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## Nano Teaching Strategies: Effect on Feeding Difficulties among Children Having Cerebral Palsy

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Abstract: Background: Children having cerebral palsy usually experience feeding difficulties which may have a significant impact on their health. Nano teaching helps the learner to acquire knowledge through an ongoing process without requiring a lot of time commitment. Purpose: To assess the effect of Nano teaching strategies on feeding difficulties among children having cerebral palsy. Design: A quasi-experimental research design was utilized (pre and post design). Setting: Wogod Center and EL Mogamma EL Teby AL Shamal at Shebin El-Kom City. Sample: A purposive sampling of fifty children with cerebral palsy and their mothers. Instruments: four instruments were utilized. Cerebral palsy mothers knowledge Questionnaire, Mothers' practice regarding feeding children with cerebral palsy, Children's Observational Assessment Record and Eating & Drinking Ability. Results: There was an improvement in both mothers' knowledge and practice posttest and follow-up tests than pretest. Also, there were reductions in mean scores of feeding difficulties in post and follow-up tests as compared to pretest  $(2.80 \pm 1.51, 9.80 \pm 1.45 \& 12.02 \pm 1.52$  respectively). Conclusion: implementing Nano teaching strategies had a great influence on improving feeding difficulties of children having cerebral palsy. Recommendation: Conducting periodic in-service educational training involving new teaching methods as Nano teaching for mothers having CP children to enhance their knowledge, practice and improve feeding difficulties of their children.

**Keywords:** Children having cerebral palsy, Feeding difficulties, Nano teaching strategies

## Introduction

Cerebral palsy (CP) refers to a broad range of symptoms that change with age rather than a single illness. (Sadowska et al., 2020). CP usually takes place during the perinatal or prenatal stage, especially in preterm .Prenatal causes comprise infants hemorrhage, maternal disease. placental separation and nutritional deficiencies. While. oxvgen deprivation before, during, and after birth are among the perinatal causes with 10% to 20% happen after birth. The most prevalent postpartum factors are cerebrovascular accident, head and infection (Zerai & trauma Gilanian, 2019). These problems cause neurodevelopmental disorder or nonprogressive disturbances to the developing fetal brain that control movement (Gulati & Sondhi 2018).

The neurodevelopmental disorder causes а number of permanent disorders of movement, posture, balance, muscle tone and motor skills causing activity limitation and severe physical disability (Ferre et al., 2020). Movement disorders related to CP are classified as spasticity, ataxia, and dyskinesia and mixed. Spasticity is the most prominent movement disorder affects 80% of children with CP that is by hypertonia characterized and neuromuscular mobility impairment (Vitrikas et al., 2020). Meanwhile, ataxic CP that is characterized by hypotonia, tremors and wide based gait occur due to damage to cerebellum and affect nearly 10% of cases. Dyskinetic type of CP is characterized by a combination of hypertonia and hypotonia in the muscles, as well as writing persistent, uncontrollable movements. Mixed type of CP is a combination of dyskinetic and spastic cerebral palsy in which no particular pattern predominates. motor

(Sadowska et al., 2020 & Uma Soundari, 2017).

In addition to motor disorders, children with CP often experience disturbances of sensation, perception, cognition, communication, behavior and epilepsy (Korzeniewski et al., 2018). Also, they can be unable to speak, recognize voices or interact with peers. Moreover, Muscle spasms can cause joint problems that can lead to a variety of secondary complications such as spine abnormalities, hand dysfunction. hip discomfort or dislocation and difficulties with balance (Sadowska et al., 2020). Furthermore, this motor disorder affects the muscles responsible for chewing and swallowing, leading to dysphagia, feeding difficulties and nutritional problems (Boel et al., 2019).

Feeding difficulties lead to problems during feeding including gagging, drooling, vomiting, aspiration of food or fluid and longer feeding time more than 3 hours per day (Blackmore et al., Additionally, 2018). feeding difficulties lead to medical problems including recurrent lung infections, gastro esophageal reflux, constipation and decrease fluid intake that causes dehydration. Consequently, CP child with feeding difficulties suffers from nutritional problems and impaired physical growth that affect overall health. Therefore, in order to lessen the effects of feeding challenges, feeding guidelines are crucial to be used for children to improve their growth (Usman, 2017).

