumonia among children with cerebral palsy in Sri Lanka has made it necessary to conduct low-cost multidisciplinary team-led dysphagia awareness workshops for healthcare professionals and caregivers.

**Method:** A group of 38 Public Health Midwives (PHMs) was offered an experiential workshop by a small multidisciplinary team (MDT). To determine changes in knowledge, a self-administered questionnaire that included a video-based client scenario was administered pre- and post-workshop. The data were analysed statistically using non-parametric within-participant t-tests.

**Results:** The post-workshop responses to the questionnaire indicated a significant increase in the level of knowledge. This included positive changes in the understanding and knowledge of cerebral palsy ( $t(37) = -7.44, p = .000$ ), effects of cerebral palsy on eating and drinking skills ( $t(37) = -3.91, p = .000$ ), positioning ( $t(37) = -9.85, p = .000$ ), aspiration ( $t(37) = -3.46, p = .001$ ), food categorisation ( $t(37) = -3.85, p = .000$ ) and client video observation ( $t(37) = -3.91,$

---

\* **Corresponding Author:** Shyamani Hettiarachchi, Department of Disability Studies, Faculty of Medicine, University of Kelaniya, Sri Lanka, & School of Social Work and Social Policy, Trinity College Dublin, The University of Dublin, Ireland. Email: shyamani@kln.ac.lk

$p=.000$ ) at a  $p=.05$  level of significance. While there was also an increase in the knowledge on general guidelines during mealtimes, this did not reach statistical significance.

**Conclusion:** *The low-cost MDT-led experiential workshop was effective in increasing knowledge of feeding and dysphagia-related issues in cerebral palsy among a group of PHMs. This workshop could serve as a model for training PHMs and Community-Health Workers across the country in order to reach the Sustainable Development Goal of 'good health and well-being' for children with cerebral palsy and all children experiencing feeding difficulties. Follow-up workshops and continued professional development courses for midwives on dysphagia care are strongly recommended, in addition to collaborative clinical practice.*

**Key words:** *Cerebral palsy, dysphagia, midwives, training*

## INTRODUCTION

Children diagnosed with cerebral palsy are at risk of feeding difficulties due to clinically significant motor as well as associated sensory difficulties (Thommessen et al, 1991; Stallings et al, 1993; Dahl et al, 1996; Reilly, Skuse & Poblete, 1996; Yokochi, 1996; Gisel, Alphonse & Ramsay, 2000; Troughton & Hill, 2001; Workinger, 2005; Wilson & Hustad, 2009). The estimated prevalence of feeding difficulties among children with cerebral palsy is between 40% - 90% (Reilly et al, 1996; Trier & Thomas, 1998; Morrow et al, 2007), reflecting a possible lack of agreement on the definition of feeding difficulties and the diverse levels of severity, assessment procedures used and sample sizes adopted. Feeding difficulties in children with cerebral palsy could result from, for instance, poor coordination of suck-swallow-breath synchrony, incomplete lip closure, tongue thrust, under-developed chewing patterns, inadequate laryngeal elevation (Speech Pathology Australia, 2012; Suzuki et al, 1991; Reilly et al, 1995; Sullivan et al, 2000; Field et al, 2003; Workinger, 2005; Wilson & Hustad, 2009), leading to poor overall growth, nutrition and hydration concerns, failure to thrive, aspiration and gastro-oesophageal reflux (Loughlin & Lefton-Grief, 1994; Sullivan et al, 2000; Vik et al, 2001; Fung et al, 2002; Yousafzai, Filteau & Wirz, 2003; Spiroglou, 2004; Workinger, 2005; Odding, Roebroek & Stam, 2006; Ramelli et al, 2007; Sullivan, 2008; Wilson & Hustad, 2009; Erkin et al, 2010; Adams et al, 2011; Barkmeier-kraemer et al, 2017).

The high risk of dysphagia-related aspiration pneumonia among children with disabilities has been widely documented (Patrick et al, 1986; Mirrett et al, 1994; Reddihough, Baikie & Walstab, 2001). Anecdotally, this risk is believed to be high and often goes undetected in Sri Lanka, resulting in serious nutritional and health concerns among children with cerebral palsy. Hence, children with cerebral palsy are at a higher risk of malnutrition (Reilly, 1990; Vik et al, 2001) and of recurrent chest infections, chronic lung disease and aspiration pneumonia related complications (Patrick et al, 1986; Loughlin & Lefton-Greif, 1994; Dahl et al, 1996; Sullivan et al, 2000; Reddihough et al, 2001).

Given the potentially serious implications of feeding difficulties and dysphagia in children with cerebral palsy, early detection and early intervention by a multidisciplinary team is vital. This includes parent/caregiver training as well as training for all healthcare professionals involved. In the Global South, this includes the training of midwives and Community Health Workers who, arguably, have close interaction with mothers and their young children. Over the past decade, there has been a growing focus on offering appropriate training for nursing staff, other healthcare professionals and caregivers, to support safe feeding practices for children (Sullivan et al, 2000; Samuels & Chadwick, 2002; Chadwick, Jolliffe & Goldbart, 2003; Crawford, Leslie & Drinnan, 2007; Adams et al, 2011). In Sri Lanka, there is anecdotal evidence of a high incidence of serious complications resulting from aspiration pneumonia among children with cerebral palsy. It is, therefore, necessary to formulate and conduct low-cost multidisciplinary team-led dysphagia awareness workshops for caregivers and healthcare professionals across the country.

Within the Sri Lankan healthcare system, Public Health Midwives (PHMs) have the closest, most consistent interaction with children under 5 years of age and their mothers/caregivers, making them key professionals in supporting early identification and support for safe feeding practices. Guldan and colleagues (1993) assert that better education results in improved responsive feeding practices among caregivers, which could extend to PHMs, who offer advice and information to caregivers.

## **METHOD**

### **Participants**

Thirty-eight Public Health Midwives (PHMs) in one Ministry of Health (MOH) division in the Northern Province were invited to attend a half-day experiential

workshop on dysphagia management for children with cerebral palsy, which was conducted by a small multi-disciplinary team (MDT). The PHMs were all female and had between 2 - 18 years of service, with an average of 8.2 years of work experience. In addition, one female Occupational Therapist and two male Medical House-Officers also attended the workshop as observers, although they were not part of the study.

### **Ethical Considerations**

Ethical approval for the study was obtained from the Ethics Review Committee of the Faculty of Medicine, University of Kelaniya, Sri Lanka. The participants were offered an information sheet and consent form, with an explanation that the questionnaire data and feedback received were for a research study to evaluate the effectiveness of the workshop to improve its format for future training.

### **Dysphagia Workshop**

The half-day workshop was conducted in Tamil. It was facilitated by four members of the resource team whose first language is Tamil. Comments made in English by the two non-Tamil speaking team members were immediately translated by the Tamil-speaking speech and language therapist to facilitate discussion. The programme was devised from a multidisciplinary perspective following a discussion over the phone with the Director of the MOH division on the specific needs of the area and what the team could offer.

The broad aims of the workshop, as explained to the participants, were:

- To understand cerebral palsy
- To consider the importance of mealtimes
- To consider the phases of the swallow
- To review the key milestones of development in eating and drinking skills in children
- To discuss potential difficulties of eating and drinking experienced by children with cerebral palsy
- To understand key considerations of the MDT team in supporting children with cerebral palsy during mealtimes.