Nano teaching helps the learner to acquire knowledge through an ongoing process without requiring a lot of time commitment. With Nano-learning, the most valuable knowledge synthesized into shorter learning capsules (Gramming et al., 2019). It focuses on

one particular learning goal or one particular topic. Even when learners receive the greatest amount of information necessary to understand the material, their brains do not become tired of lengthy classes or teacher with the interactions (Aburizaizah & Albaiz., 2021). In addition, the goal of nano-learning is to provide students the ability to study any subject in five to ten minutes.

#### Significance of the study

It was estimated that 8.1 million (7.1-9.2) or 1.2% of children below 5 years old are diagnosed with cerebral palsy, globally. The majority of them live in low-income and middle-income countries (Olusanya et al., 2022). Cerebral palsy children possessed alterations in the oral functions; this results in difficult feeding and serious health consequences as malnutrition and pneumonia. Guidelines for food practices and care are crucial and must be effective and satisfactory in order to avoid complications and reduce stress caregivers for both and child. (Maggioni & Marina, 2020). Thus, the purpose of this study was to assess the effect of feeding practice guidelines based on Nano teaching strategy on feeding difficulties among children having cerebral palsy.

## **Operational definitions:**

- Nano Teaching Strategy: It involves delivering smaller amount of knowledge within a short period of time usually ranging from 1-3 minutes to increase the ability of mothers to attend, take in, and retain information.
- Feeding practice guidelines: In the current study, it includes positioning, supporting jaw control, oral stimulation, perioral massage, stroking the throat, closing the lips, identifying food types and consistency, and paying attention to

the child for thirty to forty minutes following feeding. It will be assessed using instrument two.

• Feeding Difficulties: In current study, indicated that children have motor impairments that affect the muscles necessary to chew and swallow that result in problems with sucking, eating from a spoon, chewing, or drinking from a cup. Swallowing disorders include difficulties with moving food or liquid from the mouth, throat, or esophagus to the stomach.

## **Purpose:**

To assess the effect of Nano teaching strategies on feeding difficulties among children having cerebral palsy.

#### **Research hypotheses**

- Mothers' knowledge is anticipated to be higher on posttest than it was before implementing Nano-Teaching approach.
- Mothers' feeding practices are expected to be higher on posttest than it was before implementing Nano-Teaching approach
- The feeding skills of children having cerebral palsy are expected to be higher on posttest than pre implementing Nano-Teaching approach.
- Feeding difficulties among children having cerebral palsy are expected to be more on pretest than posttest.

## Method

#### **Research Design**

A quasi-experimental design was used (pre and posttest).

#### **Research Setting**

The study was conducted in two settings for children with special needs in Menoufia governorate (Wogod center and outpatient neuropsychiatric clinic at EL Mogamma EL Teby AL Shamal in Shebin El-Kom City)

Wogod center contains two floors. The 1st floor had library and one hall for lectures. The 2nd floor contained four rooms. A pair of rooms for those with special needs children's early intervention programs e.g. Cerebral palsy, Down syndrome, and children with learning difficulties, the third room for physiotherapy, the final room served as a speaking and language therapy center for kids with speech issues. The neuropsychiatric clinic was located on the second floor at EL Mogamma EL Teby AL Shamal and contains three rooms. The first is a large diagnostic room. The second room is used for case registration, while children and their caregivers wait in the third room.

## **Research Sampling**

A purposive sampling of fifty children with cerebral palsy was recruited from the previously mentioned clinical settings with their mothers. The total number of mothers was calculated in line with the equation that follows:

Sample size  $(\mathbf{n}) = \mathbf{N}/\mathbf{1} + \mathbf{N}^*\mathbf{d}\mathbf{2}$ (Sharma et al, 2020)

- N = Total population = 57 mothers
- $\mathbf{d}$  = Margin of error or precision = 0.05  $\mathbf{n}$  = 57/1+57\* (0.05)2 = 50 mothers.

## **Inclusion criteria:**

- Child age should range from 3-12 years old.
- Diagnosed with CP for six months with feeding difficulties.
- Free from congenital anomalies.

## **Exclusion Criteria:**

- Pediatric patients requiring tube feeding due to cerebral palsy.
- Mothers who had any disability (cognitive or others) which might block communication.
- Mothers who previously received health education about feeding practices.

#### Instruments

The following four instruments were used to collect data in order to fulfill the research's objective:

## Instrument one: - Cerebral palsy

### mothers knowledge Questionnaire:

It was developed by Reyes et al., (2019) and adapted by researchers to assess knowledge about cerebral palsy. It contained three parts:

- Part 1:- Characteristics of mothers such as age, educational level, occupation, and training regards CP.
- Part 2:- Mothers' obstetric history: This section contained three questions about family members affected by cerebral palsy, complications of pregnancy and labor.
- Part 3:- Mothers' knowledge concerning cerebral palsy: This section was modified following a review of the literature Andrew et al., (2018) and Reves et al, (2019); It was intended to evaluate mothers' knowledge about CP (pre and post). This instrument included sixteen true/false and multiple choice questions about definition. prevalence, forms, reasons, risk variables, clinical manifestations, and management as well as feeding difficulties; type of food, amount, consistency, quality, and feeding time; as well as frequencies.

#### Scoring system:

For assessing mothers' level of knowledge, a scoring method was used. Each item was scored (2) for correct answer, while the incorrect answer was scored (1). Total knowledge scores were categorized as:

• Poor knowledge: < 60% of the total knowledge score.

- Average knowledge: 60 75% of the total knowledge score.
- Good knowledge: > 75% of the total knowledge score

### <u>Instrument two:</u> Mothers' feeding

#### practices related to CP checklist: -

It was adopted from Uma Soundari (2017). It has twelve questions such as: Does the mother position the child appropriately? Does she face forward or flex her neck? and did she provide any oral stimulation or perioral massage? etc....

Scoring system; correctly done was scored (1), while incorrectly done or not done was scored (0). Total scoring system was categorized as:

- Poor feeding practices 0-4
- Fair feeding practices 1-3
- Good feeding practices 9-12.

#### **Instrument** three: Children's

#### **Observational Assessment Record**

It was adopted from the National Center on Birth Defects and Developmental Disabilities, Centers for Disease Control and Prevention (2022). It included two parts.

- Part 1: Characteristics of children such as age, sex, birth order, type of cerebral palsy and presence of convulsions.
- Part 2:- Physical assessment record. It included body weight and height. Calculated children Body Mass Index (BMI) (using the equation = weight in kilograms divided by height in meters squared).

#### Scoring system

- Underweight is considered if BMI was less than 18.5 (< 5th percentile).
- Normal weight is considered if BMI was from 18.5 through 24.9 (from 5th percentile to <85th percentile).

- Overweight is considered if BMI was from 25 to 29.9 (> 85th percentile to < 95th percentile:
- Obese is considered if BMI was 30.0 or greater (≥ 95th percentile).

## Instrument four: - Eating and

#### **Drinking Ability:**

This instrument was adopted from Gangil, et al., (2011). It contained two parts

• **Part 1**: Feeding difficulties was based on Gisel and Patrick's feeding behavior skill score (1988). It was used for assessing the child's ability and feeding difficulties it contained sixteen items such as inability to self-feed, swallowing problems, chewing problems, coughing/choking during feed. drooling, and sucking problem etc....

#### Scoring system:

A scoring system was followed to obtain the outcome of feeding problems. Each item was scored as follows: Present = 1, absent = Zero

The total score was categorized as follows mild feeding difficulties  $\leq 4$ . Moderate feeding difficulties 5- 8. Sever feeding difficulties  $\geq 9$ 

- Part 2:- Levels of feeding ability: It was adopted from Bykova, et al, (2023). It was developed to categorize children having cerebral palsy according to their abilities to eat and drink efficiently and safely from age 3 years. It was composed of a five-level scale to classify drinking, eating, and swallowing abilities. It was scored as follows:
  - Level I scored (5) includes eats and drinks safely and efficiently.
  - Level II scored (4) includes eats and drinks safely but with some limitations to efficiency.
  - Level III scored (3) includes eats and drinks with some limitations to

safety; there may be limitations to efficiency.