The workshop included the following topics:

- Cerebral Palsy - definition, causes, types
  - identification of different types of cerebral palsy
  - associated difficulties
- Swallowing - phases of the normal swallow
  - ages and stages of the development of eating and drinking skills in children
  - potential feeding and swallowing difficulties in children with cerebral palsy
  - aspiration and potential signs of aspiration
- Key Strategies - demonstrations and experiential learning activities on
  - posture and positioning
  - food textures
  - pacing
  - modified utensils
  - communication during mealtimes
- Client Profiles - video case studies and discussion
- Question & Answer Session - addressing current clinical concerns.

The workshop was organised at the main MOH building in the area, which was in the heart of the city. The workshop aimed to use the experiential learning model (Kolb, 1994) and diverse adult learning styles (Honey & Mumford, 1986) encouraging the connection of theory to practice. The workshop format included a combination of theoretical lectures using PowerPoint, video case studies of children with different types of cerebral palsy and associated feeding and swallowing difficulties, demonstrations, experiential paired learning activities on posture, pacing and food/drink consistencies, role-play activities, small group case discussions and action stations with problem-based target questions. The case discussions enabled the team to highlight the scope of practice of the profession of each team member, how the responsibilities of each healthcare professional intersects with others in the team, and the crucial need for

collaborative assessment, goal-setting and intervention. Paired and small group activities included opportunities for experiential learning through simulated role-play activities of adult-feeder child-feeding scenarios, trialling diverse postures/positioning (e.g., head in extension; fed by the adult standing behind the person) and action stations of different food and drink textures and feeding utensils with target questions encouraging small teams to work together to answer the questions placed at the stations. Food and drink types and textures authentic to the culture and geographical area were trialled, to encourage an appreciation of the complexity of the eating-drinking-swallowing process.

### **Team of Facilitators**

The facilitators were local specialists and a team of practitioners attached to a specialist centre for children with developmental disorders in the capital city. The small multidisciplinary team included three speech and language therapists who work closely with children with cerebral palsy and two Bobath-trained physiotherapists from the centre. Three of the team members from the city were native speakers of Tamil. The team was joined by a local freelance speech and language therapist who was aware of the realities of working in the area, a consultant Paediatrician from the Province and a senior official of the MOH of the area. An Occupational Therapy perspective was offered through a PowerPoint presentation prepared by a colleague at the centre and delivered through a physiotherapist colleague. Comments were also invited from the Occupational Therapist of the area who attended the workshop.

### **Data Collection**

The workshop aimed to increase the participants' knowledge of dysphagia management for children with cerebral palsy. Hence, a self-administered questionnaire in Tamil was offered to all the participants, to determine changes in knowledge prior to the workshop as well as immediately afterwards. The questionnaire consisted of two sections that explored actual knowledge and perceived knowledge pre- and post-workshop.

The breakdown of the questionnaire is given below.

#### **Section 1: Demonstrated knowledge**

There were twelve open-ended questions requiring short answers - covering knowledge of cerebral palsy, normal swallowing, potential effects of cerebral

palsy on feeding and swallowing, development of feeding skills, positioning, aspiration, mealtime duration, food categorisation and communication during mealtimes. The questions incorporated into the questionnaire included:

*What do you understand by the term 'cerebral palsy'?*

*How do you think cerebral palsy affects eating and drinking skills in a child?*

*What do you understand by the term 'aspiration'?*

## Section 2: Perceived knowledge and confidence

This section contained 13 statements with Likert-type response options (Very little, Little, Satisfactory, Good, Very good) on perceived knowledge of cerebral palsy, development of feeding skills and swallowing difficulties, and two statements on confidence related to cerebral palsy and feeding difficulties. Some of the target statements of this section included:

*My knowledge of eating and drinking skills in children with cerebral palsy is:*

*Very little      Little      Satisfactory      Good      Very good*

*My knowledge of the possible signs of aspiration is:*

*Very little      Little      Satisfactory      Good      Very good*

*My knowledge of food textures is:*

*Very little      Little      Satisfactory      Good      Very good*

Additional comments were sought from the participants, using an open question to provide any feedback. Participants chose to either offer this feedback directly, face-to-face with the researchers/team of facilitators, or through documented feedback on the back of the questionnaire.

The questionnaire, which was devised by the authors, was specific to the professional role of PHMs and to the Sri Lankan context. In order to make the questionnaire locally applicable, the authors used the findings of a previous qualitative study on parental views, which highlighted their needs with regard to dysphagia support (Hettiarachchi, 2011, and the questionnaire used in a study with parents by two of the current authors (Hettiarachchi, 2011; Hettiarachchi & Kitnasamy, 2013). The questionnaire devised in English by the first author was circulated to the other members of the team for their comments. A meeting was convened with four members of the team at the centre to discuss the content

and format of the questionnaire and the content and presentation style of the workshop. After the research team discussion, the wording of two questions (no. 9 and no.12) was changed from 'What different groups would you categorise food into?' and 'What, if any, are your concerns during mealtimes?' to 'What broad categories can you classify food and drink into?' and 'What are your main concerns related to feeding in children with cerebral palsy as a PHM?' respectively. In order to obtain more information specific to the scope of practice of PHMs, a final question was added - 'What general management strategies would you use as a PHM to support children with cerebral palsy and feeding difficulties?'. It was translated into Tamil by the Tamil-speaking speech and language therapists in the team. Both the English and Tamil versions of the questionnaire were made available to the participants.

### **Data Analysis**

The 12 open questions of Section 1 requiring short-answers were assigned 5 marks per correct answer (60 marks in total), thereby converting the written participant responses to a numerical score and enabling statistical analysis. In Section 2, the 5 responses to the 15 statements were equated to a number (i.e., Very little=1, Little=2, Satisfactory=3, Good=4, Very good=5) to aid statistical analysis to determine changes, if any, in perceived knowledge on cerebral palsy and dysphagia (a total of 75 marks on offer). In addition, 2 statements on confidence were also translated into numbers (i.e., Not confident=1, A little confident=2, Reasonably confident=3, Confident=4, Very confident=5), with a total score of 10 marks possible. Line graphs were designed to visually represent changes in reported perceived levels of knowledge on the 15 target statements and confidence on 2 target statements. The individual participant scores derived through the conversion of the actual participant responses into a score and the self-reported levels of knowledge and confidence pre- and post-workshop were calculated, and Wilcoxon non-parametric tests for within-subjects' statistical analysis were undertaken to determine the statistical significance of the changes in scores.