- Level IV scored (2) includes eats and drinks with significant limitations to safety.
- Level V scored (1) includes unable to eat or drink safely, tube feeding may be considered to provide nutrition.

## Validity:

The instruments were assessed for clarity, comprehensiveness, appropriateness, and relevance by a board consisting of five expert professors in neurology and five expert professors in pediatric nursing with over ten years of combined experience in the fields. No modifications were required.

## Reliability of the instruments:-

Cronpach's Coefficients Alpha was used to test the reliability of the developed instruments. Reliabilities of instruments one, two and four were 0.87, 0.785 and 0.93 respectively.

## **Pilot Study:**

It was conducted on 5 mothers (10% of the study sample). It was done in order to find any areas of uncertainty in the instruments, confirm item transparency, and determine how long data collection will take. Also, it was conducted to test the feasibility of the research methodology. In order to prevent sample contamination, mothers who were a part of the pilot study were omitted from the study sample.

## **Ethical Considerations:**

- Approval of the Ethical Research committee in the Faculty of Nursing was obtained (No. 991).
- All mothers who took part in the study provided their written consent and they were told that they could leave the study at any time without incurring any penalties and that participation was completely

voluntary. Anonymity was preserved, and each participant's confidentiality was protected via assigning the questionnaire sheet a code number. Participants were informed that their information would be utilized solely for the purpose of research.

## **Procedure:**

- A letter was submitted from the Dean of the Faculty of Nursing, Menoufia University to the directors of the settings including the purpose and methods of data collection.
- Data gathering took place throughout 6 months from July 2023 to December 2023.

#### Assessment phase

- At the beginning of the study, each mother was interviewed to assess her characteristics using instrument one, parts 1& 2 (pretest). Mothers' knowledge about cerebral palsy was assessed at the beginning of the study utilizing the third part of instrument one (pretest). Assessment of mothers' practices about feeding technique and feeding practices was done using instrument two (pretest).
- Assessment of children characteristics was done by using part one of instrument three (pretest). The physical measurements of the children (weight, height) were measured by using instrument three, part two (pretest). Assessment of children's feeding difficulties was done by using instrument four, part one (pretest).
- Assessment of the child's ability, level of eating and drinking abilities was done using instrument four, part two (pretest). The data gathered in this stage served as the foundation for subsequent assessments of the effectiveness of the instructional techniques used.

## **Planning phase**

Following an extensive analysis of pertinent scholarly literature from journals, textbooks, bulletins, and electronic media. the researchers developed instructional videos to foster feeding rehabilitation. These videos were given out at the conclusion of the and practice pre-test. Knowledge deficiencies regarding feeding practices of children having cerebral palsy were identified and considered while preparing the Nano-teaching videos including feeding practice guidelines.

Based on expert validation and evaluation findings in the field, the researcher developed Nano teaching videos that are workable and useful for caregiver learning the process (Azzahra et al., 2022). Feeding practice provided in guidelines was six sessions, each session includes one video and each video took about 1-3 minutes. The caregivers were divided into small groups (4/6).

Videos were designed by Motion Graphic and Video editing specialist. Animation was used in the creation of the videos to make them attractive to mothers who watched them.

 Canva Pro, Adobe Premiere Pro 2019, and Adobe after Effects 2015 were used to develop instructional videos. Six videos were developed with duration of each video ranged from 1-3 minutes per video.

## Implementation phase

• The mothers were given a warm welcome by the researchers, who also discussed the purpose of the program, ascertained the participants' expectations, gave out the pretest, and scheduled the time of the upcoming sessions. The researchers began implementing the program after they were prepared. The program consisted of six sessions (one video per session).