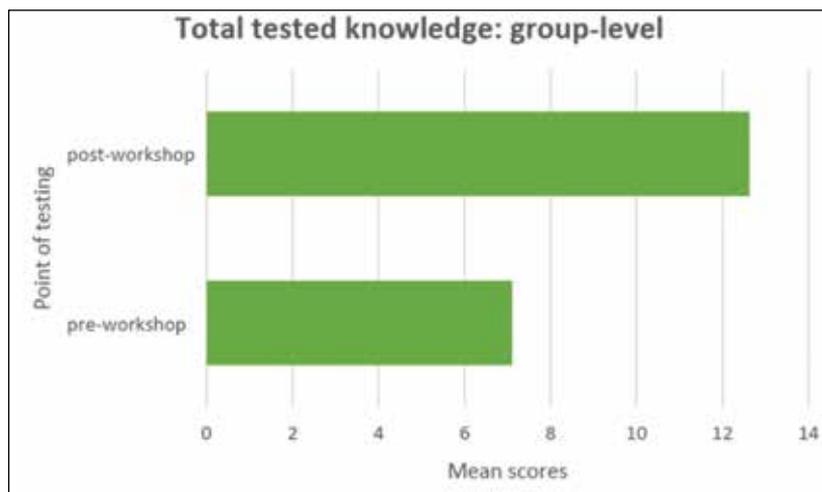
The qualitative data, gathered through open-ended questions regarding feedback on the workshop, was analysed using a simple thematic analysis (Boyatzis, 1998). As member checking was not an option due to the distance between the main city where the researchers work and the geographical area in the North where the workshop was held, the verbal feedback was checked during the discussion itself, by immediately rephrasing it and presenting it to the participants in summary.

## RESULTS

### Tested level of Knowledge

The responses to the 12 open questions, which were assigned a total of 60 marks in the questionnaire, showed a general increase post-workshop. The mean group score pre-workshop was 7.11 (SD: 3.31), ranging from 01 to 13. Post-workshop, the mean group score was 13.82 (SD: 3.72), ranging from 08 to 23 respectively. Given the low starting score, the participants were not able to score very high (i.e., close to the total possible score), even so, 37 of the 38 participants indicated a positive change. Overall, the knowledge on the tested content of the workshop showed a positive increase following the workshop (Graph1). This positive change post-workshop was statistically highly significant at  $t(37) = -10.50$ ,  $p = 0.000$ , with  $p = .05$  level of significance.

**Graph 1: Tested Level of Knowledge Pre- and Post-workshop at the Group Level**

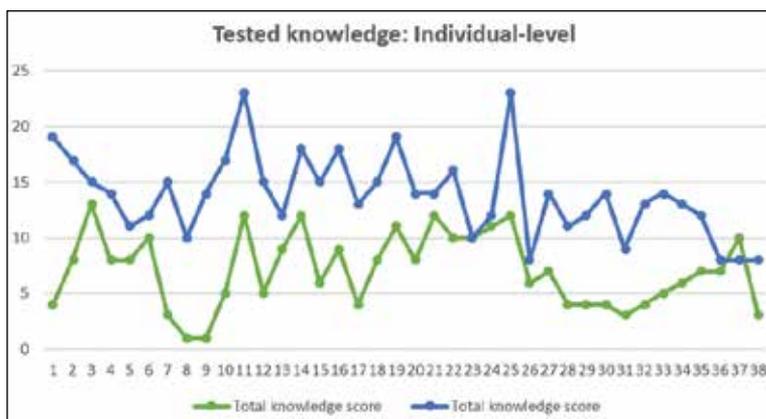


At the group level there was a positive change, post-workshop, on all 12 items (11 areas) of part 1 of the questionnaire, although this change did not always reach statistical significance on all of the items. Closer inspection of the results indicated statistically highly significant positive changes on 6 of the areas targeted and tested post-workshop. This included: understanding and knowledge of cerebral palsy ( $t(37) = -7.44$ ,  $p = .000$ ), effects of cerebral palsy on eating and drinking skills ( $t(37) = -3.91$ ,  $p = .000$ ), positioning ( $t(37) = -9.85$ ,  $p = .000$ ), aspiration ( $t(37) = -3.46$ ,

$p=.001$ ), food categorisation ( $t(37), -3.85, p=.000$ ) and client video observation ( $t(37)-3.91, p=.000$ ) at a  $p=.05$  level of significance. The remaining 5 areas included in the workshop did not reach statistical significance in the comparison of participant scores pre- and post-workshop. This included: normal swallowing ( $t(37) =-.37, p=.71$ ), development of eating, drinking and swallowing skills ( $t(37) =-1.78, p=.08$ ), duration ( $t(37) =-1.43, p=.16$ ), communication during mealtimes ( $t(37) =-1.00, p=.32$ ) and general management ( $t(37) =-1.43, p=.16$ ).

At the individual level (Graph 2), 36 participants showed an increase in the post-workshop questionnaire score compared to the pre-workshop score, 1 participant showed no change and 1 participant indicated a slight drop in knowledge. It is of importance to note that 19 of the participants gained a double or higher score post-workshop compared to the original pre-workshop individual score.

**Graph 2: Tested Level of Knowledge Pre- and Post-workshop at the Individual Level**



One participant (P1) indicated a remarkable change in score, from 4 marks pre-workshop to 19 marks post-workshop. A closer review of the comments offered by this participant revealed that she had no previous training. This explains the initial very low score. However, as she has worked with many children with cerebral palsy she could easily understand and relate to the information provided. She had written,

*“The workshop was very useful. I like your style of delivery. I had no training when I started, but have some experience of working with these children. I now understand the theories. I will be able to work better.”*

A review of the responses to the target short-answer questions showed a qualitative difference post-workshop. This change in the quality and relevance of responses before and after the workshop was particularly evident in questions pertaining to cerebral palsy and feeding and swallowing difficulties, positioning, aspiration, and food categorisation (see Table 1).

**Table 1: Knowledge Pre- and Post-workshop**

Pre-workshop	Post-workshop	Responses	
<b>Cerebral Palsy</b>		<b>Pre-workshop</b>	<b>Post-workshop</b>
		P7: "Happening in the brain."	P7: "Damage to the developing brain due to lack of oxygen supply."
		P8: (Left blank)	P8: "Brain damage due to lack of oxygen to the brain can cause cerebral palsy."
<b>Cerebral Palsy and its potential effects on feeding/swallowing difficulties</b>		<b>Pre-workshop</b>	<b>Post-workshop</b>
		P4: (Left blank)	P4: "Unable to coordinate swallowing, drooling, food dropping out, choking, lack of strength in tongue and lips, lack of balance and movement, no independent feeding."
		P13: "Choking. Vomiting."	P13: "Unable to close the mouth. Unable to chew. Long time for swallowing. Cough, choking. Cannot sit without support."
<b>Normal swallow</b>		<b>Pre-workshop</b>	<b>Post-workshop</b>
		P9: (Left blank)	P9: "Food from the mouth going into the digestive system."
<b>Development of feeding skills</b>		<b>Pre-workshop</b>	<b>Post-workshop</b>
		P9: (Left blank)	P9: "Developing munching, chewing skills."

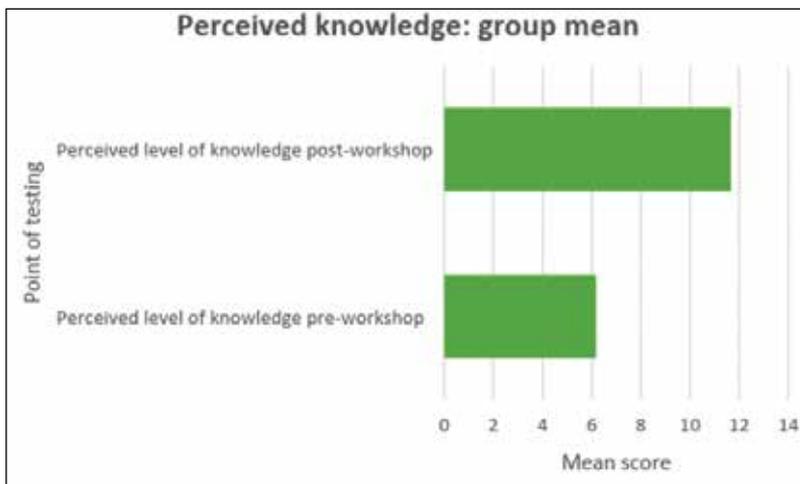
Positioning		Pre-workshop	Post-workshop
		P10: "In a chair."	P10: "Use feeding chairs or comfortable wheelchairs. Head and back straight and aligned. Provide support to the head and face the child when feeding."
		P14: "Straight on a chair."	P14: "On a chair, sitting straight, keeping the head and vertebrae in line, with head support."
Aspiration		Pre-workshop	Post-workshop
		P8: (Left blank)	P8: "Food going into the respiratory track, it may cause death."
		P12: "Food enters into the respiratory system."	P12: "Because of incoordination of the swallowing mechanism, food enters into the respiratory system."
Duration		Pre-workshop	Post-workshop
		P31: (Left blank)	P31: "Not more than 45 minutes."
Food categorisation		Pre-workshop	Post-workshop
		P15: (Left blank)	P15: "Solid, semi-solid, fluid."
Client video observation		Pre-workshop	Post-workshop
		P4: "The child has difficulties with sitting upright."	P4: "The child is unable to coordinate chewing and swallowing, is drooling, food is falling out. There are signs of choking. The child is not able to maintain her balance on her seat. There is a lack of strength, balance and movement. She is not an independent feeder."
		P25: "Fluids. Difficult to chew solid food."	P25: "Semi-solid food because his muscles movements are low. Also, he cannot chew."

Communication during mealtimes		Pre-workshop	Post-workshop
		P25: (Left blank)	P25: "When feeding, observe his likes, dislikes from his facial expression."
Management		Pre-workshop	Post-workshop
		P5: (Left blank)	P5: "Consider the colour of the food, texture of the food and whether the child enjoys the food."
		P4: (Left blank)	P4: "We have to decide on what texture of food needs to be prepared and provided. We have to decide on the smell, colour and taste of the food offered."
General feedback	<p>Format This training was conducted perfectly and we participated actively. (P4)</p> <p>I got complete knowledge because of the practical work. We need new practical programmes like this. (P14)</p> <p>Benefit I got all the knowledge I need. Thank you. (P5)</p> <p>This was a useful workshop for us. Thank you to everyone who organized this. (P2)</p> <p>This workshop was most important. (P7)</p> <p>This is a very useful workshop. I did not have knowledge about feeding. Now I got it. Thank you so much.</p>		

### Perceived Level of Knowledge

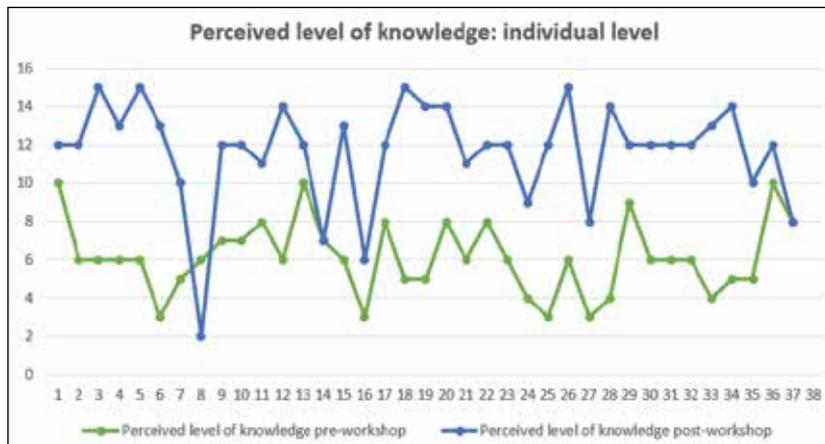
Based on the Likert responses to 12 statements in the questionnaire, the mean reported level of knowledge among the 38 participants was 4.13 (Standard Deviation: 1.51) pre-workshop, and 8.37 (Standard Deviation: 1.95) post-workshop. The perceived level of knowledge reported by all 38 participants showed a positive change post-workshop at the group level (Graph 3). At group level, this positive change reached statistical significance at  $t(37) = -10.89$ ,  $p = .000$ .

**Graph 3: Perceived Knowledge Pre- and Post-workshop at Group Level**



At the individual level, one participant (P9) reported that her perceived level of knowledge was lower post-workshop as she is “more aware of what I don’t know”, and two participants (P15 and P38) noted no change (Graph 4).

**Graph 4: Perceived Level of Knowledge Pre- and Post-workshop at Individual Level**



**Perceived Level of Confidence**

On the 2 items on confidence that translated into 10 marks (i.e., Not confident=1, A little confident=2, Reasonably confident=3, Confident=4, Very confident=5), the

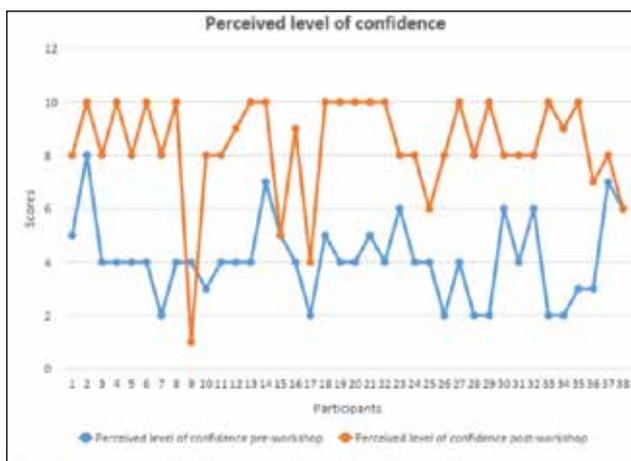
post-workshop responses to the questionnaire indicated a marked positive change from the pre-workshop level of perceived confidence at group level (Graph 5). The reported mean level of confidence pre-workshop was 6.18 (Standard Deviation=1.92) and 11.66 (Standard Deviation=2.69) post-workshop respectively. At group level, this positive reported change in perceived levels of confidence reached statistical significance at  $t(37) = -10.56, p=.000$ .

**Graph 5: Perceived Confidence Pre- and Post-workshop at Group Level**



At the individual level, 35 participants reported a perceived increase in confidence in supporting a child with cerebral palsy with feeding/swallowing issues. Two participants reported no perceived change in their self-confidence (P15 and P38) while one participant (P9) noted a decline in confidence post-workshop (Graph 6).

**Graph 6: Perceived Confidence Pre- and Post-workshop at Individual Level**



One PHM (P9) showed a decline in the reported level of confidence post-workshop while two PHMs noted no change (P15 and P38). On enquiry, the PHM who reported a reduction in perceived level of confidence post-workshop explained that she was now *“more aware of what I don’t know. I did not realise that we need to be careful about aspiration”* (P9).