- **First session** includes introduction and knowledge about CP as meaning of CP, causes and common signs, as well as complications and CP management.
- The second session talked about feeding difficulties in children with CP. Meal kinds, amount, consistency, quality, duration, frequency of eating, and prohibited meals.
- The third session included interventions on how to handle feeding difficulties appropriately as child positioning during eating, eating with spoon, and successful cup drinking.
- The fourth session focused on how to teach the child to bite, help in chewing process, and method to help in swallowing techniques.
- The fifth session focused on different feeding tools/utensils, the perioral massage to strengthen the oromotor function and the oral muscles.
- Finally, the six session focused on ways to decrease choking, drooling and rinsing the mouth after feeding.
- All mothers received 6 videos; the video took 1-3 minutes and supported by oral presentation, feedback questions. In order to accomplish its goals, the videos were given to all moms who were recruited and made readily available to CP child caregivers on laptops or cellphones.

## **Evaluation phase:**

In this stage, a post-test was carried out after one week following the program.

 Reassessment of mothers' knowledge and practices were done one week post application of Nanoteaching strategy using instrument one & two. Children's physical

assessment, eating and drinking abilities using instrument three and four (posttest).

 Follow up test was done three months later to reassess mothers' knowledge, practices using instrument one & two. Children's physical assessment, eating and drinking abilities using instrument three and four (follow up test).

## Data Analysis

The Statistical Software Package for Social Sciences, version 20.0, was used to analyze the data entered. The percentage and frequency of the qualitative data were displayed. We conducted the following tests: We compared the proportions between the qualitative factors using the Chi-square (x2) test of significance. If the means of the two groups differ significantly, t-test is employed to find out. Highly statistically significant difference at p <0.01, and statistically significant difference at p <0.05.

## Results

Table1 illustrated percentage distribution of studied mothers according to their characteristics. It was clear that less than three quarters of them (70.0%) were between 31- 40 years with mean age of  $32.45 \pm 8.75$ . Regarding mother's educational level, less than half of them (48.0%) had secondary education and less than three quarters of them (70.0%) were house wife. It was obvious that the majority of studied mothers (86.0%) did not have relatives who have cerebral palsy. In addition, 72.0% of them did not have complications during pregnancy and nearly two-thirds of them (62.0%) had complications during labor.

Table 2clarifiedpercentagedistributionofstudiedchildrenaccording to their characteristics. Thistableclarified

children (54.0%) were between 3-6 years with mean age  $7.80 \pm 3.5$ . Also, nearly two thirds of them (62.0%) were males and 50.0% were the first child in the family. In addition, nearly three quarters of them (72.0%) had spastic CP while more than three quarters of them (76.0%) did not have convulsions.

Table 3 showed mean score of mothers' knowledge and practice on pre, post and follow-up tests. Regarding mothers' knowledge mean score, the knowledge of mothers improved on posttest than follow up and pretest where Mean  $\pm$  SD = (24.60  $\pm$  3.99, 23.92  $\pm$  3.99 & 6.64  $\pm$  3.35 respectively). Concerning mothers' practice, the mothers' practice mean score increased on the posttest than follow up and pretest as Mean ± SD=  $(9.86 \pm 2.30, 8.88 \pm 2.24 \& 3.88 \pm 2.61)$ respectively). Therefore, there were very highly statically significant differences 1% between posttest and pretest

Figure 1 clarified comparison between level of mothers' practice on pre, post and follow-up the intervention. It was clear that nearly three quarters of mothers on follow up and more than half of them on posttest had good practice (76.0%) & 58.0% respectively). Meanwhile, only 4.0% of them had good practice in pretest. Therefore, there were highly statically differences significant regarding mothers' practice between follow up, posttest and pretest.

**Table 4** indicated comparison between body mass index (BMI) on pre, post and follow up the intervention among studied children. It was clear that there was an improvement in BMI among children where almost two thirds of them (62.0%) had normal BMI in follow up compared to more than one third(38.0%) in posttest and only 14.0% in pretest. Therefore, there were

statically significant differences between posttest & pretest and between posttest & follow up.