## DISCUSSION

In summary, 38 PHMs were offered a half-day experiential workshop on dysphagia management of children with cerebral palsy by a MDT. The workshop incorporated a range pedagogical methods, and used a pre- and post-assessment to determine changes in actual and perceived knowledge and perceived confidence. The results of the pre- and post-workshop questionnaire indicated positive changes in the knowledge tested, in the perceived level of knowledge and perceived level of confidence. At the group level, the positive changes observed in the level of knowledge assessed post-workshop were proportionate with the perceived changes in knowledge as reported by the participant group. At the individual level, the positive changes in tested knowledge in real terms among the majority of participants were commensurate with the perceived increase in knowledge and confidence and vice versa. Comparable increases in actual or tested and perceived knowledge have been reported in similar workshops on dysphagia management with parents/caregivers from similar cultural and socio-economic backgrounds in Bangladesh (Chadwick et al, 2002; Chadwick et al, 2006) and in Sri Lanka (Hettiarachchi, 2011; Hettiarachchi & Kitnasamy, 2013).

The post-workshop responses to the short answer questions showed better recall of information associated with cerebral palsy, associated eating, drinking and feeding difficulties, signs of aspiration, positioning during mealtimes and food categorisation. This may be due to the adult learning theories/strategies of experiential learning activities (Kolb, 1994) and diverse adult learning styles (Honey & Mumford, 1986) used, hands-on demonstrations, video case presentations, and the clear link between theory and practice included as part of the teaching-learning methods. The information on appropriate positioning, in particular, was presented using videos, demonstrations and experiential activities, thereby resulting in better immediate recall of information. It may also be reflective of the multidisciplinary perspective, as each facilitator reinforced the key information and complemented each other’s professional view on dysphagia management.

## **Cerebral Palsy and Eating, Drinking and Swallowing Difficulties**

The PHMs were better able to recall information on cerebral palsy and associated eating, drinking and feeding difficulties. This section of the workshop entailed the use of PowerPoint, offering a clear theoretical background with pictorial support, and an open discussion on the PHMs' clinical observations and experiences of eating, drinking and swallowing difficulties among the children they work with. The use of available current schemas of knowledge (Gathercole & Baddeley, 1993) proved a useful pedagogical tool during the current workshop, and one that would be beneficial when incorporated into other training programmes.

### **Positioning/Posture**

Appropriate positioning of children with cerebral palsy during mealtimes is a recurrent concern highlighted within the literature (Reilly & Skuse, 1992; Larnert & Ekberg, 1995; Gisel et al, 2003; Adams, 2009). The improved recall of information on posture and positioning during mealtimes was similar to the findings of the previous workshop offered to parents/caregivers (Hettiarachchi, 2011; Hettiarachchi & Kitnasamy, 2013 but dissimilar to the findings reported by Chadwick et al (2002). That said, both studies differed from the current study, either in the participants included (i.e. PHM vs. parents/caregivers) or in the study objective (i.e. training workshop vs. assessment of knowledge received from speech and language therapy services).

As stated earlier, one explanation for the better recall of theory and clinical practice within dysphagia management in the current study could be the use of demonstrations and hands-on experiential activities. Postural alignment is a key compensatory strategy suggested by physiotherapists and implemented as part of the MDT plan to decrease the risk of aspiration (Larnert & Ekberg, 1995), making it crucial for PHMs to understand it.

### **Texture**

Children with cerebral palsy are often offered a diet restricted in variety, taste and texture (Reilly & Skuse, 1992), which places them at high risk of malnutrition and lack of micronutrients (Reilly, 1990; Vik et al, 2001). The better recall of food consistencies, though less than positioning/posture, is comparable to findings in the studies by Chadwick and colleagues (2002, 2006), although in contrast to the study on caregivers by the current author (Hettiarachchi, 2011; Hettiarachchi & Kitnasamy, 2013).

Chadwick and colleagues (2006) explain this finding as reflective of the concrete nature of texture modification and its everyday experience as aiding caregiver recall of speech and language therapists' recommendations of food/drink consistencies. This was, however, in contrast to a previous study (Hettiarachchi, 2011; Hettiarachchi & Kitnasamy, 2013) and to the studies by Chadwick and colleagues (2003, 2006) with caregivers. The former study (Hettiarachchi, 2011; Hettiarachchi & Kitnasamy, 2013) did not offer opportunities for experiential learning activities on food consistencies during the workshop, which may explain this observed difference. The authors themselves concluded that while caregivers may not be able to offer explanations on texture modification, it may be possible for them to demonstrate the necessary procedures involved in changing food textures. The latter studies (Chadwick et al, 2003; 2006) included caregivers of adults with learning difficulties (a different client group to children with cerebral palsy) which may go some way to explain this difference in the findings. The current study's findings strengthen the use of demonstrations and experiential learning activities connected to texture modification in workshops on dysphagia management to enable understanding and recall.

With regard to PHMs in the current study, the relatively better recall may be due to the use of experiential activities of trialling a variety of specific local food textures. rather than generic Sri Lankan food This could help with a clearer understanding of texture classification due to familiarity, and consequently lead to better retention, memory and recall. This pedagogical method of an experiential learning cycle (Kolb, 1984) is widely used within teaching workshops. Given the current evidence for the use of texture modification to minimise levels of aspiration (Rogers et al, 1994; Gisel et al, 1995; Gisel et al, 2000; Novak, 2013), a sound understanding of texture modification and the rationale for its use among PHMs and other members of the MDT, is critical.

### **Duration**

The PHMs were able to recall information on best practices connected to the duration of mealtimes for children with cerebral palsy and eating and drinking difficulties. Sri Lankan caregivers, in general, spend a lot of time and effort in feeding their children (without disabilities), often fretting that children are not receiving sufficient nutrition. In the case of children with disabilities, and children with cerebral palsy in particular, caregivers may hold similar views

during mealtimes. This may be a notion held by the PHWs of this study too; all of whom were mothers, young and old. The time-burden or insufficient time to feed the child were themes that emerged in the studies on caregivers by Yousafzai and colleagues (2003) and Adams (2009). Yousafzai et al (2003), for instance, found that 62% of the caregivers of children with cerebral palsy, who lived in Dharavi, India, raised concerns about insufficient time to feed them. Adams (2009), in her study in Bangladesh, reported that 90% of the caregivers were dissatisfied with the duration of mealtimes, with 76% requiring 2.5 to 5 hours daily to feed their child, while Sullivan and colleagues (2000) found that 51% of children with disabilities required 3 hours or more each day for feeding. Children with cerebral palsy reportedly require an additional 15 minutes more per mouthful than their peers without disabilities, an average of 3.9 hours a day, sometimes amounting to 7 ½ hours a day for feeding, in contrast to 0.8 hours for children without cerebral palsy (Johnson & Deitz, 1985).

While longer mealtimes may be counterproductive in terms of the energy lost and energy gained, shorter mealtimes too have been associated with feeding difficulties, with a risk of under-nutrition. Evidence supporting the latter view has been suggested, with shorter mealtimes associated with severe oral motor dysfunction (Reilly et al, 1996), a potential risk factor for malnutrition (Hung et al, 2003; Reilly, 2001). There appears to be a disconnect between theories on the optional duration of mealtimes vs. the lived reality of feeding a child with cerebral palsy, with the associated parental need to feed their child by 'any means necessary'. In spite of mealtime observations of shorter durations, the Bangladeshi caregivers in the study by Adams (2009) also had estimated longer mealtimes, which put children with cerebral palsy at risk of under-nutrition (Reilly, 2001). Parental concerns about underweight have recurred in the literature on children with cerebral palsy (Reilly & Skuse, 1992; Sullivan et al, 2000; Adams, 2009; Barkmeier-kraemer et al, 2017). Although the parents in the Oxford study by Sullivan and colleagues (2000) did not report high levels of associated stress with feeding, there were concerns noted on the extra time required to prepare food and to feed the child, together with the associated food costs. Given the 'cultural' context of longer mealtimes and the general concerns that 'my child is not eating' among most, if not all Sri Lankan parents, the need for adequate hydration and nutrition for children with cerebral palsy with regard to food textures, oral or non-oral feeding and the duration of mealtimes must continue to be discussed.

## **Observational Skills**

The participants also showed improved observational skills in determining a child's eating and drinking abilities and difficulties, through the use of video case studies. Video case studies and simulated video teaching sessions have been used successfully in speech and language therapy, for instance, as a clinical teaching methodology (Horton et al, 2004; Cummins, Stokes & Weir, 2013), which appeared to be a useful pedagogical method in the workshop for PHMs.

## **Communication Skills during Mealtimes**

Poorer recall was observed on communication during mealtimes, the optimal duration of mealtimes and on general management strategies in dysphagia. Overall, information on communication during mealtimes was one of the areas least well recalled. This could be due to the general lack of emphasis on speaking with children with cerebral palsy as many such children in Sri Lanka are not primary verbal communicators. Caregiver-child interaction is affected by the child's skill at communication (Satter, 1990), characterised sometimes by a lack of responsiveness or passivity (Pennington & McConachie, 1999), and by the child's feeding difficulties (Adams, 2009). For instance, Reilly and Skuse (1992) found limited verbal interaction during mealtimes, in contrast to communication behaviour outside. In yet another study, Brooks-Gunn and Lewis (1984) observed levels of maternal responsiveness that were commensurate with the cognitive age of the child, with mothers of children with cerebral palsy demonstrating poor responsiveness compared to mothers of children with Down syndrome or developmental delay. While there may be a cultural dimension to interaction (Pelto et al, 2003; Moore, Akhter & Aboud, 2006; Adams, 2009), the more likely explanation is the presence of a disability (Reilly & Skuse, 1992; Sayre et al, 2001; Moore et al, 2006). Therefore, the poor recall by the PHMs may be reflective of the lack of importance placed on communication with children with cerebral palsy or disabilities. This highlights the need to raise awareness on 'communication rights' (McLeod, 2018) and on diverse communication modes as part of an MDT care initiative.

## **Limitations**

The methodological limitations of this study need to be borne in mind in the interpretation of the results and the conclusions. First, the study was only able to assess the potential immediate recall of knowledge. As follow-up

reviews were not undertaken due to issues of distance and feasibility, it is unclear whether the PHMs were able to retain this knowledge in the long term. It is likely that there would be some level of deterioration of this 'new knowledge', unless reiterated through subsequent refresher workshops and ongoing supervisory support to use this knowledge and implement changes in clinical practice.

Secondly, the workshop was only focussed on offering instructional knowledge and on testing its recall, rather than on ascertaining whether the knowledge gained through the workshop translated into changes in the clinical behaviour of the PHMs. Again, no observations of the PHMs during clinical work were undertaken due to constraints of time. Future studies should aim to undertake both baseline observations of clinical practice as well as follow-up observations, in order to assess whether the PHMs are better able to detect feeding difficulties or dysphagia in children with cerebral palsy and make onward referrals to a speech and language therapist or Paediatrician. The number of appropriate referrals made before and after the workshop could also add to this exploration of changes in clinical/professional behaviour. In addition, as PHMs are often the first-line healthcare professionals who meet parents, it would be useful to review the veracity and any changes in the explanations of cerebral palsy and feeding difficulties and on the signs of aspiration that they might offer parents/caregivers as a consequence of attending a training workshop.

## CONCLUSION

The low-cost MDT-led experiential workshop was effective in increasing tested and perceived knowledge and perceived self-reported confidence on feeding and dysphagia issues in cerebral palsy among a group of PHMs. The increase in knowledge needs to be matched by an increase in levels of skill, which highlights the need for observation studies in the future. This workshop could serve as a model for training PHMs and Community-Health Workers (following amendments) in order to reach the Sustainable Development Goal of 'good health and well-being'.

## REFERENCES

Adams MS (2009). The management of feeding difficulties in children with Cerebral Palsy in Bangladesh. Doctoral dissertation, University of London, UK. <http://discovery.ucl.ac.uk/18980/1/18980.pdf>

- Adams MS, Khan NZ, Begum SA, Wirz SL, Hesketh T, Pring TR (2011). Feeding difficulties in children with cerebral palsy: Low-cost caregiver training in Dhaka, Bangladesh. *Child: Care, Health and Development*; 38(6): 878-88. <http://www.ncbi.nlm.nih.gov/pubmed/22082112> <https://doi.org/10.1111/j.1365-2214.2011.01327.x> PMID:22082112 <https://doi.org/10.1111/j.1365-2214.2011.01327.x>
- Barkmeier-Kraemer JM, Linn C, Thompson HL, Byrd RS, Steinfeld MB, Hoffmann, RG, Silverman, AH (2017). Preliminary study of a caregiver-based infant and child feeding and swallowing screening tool. *Journal of Pediatric Gastroenterology and Nutrition*; 64(6): 979-983. <https://doi.org/10.1097/MPG.0000000000001442> PMID:27755343
- Boyatzis RE (1998). *Transforming qualitative information: Thematic analysis and code development*. Thousand Oaks, CA: Sage. PMID:9729839
- Brooks-Gunn J, Lewis M (1984). Maternal responsivity in interactions with handicapped infants. *Child Development*; 55: 782-793. <https://doi.org/10.2307/1130129> <https://doi.org/10.1111/j.1467-8624.1984.tb03815.x> PMID:6203686
- Chadwick DD, Jolliffe J, Goldbart J (2002). Career knowledge of dysphagia management strategies. *International Journal of Language & Communication Disorders*; 37(3): 345-357. <https://doi.org/10.1080/13682820210137196>. PMID:12201982 <https://doi.org/10.1080/13682820210137196>
- Chadwick DD, Jolliffe J, Goldbart J (2003). Adherence to eating and drinking guidelines for adults with intellectual disabilities and dysphagia. *American Journal of Mental Retardation*; 108(3): 202-211. <http://www.ncbi.nlm.nih.gov/pubmed/12691599>. [http://dx.doi.org/10.1352/0895-8017\(2003\)108<0202:ATEADG>2.0.CO;2](http://dx.doi.org/10.1352/0895-8017(2003)108<0202:ATEADG>2.0.CO;2) [https://doi.org/10.1352/0895-8017\(2003\)108<0202:ATEADG>2.0.CO;2](https://doi.org/10.1352/0895-8017(2003)108<0202:ATEADG>2.0.CO;2)
- Chadwick DD, Jolliffe J, Goldbart J, Burton MH (2006). Barriers to caregiver compliance with eating and drinking recommendations for adults with intellectual disabilities and dysphagia. *Journal of Applied Research in Intellectual Disabilities*; 19(2): 153-162. <http://onlinelibrary.wiley.com/doi/10.1111/j.1468-3148.2005.00250.x/abstract>. <https://doi.org/10.1111/j.1468-3148.2005.00250.x>
- Crawford H, Leslie P, Drinnan M (2007). Compliance with dysphagia recommendations by carers of adults with intellectual impairment. *Dysphagia*; 22(4): 326-334. <http://www.ncbi.nlm.nih.gov/pubmed/17701245>. <http://dx.doi.org/10.1007/s00455-007-9108-1> PMID:17701245 <https://doi.org/10.1007/s00455-007-9108-1>
- Cummins K, Stokes J, Weir H (2013). The use of video to put interaction at the centre of supporting parents communication with children. *Health and Social Care Education*; 2(1): 6-10. <https://doi.org/10.11120/hsce.2013.00014>
- Dahl M, Thommessen M, Rasmussen M, Selberg T (1996). Feeding and nutritional characteristics in children with moderate or severe cerebral palsy. *Acta Paediatrica*; 85: 697-701. <http://www.ncbi.nlm.nih.gov/pubmed/8816207>. <http://dx.doi.org/10.1111/j.1651-2227.1996.tb14129.x> <https://doi.org/10.1111/j.1651-2227.1996.tb14129.x>
- Erkin G, Culha C, Ozel S, Kirbiyik EG (2010). Feeding and gastrointestinal problems in children with cerebral palsy. *International Journal of Rehabilitation Research*; 33(3): 218-