**Table 5** explained total mean score of feeding difficulties on pre, post and follow-up the intervention among studied children. There were highly statically significant differences regarding children's feeding difficulties between post and pretest. In addition, the overall mean feeding difficulties score showed improvement in follow up compared to posttest and pretest as Mean  $\pm$  SD = (2.80  $\pm$  1.51, 9.80  $\pm$  1.45 & 12.02  $\pm$  1.52 respectively).

**Figure 2** illustrated frequency distribution of level of feeding difficulties on pre, post and follow- up tests among studied children. This figure indicated that the majority of children had mild feeding difficulties at follow up compared to more than half of them in posttest who had mild feeding difficulties (84.0% VS 56.0%)

respectively). Meanwhile, none of children had mild feeding difficulties in pretest.

**Figure 3** showed comparison between eating and drinking ability on pre, post and follow-up intervention among studied children. This figure illustrated that more than half of children (52.0%)ate and drank safely but with some limitations in follow up compared to nearly one third(38.0\%) in posttest and none in pretest.

Table6 demonstrated Pearson correlation between total score of mothers' practice, knowledge and children's feeding difficulties. Obviously, there was very highly statistically significant positive correlation between mothers' practice and their knowledge while there was highly statistical significant negative correlation between mothers' practice & knowledge and children's feeding difficulties.

Fable (1): Percentage	e distribution of studied	mothers according to the	ir characteristics.
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Characteristics	No	%			
Age of the mother (in years)					
20 - < 30	9	18.0%			
30 - < 40	35	70.0%			
$\geq$ 40	6	12.0%			
- Mean $\pm$ SD	32.45	± 8.75			
Educational level					
<ul> <li>Read and write</li> </ul>	3	6.0%			
– Primary/preparatory	10	20.0%			
<ul> <li>Secondary/diploma</li> </ul>	24	48.0%			
<ul> <li>University education</li> </ul>	13	26.0%			
Family members affected by cerebral palsy					
– No	43	86.0%			
– Yes	7	14.0%			
Complications during pregnancy					
– No	36	72.0%			
– Yes	14	28.0%			
Complications during Labor					
– No	19	38.0%			
– Yes	31	62.0%			

Children characteristics	No	%				
Child age / year						
3 - < 6	27	54.0%				
$\geq 6$	21	42.0%				
– More than 10	2	4.0%				
Mean ± SD	7.8	0 ± 3.5				
Sex						
– Male	31	62.0%				
– Female	19	38.0%				
Child ranking						
– First	25	50.0%				
– Second	20	40.0%				
– Third	5	10.0%				
Types of cerebral palsy						
– Spastic	36	72.0%				
<ul> <li>Ataxic type</li> </ul>	10	20.0%				
– Athletic	1	4.0%				
<ul> <li>Mixed type</li> </ul>	3	6.0%				
Presence of convulsions						
– No	38	76.0%				
– Yes	12	24.0%				

#### Table (2): Distribution of studied children according to their characteristics

#### Table (3): Mean score of mother's knowledge and practice on pre, post and follow up tests

Variables	Pretest Mean ± SD	Post test Mean ± SD	Follow-up Mean ± SD	t <sub>1</sub> test P1-value	t <sub>2</sub> test P2-value
Total knowledge	6.64 ± 3.35	$24.60\pm3.99$	23.92± 3.99	24.34 <sup>***</sup> 0.00	0.93ns 0.35
Total practice	3.88 ± 2.61	9.86 ± 2.30	8.88 ± 2.24	$12.15^{***}$ 0.00	2.15 <sup>*</sup> 0.03

*NB:* Paired  $t_1$ = comparison between pretest and posttest Paired  $t_2$ = comparison between posttest and follow up



Figure (1): level of Mother's Practice on Pre, Post and Follow-Up the Intervention.

## Table (4): Comparison between body mass index (BMI) on pre, post and follow up the intervention among studied children

Variables	Pre te	est	Postte	est	Follo	w-up	$X_1^2$	$X_2^2$
	No	%	No	%	No	%	P <sub>1</sub> -value	P <sub>2</sub> -value
BMI								
Low BMI	43	86.0%	31	62.0%	19	38.0%	7.48**	5.76*
(Underweight)							0.006	0.01
Normal BMI	7	14.0%	19	38.0%	31	62.0%		

*NB*:  $X_1^2 \& P_1 =$  comparison between posttest and pretest.  $X_2^2 \& P_2 =$  comparison between follow up and posttest

# Table (5): Total Mean Score of Feeding Difficulties on Pre, Post and Follow-Up the Intervention among Studied Children.