24. Available from: [www.ncbi.nlm.nih.gov/pubmed/20216224](http://www.ncbi.nlm.nih.gov/pubmed/20216224) <https://doi.org/10.1097/MRR.0b013e3283375e10> PMID:20216224

Field D, Garland M, Williams K (2003). Correlates of specific childhood feeding problems. *Journal of Paediatric Child Health*; 39: 299-304. <http://www.ncbi.nlm.nih.gov/pubmed/12755939> <https://doi.org/10.1046/j.1440-1754.2003.00151.x>

Fung EB, Samson-Fang L, Stallings VA, Conaway M, Liptak G, Henderson RC, Worley G, O'Donnell M, Calvert R, Rosenbaum P, Chumlea W, Stevenson RD (2002). Feeding dysfunction is associated with poor growth and health status in children with cerebral palsy. *Journal of the American Dietetic Association*; 102(3): 361-73. <http://www.ncbi.nlm.nih.gov/pubmed/11902369>. [http://dx.doi.org/10.1016/S0002-8223\(02\)90084-2](http://dx.doi.org/10.1016/S0002-8223(02)90084-2) [https://doi.org/10.1016/S0002-8223\(02\)90084-2](https://doi.org/10.1016/S0002-8223(02)90084-2)

Gathercole SE, Baddeley AD (1993). *Working memory and language*. Hove, England: Lawrence Erlbaum Associates: 1-266.

Gisel EG, Applegate-Ferrante T, Benson J E, Bosma JF (1995). Effect of oral sensorimotor treatment on measures of growth, eating efficiency and aspiration in the dysphagic child with cerebral palsy. *Developmental Medicine and Child Neurology*; 37: 528-543. <https://doi.org/10.1111/j.1469-8749.1995.tb12040.x> PMID:7789662

Gisel EG, Alphonse E, Ramsay M (2000). Assessment of ingestive and oral praxis skills: children with cerebral palsy vs. controls. *Dysphagia*; 15: 236-244. <https://doi.org/10.1007/s004550000033> PMID:11014887

Guldan GS, Zeitlin MF, Beiser AS, Super CM, Gershoff SN, Datta S (1993). Maternal education and child feeding practices in rural Bangladesh. *Social Science & Medicine*; 36: 925-935. [https://doi.org/10.1016/0277-9536\(93\)90084-H](https://doi.org/10.1016/0277-9536(93)90084-H)

Hettiarachchi S (2011). 'He is totally dependent on me': Sri Lankan-Tamil mothers' perceptions on the mealtime experience with their children with cerebral palsy. Oral presentation at 'Phonocon 2011' Conference, Delhi, India.

Hettiarachchi S, Kitnasamy G (2013). Effect of an experiential dysphagia workshop on caregivers' knowledge, confidence, anxiety and behavior during mealtimes. *Disability, CBR and Inclusive Development*; 24(3): 75-99. <https://doi.org/10.5463/dcid.v24i3.73>

Honey P, Mumford A (1986). *The manual of learning styles*. Peter Honey Associates. PMID:PMC1232081

Horton S, Byng S, Bunning K, Pring T (2004). Teaching and learning speech and language therapy skills: the effectiveness of classroom as clinic in speech and language therapy student education. *International Journal of Language & Communication Disorders*; 39: 365-390. <https://doi.org/10.1080/13682820410001662019> PMID:15204446

Hung JW, Hsu TJ, Wu PC, Leong CP (2003). Risk factors of under-nutrition in children with spastic cerebral palsy. *Chang Gung Medical Journal*; 26: 425-432. PMID:12956289

Johnson CB, Deitz JC (1985). Time use of mothers with preschool children: A pilot study. *The American Journal of Occupational Therapy*; 39: 578-583. <https://doi.org/10.5014/ajot.39.9.578> <https://doi.org/10.5014/ajot.39.3.211> PMID:2931990

- Kolb DA (1984). *Experiential Learning: Experience as the source of learning and development*. New Jersey: Prentice Hall: 1-256. PMID:6518360
- Larnert G, Ekberg O (1995). Positioning improves the oral and pharyngeal swallowing function in children with cerebral palsy. *Acta Paediatrica*; 84: 689-692. <https://doi.org/10.1111/j.1651-2227.1995.tb13730.x> PMID:7670257
- Loughlin GM, Lefton-Greif MA (1994). Dysfunctional swallowing and respiratory disease in children. *Advances in Paediatrics*; 41: 135-162. PMID:7992682
- McLeod S (2018). Communication rights: Fundamental human rights for all. *Journal International Journal of Speech-Language Pathology*; 20(1): 3-11. <https://doi.org/10.1080/17549507.2018.1428687>
- Mirrett PL, Riski JE, Glascott J, Johnson V (1994). Videofluoroscopic assessment of dysphagia in children with severe spastic cerebral palsy. *Dysphagia*; 9: 174-179. <https://doi.org/10.1007/BF00341262> PMID:8082326
- Moore AC, Akhter S, Aboud FE (2006). Responsive complementary feeding in rural Bangladesh. *Social Science & Medicine*; 62: 1917-1930. <https://doi.org/10.1016/j.socscimed.2005.08.058> PMID:16223552
- Morrow A, Craig J, Quine S (2007). Health professionals' perceptions of feeding related quality of life in children with quadriplegic cerebral palsy. *Child: Care, Health & Development*; 33(5): 529-538. <http://dx.doi.org/10.1111/j.1365-2214.2006.00709.x>. PMID:17725774 <https://doi.org/10.1111/j.1365-2214.2006.00709.x>
- Novak I, McIntyre S, Morgan C, Campbell L, Dark L, Morton N, Stumbles E, Wilson S-A, Goldsmith S (2013). A systematic review of interventions for children with cerebral palsy: State of the evidence. *Developmental Medicine & Child Neurology*; 55(10): 885-910. <https://doi.org/10.1111/dmcn.12246> PMID:23962350
- Odding E, Roebroek ME, & Stam HJ (2006). The epidemiology of cerebral palsy: Incidence, impairments and risk factors. *Disabilities Rehabilitation*; 28(4): 183-191. <https://doi.org/10.1080/09638280500158422> PMID:16467053
- Patrick J, Boland M, Stoski D, Murray GE (1986). Rapid correction of wasting in children with cerebral palsy. *Developmental Medicine and Child Neurology*; 28:734-739. <https://doi.org/10.1111/j.1469-8749.1986.tb03925.x> PMID:3102303
- Pelto GH, Levitt E, Thairu L (2003). Improving feeding practices: current patterns, common constraints, and the design of interventions. *Food and Nutrition Bulletin*; 24: 45-82. <https://doi.org/10.1177/156482650302400104> PMID:12664527
- Pennington L, McConachie H (1999). Mother-child interaction revised: Communication with non-speaking physically disabled children. *International Journal of Language and Communication Disorders*; 34: 391-416. <https://doi.org/10.1080/136828299247351> PMID:10884908
- Ramelli GP, Aloysius A, King C, Davis T, Muntoni F (2007). Gastrostomy placement in paediatric patients with neuromuscular disorders: indications and outcome. *Developmental Medicine and Child Neurology*; 49: 367-71. <http://dx.doi.org/10.1111/j.1469-8749.2007.00367.x>. PMID:17489811 <https://doi.org/10.1111/j.1469-8749.2007.00367.x>

- Reddihough DS, Baikie G, Walstab JE (2001). Cerebral palsy in Victoria, Australia: mortality and causes of death. *Journal of Paediatrics and Children Health*; 37: 183-186. <https://doi.org/10.1046/j.1440-1754.2001.00644.x> PMID:11328476
- Reilly S (2001). Prevalence and severity of feeding and nutritional problems in children with neurological impairment: Oxford Feeding Study. *Developmental Medicine & Child Neurology*; 43: 358-360. <https://doi.org/10.1111/j.1469-8749.2001.tb00219.x> <https://doi.org/10.1017/S0012162201210676> <https://doi.org/10.1017/S0012162201230679> <https://doi.org/10.1017/S0012162201220672> PMID:11368491
- Reilly S, Skuse D (1992). Characteristics and management of feeding problems of young children with cerebral palsy. *Developmental Medicine & Child Neurology*; 34(5): 379-388. <https://doi.org/10.1111/j.1469-8749.1992.tb11449.x> PMID:1592191
- Reilly S, Skuse D, Mathisen B, Wolke D (1995). The objective rating of oral-motor functions during feeding. *Dysphagia*; 10(3): 177-91. <https://doi.org/10.1007/BF00260975> PMID:7614860
- Reilly S, Skuse D, Poblete X (1996). Prevalence of feeding problems and oral motor dysfunction in children with cerebral palsy: a community survey. *Journal of Paediatrics*; 129: 877-882. [https://doi.org/10.1016/S0022-3476\(96\)70032-X](https://doi.org/10.1016/S0022-3476(96)70032-X)
- Rogers B, Arvedson J, Buck G, Smart P, Msall M (1994). Characteristics of dysphagia in children with cerebral palsy. *Dysphagia*; 9: 69-73. <https://doi.org/10.1007/BF00262762> PMID:8131428
- Samuels R, Chadwick DD (2002). "How I trained others in dysphagia: Fred the head stops mars bars in bed". *Speech and Language Therapy in Practice*; 3: 26-27.
- Satter EM (1986). The feeding relationship. *Journal of American Dietetic Association*; 86: 352-356. PMID:3950279
- Sayre JM, Pianta RC, Marvin RS, Saft EW (2001). Mothers' representations of relationships with their children: relations with mother characteristics and feeding sensitivity. *Journal of Pediatric Psychology*; 26: 375-384. <https://doi.org/10.1093/jpepsy/26.6.375> PMID:11490040
- Speech Pathology Australia (2012). *General Dysphagia Guidelines*.
- Spiroglou K, Xinias I, Karatzas N, Karatza E, Arsos G, Panteliadis C (2004). Gastric emptying in children with cerebral palsy and gastroesophageal reflux. *Pediatr Neurol*; 31: 177-182. <https://doi.org/10.1016/j.pediatrneurol.2004.02.007> PMID:15351016
- Stallings VA, Charney EB, Davies JC, Cronk CE (1993). Nutritional status and growth of children with diplegic or hemiplegic cerebral palsy. *Developmental Medicine and Child Neurology*; 35: 997-1006. <https://doi.org/10.1111/j.1469-8749.1993.tb11582.x> PMID:8224567
- Sullivan PB (2008). Gastrointestinal disorders in children with neurodevelopmental disabilities. *Feeding and Swallowing and Developmental Disabilities*; 14(2): 128-136. <https://doi.org/10.1002/ddrr.18>
- Sullivan PB, Lambert B, Rose M, Ford-Adams M, Johnson A, Griffiths P (2000). Prevalence and severity of feeding and nutritional problems in children with neurological impairment: Oxford Feeding Study. *Developmental Medicine & Child Neurology*; 42: 674-80. <https://doi.org/10.1111/j.1469-8749.2000.tb00678.x> <https://doi.org/10.1017/S0012162200001249> PMID:11085295

- Suzuki M, Saitoh S, Tasaki Y, Shimomura Y, Makishima R, Hosoya N (1991). Nutritional status and daily physical activity of handicapped students in Tokyo metropolitan schools for deaf, blind, mentally retarded, and physically handicapped individuals. *American Journal of Clinical Nutrition*; 54: 1101-1111. <https://doi.org/10.1093/ajcn/54.6.1101> PMID:1835563
- Thommessen M, Heiberg A, Kase BF, Larsen S, Riis G (1991). Feeding problems, height and weight in different groups of disabled children. *Acta Paediatrica Scandinavica*; 80: 527-533. <https://doi.org/10.1111/j.1651-2227.1991.tb11897.x> PMID:1831317
- Trier E, Thomas AG (1998). Feeding the disabled child. *Nutrition*; 14: 801-805. [https://doi.org/10.1016/S0899-9007\(98\)00088-4](https://doi.org/10.1016/S0899-9007(98)00088-4)
- Troughton KEV, Hill AE (2001). Relation between objectively measured feeding competence and nutrition in children with cerebral palsy. *Developmental Medicine*; 43: 187-190. <https://doi.org/10.1111/j.1469-8749.2001.tb00185.x> <https://doi.org/10.1017/S0012162201000354>
- Vik T, Skrove MS, Dollner H, Helland G (2001). Feeding problems and growth disorders among children with cerebral palsy in south and north Trondelag. *Tidsskrift for den Norske laegeforening*; 121: 1570-1574. PMID:11446040
- Wilson EM, Hustad KC (2009). Early feeding abilities in children with cerebral palsy: A parental report study. 31-44.
- Workinger MS (2005). *Cerebral palsy resource guide for speech-language pathologists*. Thomson Delmar Learning.
- Yokochi K (1996). Tongue thrust swallowing in severely physically disabled children. *Brain & Development*; 18: 242-244. [https://doi.org/10.1016/0387-7604\(96\)00004-6](https://doi.org/10.1016/0387-7604(96)00004-6)
- Yousafzai AK, Filteau S, Wirz S (2003). Feeding difficulties in disabled children leads to malnutrition: Experience in an Indian slum. *British Journal of Nutrition*; 90: 1097-1106. <https://doi.org/10.1079/BJN2003991> PMID:14641969