Voriable	Pre test	Posttest	Follow-up	t <sub>1</sub> test	t <sub>2</sub> test	
variable	Mean ± SD	Mean ± SD	Mean ± SD	P1-value	P2-value	
Total mean score				$t - 4 12^{**}$	t –23 01 <sup>***</sup>	
of feeding	$12.02\pm1.52$	$9.80 \pm 1.45$	$2.80 \pm 1.51$	0.03	0.00	
Difficulties						

*NB*: Paired  $t_1$ = comparison between pretest and posttest Paired  $t_2$ = comparison between posttest and follow up





Figure (3): Comparison between eating and drinking ability on Pre, Post and follow-Up intervention among studied children



 Table (6): Pearson correlation between total score of mothers' practice, knowledge and children feeding difficulties.

Variables	Mothers' practice		
	R	p. value	
Mothers' knowledge	0.66***	0.00	
Children's Feeding difficulties	- 0.65***	0.00	

## Discussion

Mothers face common difficulties when feeding their cerebral palsy children as food spilling, children experience vomiting and choking. Those children also complain of problems in chewing and swallowing process that can hinder feeding and drinking, so this is a big problem for persons caring for them particularly their parents. So, it is vital to modify parents' practices regarding texture of food, cutlery, and position while food consumption through good feeding practices education. (Maggioni & Araújo, 2020).

Regarding mothers' knowledge, results of this study showed that there was an improvement of mothers' knowledge post applying Nano- teaching than at follow up and pretest. Such low level of knowledge on pretest might be due to mothers' intermediate educational level as less than half of them had secondary education and half of those mothers received a brief knowledge from doctors about their children disease. In addition to all mothers did not take any training concerning care of their CP children, but this enhanced after providing adequate information and skills through using Nano teaching which indicated a positive impact of it on mothers' knowledge.

Moreover, using video as learning media, attracts mothers to the material presented through sound, text. animation, and graphics within video media which in turn can improve cognitive. affective, psychomotor realms improve mothers' and interpersonal abilities. This was consistent with Chakra et al., (2022) who indicated in their study that the video was perfect in delivering the message and would significantly assist the learners understanding.

On the same context, Mohammed et al., (2020) reached to the same outcome, as presented that the majority of studied mothers demonstrated unsatisfactory knowledge level prior to social platform program application and interpreted this as a result of absence of ongoing educational program contrary to after socialprogram, with platform highly statistically significant enhancement in their total knowledge level. In addition, Afifi et al., (2018) established in their study that mothers possessed higher knowledge on posttest level of compared to before and follow up program conduction. This pointed to the great impact of the intervention program on mothers' knowledge. Also, El-Kurdy et al., (2022) declared in their study that after using Nano teaching, there was dramatically improvement of maternal knowledge with statistically significant difference between pre and post using Nano teaching. These outcomes highlighted the efficacy of Nano-teaching session. In addition, Ali (2022) said that Nano learning helped learners to engage, interact and get more knowledge in their study.

In relation to mothers' practice, the recent study discovered that the mean score of mothers' practice improved after implementing Nano teaching than follow up and pre teaching with highly statically significant differences among program phases. Such improvement may be owing to the high level of mothers' knowledge they acquired after providing Nano teaching which in turn improved their practice. Besides, used videos improved psychomotor abilities of the mothers where those mothers can have easily access to such videos because they were distributed by researchers to every mother included in the research. This meant that there was a great impact of Nano teaching on mothers' practice as well.

This result agreed with Hallman (2018) who dedicated that well educated mothers can look after their children, especially those diagnosed with CP as they require special care and well understanding of their needs and health problems. At the same time. Mohammed et al., (2020) reported that using video media enhanced mothers' practices toward feeding CP children. This could be due to caregiver's ability to provide better performance after having Nano teaching strategies. Sagita et al. (2023) stated that after developing educational videos for caregivers about CP children's feeding practice, those caregivers acquired adequate knowledge and skills about feeding practice for CP children. This finding was in same context with Gad et al., (2023) who reported in their study that the total score of mothers' knowledge and practices enhanced after the program was carried out.

In addition, Rashad et al., (2021) also established that about one quarter of mothers had satisfactory level of reported practices regards their CP children care before conducting the educational modules. But following modules application such percentage reached to half of them. Beside, Madurai, (2017) proven that the level of feeding practices among the care givers of CP children was increased contrary to pre application of it. Indu & Saji (2023) announced that the mean practice score of mothers concerning children with cerebral palsy feeding after the interventional program was significantly higher than that of before the interventional program and the interventional program was useful in upgrading mothers' knowledge as well as their practice toward feeding their CP children. This can be interpreted as Nano strategies helped mothers to adopt to instructions, which helped to follow guidelines of feeding practices.

In relation to children's body mass index, the present study discovered that studied children's BMI the significantly increased immediately after providing the teaching and greatly increased in follow up phase with significant statistically differences between posttest & pretest and between posttest & follow up. From researchers' opinion, this improvement might be due to the effect of feeding practice guidelines that presented by teaching method, which Nano enhanced mothers practice during feeding their children, improved the choice of food quality & quantity and frequent oral training. This result was in the same line with Wafeek et al., (2022) who acknowledged that the studied children's BMI significantly increased following supportive nursing interventions and explained such improvement as a result of frequent oral training.

Regarding feeding difficulties, there was a highly statistically significant difference regarding all children's feeding difficulties between post and pre teaching. Besides, there was an improvement in total means score of feeding difficulties in follow up compared to post and pre teaching. This improvement might be due to the component, persistent training, and focus of the Nano teaching program that targets the different feeding difficulties.

This finding was in same context with Wafeek et al. (2022) who announced that supportive nursing interventions improved the feeding difficulties of children with CP and there was a statistically significant difference regarding all feeding difficulties in pre post-supportive and nursing interventions among the studied children. In addition, Madurai (2017) reported that assisted feeding practices significantly improved children's

feeding practices, maximizing feeding independence, decreasing feeding difficulties of the children. Reyes et al., (2019), Motion et al., (2020), Novak & Berry (2020) found that after implementing an educational program in their previous studies that the problems related to feeding were decreased and enhanced.

Moreover, the present study results positive significant discovered a between correlation mothers' knowledge and their practice while there was highly statistical significant negative correlation between mothers' practice & knowledge and children's feeding difficulties. This can be interpreted that when knowledge is improved will lead to more effective practice by mothers which in turn will be reflected on reducing feeding difficulties among those CP children. At the same time, this demonstrated the significance of Nano teaching strategy which satisfied mothers' needs and supplied them with acceptable level of knowledge and practices.

was This finding in line with Mohammed et al., (2020) who declared a correlation between mothers' total score of their knowledge and practice before and after providing the social program platform and it was significant. On the same line, Indu & Saji (2023) found a moderate positive correlation between mothers' knowledge and practice related to feeding their CP children. The researchers explain the successfulness of study practical guidelines was enhanced because the developed video has a lot of writing that goes along with the images of the video animation. This could be improved by finding a better equilibrium between both writing and animation that make the video look more appealing.

#### Conclusion

Depending on the current study

findings, it can be concluded that implementing Nano teaching strategies had a great influence on improving mothers' knowledge , practice and feeding difficulties among cerebral palsy children. A statistical significant positive correlation was found between the total score of mothers' knowledge, practice in contrast to children feeding difficulties where a statistically significant negative correlation was found.

According to study results, the following recommendations could be

done:

- Periodic in-service educational training involving new teaching methods as Nano teaching should be conducted for mothers of children having CP to enhance their knowledge, practices and improve feeding difficulties of their children.
- Increasing nurses' awareness about probable interventions that are essential for children with different chronic conditions via using media support.
- Continuous education for care givers regarding feeding interventions of CP children must be organized by nurse administrator.

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