

Nurses' Practices for Sensorimotor Stimulation to Enhance Oral Feeding of preterm Infants: An Assessment Study

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Abstract

Background: Preterm infants experience feeding problems due to their physiological and neurological immaturity. Sensorimotor stimulation such as oral stimulation, non-nutritive sucking and tactile kinesthetic stimulation are forms of stimulations used to enhance oral feeding for preterm infants at Neonatal Intensive Care Units. **Aim of the study:** Was to assess nurses' practices for sensorimotor stimulation to enhance oral feeding of preterm infants. **Design:** A descriptive design. **Setting:** The study was conducted at selected Neonatal Intensive Care Units (NICU) at Tanta University hospital and Tanta University Educational Hospital at Gharbia Governorate. **Subject:** A purposive sample of 80 nurses and preterm infants that satisfied predetermined inclusion criteria. **Study Tools:** Interviewing questionnaire sheet and observational checklists to assess nurses' knowledge and practices for sensorimotor stimulation to enhance oral feeding of preterm infants. **Results:** It was found that, more than three fifths of the studied nurses had a good level of knowledge and more than four fifths of them had competent level of practice regarding sensorimotor stimulation to enhance oral feeding of preterm infants. **Conclusion:** Nurses' practices to enhance oral feeding of preterm infants were competent and involved oral stimulation (perioral and intraoral stimulation combined with non-nutritive sucking) and tactile-kinesthetic stimulation. **Recommendation:** Raising awareness of nurses about sensorimotor stimulation to enhance oral feeding of preterm infants.

Key words: Preterm infant, Oral feeding, Sensorimotor Stimulation, Nursing practices.

Introduction

Oral feeding issues in preterm infants are a growing concern for neonatologists because attainment of independent oral feeding is one of the prerequisites for hospital discharge. With the increase in survival of infants born continuously more preterm, understanding such issues has certain urgency. Concerns do not pertain only to difficulties encountered by neonatologists during the birth stay hospitalization, but also by pediatricians and pediatric gastroenterologists who attend to long-term feeding difficulties/ disorders, such as oral feeding aversion (*Chiou and Ongkasuwan, 2018*).

Oral feeding is a critical milestone needed for proper growth and development in infants. Ability to orally feed is one of the most prominent developmental issues among infants who are in the neonatal intensive care unit (NICU). Healthcare professionals are greatly

concerned with infants' oral feeding difficulties because they interfere with their ability to attain breast or bottle feeding, prolong hospitalization, and can lead to long-term childhood feeding disorders (*Park et al., 2015*).

According to *Fucile et al., (2019)*, Prematurity is associated with feeding difficulties. Approximately 82% of preterm infants experience oral feeding difficulties that lead to lengthy hospital stay until improve growth and development.

Safe and efficient oral feeding is a challenge for both preterm infants and their caregivers. Preterm infants have neurodevelopmental immaturity, physiologic instability, and altered behavioral state disorganization that impact caregivers' decisions about how and when the preterm infant is ready for oral feeding (*Pineda et al., 2020*).

Sensorimotor stimulations may be used to optimize infants' oral feeding skills. It

consists of providing developmentally appropriate sensory inputs, including oral (Peri and Intraoral), tactile (stroking of trunk and limbs), kinesthetic (range of motion of limbs), auditory (sound) and olfactory (smell) to maintain and facilitate infants' development (*Rhooms et al., 2019*).

Significance of the study:

Oral feeding in preterm infants is a complex and dynamic process involving an interaction between the oral-motor, neurological, cardio-respiratory, and gastrointestinal systems. Preterm infants experience feeding problems due to their physiological and neurological immaturity. Therefore preterm infants are given long-term enteral feeding via an orogastric/ nasogastric tube until developing an adequate oral feeding skills (*Viswanathan and Jadcherla, 2019*).

Nurses can play an important role to enhance oral feeding skills through oral stimulation during preterm infants' routine care by perioral, intraoral stimulation with non-nutritive sucking and tactile-kinesthetic stimulation. Any interventions which can enhance preterm infants' oral feeding skills not only ensure safe and successful oral feeding, but also shortens hospitalization, decrease medical cost and fastens mother and infant reunion (*Lau et al., 2015 & Younesian et al., 2015*).

Nurses are the most contacted caregivers to preterm infants at Neonatal Intensive Care Units. So, lack of nurses' knowledge or faults practices regarding sensorimotor stimulation to enhance oral feeding of preterm infants may lead to unpleasant consequences (*Girgin et al., 2021*). Therefore assessing nurses' knowledge and practices regarding sensorimotor stimulation to enhance oral feeding to preterm infants is the first step towards improvement of feeding difficulties to preterm infants.

Aim of the study

This study aimed to assess nurses' practices for sensorimotor stimulation to enhance oral feeding of preterm infants.

Research questions:

What are nurses' practices for sensorimotor stimulation to enhance oral feeding of preterm infants?

Subjects and Methods

The subjects and methods of this study discuss under the following four main designs:

- I. Technical design
- II. Operational design
- III. Administrative design
- IV. Statistical design

I. Technical design:

The technical design included research design, setting, study subjects and tools for data collection.

Research Design:

A descriptive design was utilized in this study to assess nurses' practices for sensorimotor stimulation to enhance oral feeding of preterm infants.

Research settings:

This study was conducted at the neonatal intensive care units (NICU) at Tanta University hospital and Tanta University Educational hospital affiliated to Tanta University hospitals at Gharbia Governorate which considered the biggest hospital in Gharbia Governorate providing care to preterm infants.

Description of the settings:

Tanta University hospital NICU is located at 2nd floor beside Obstetric & Gynaecological Department and contains 22 incubators and 12 mechanical ventilations. Tanta University Educational hospital NICU is located in first upper floor beside Operation Rooms and contains 12 incubators and 6 mechanical ventilations.

Research subjects:

1- The total number of nurses is 100 working at the previously mentioned settings and providing care for preterm infants. A purposive sample of nurses (80) who agreed to participate in the current study regardless their characteristics (age, gender, level of education, years of experiences at NICU, marital status and

attendance of courses about sensorimotor stimulation) were included in this study over a period of 6 months. No exclusion criteria was determined.

2- A purposive sample of preterm infants (80) with predetermined inclusion criteria (gestational age $32 \leq 37$ weeks and mild to moderate cases of respiratory distress syndrome). Exclusion of preterm infants having physical health problems (such as congenital anomalies, severe chronic lung disease, intra-ventricular hemorrhage).

Tools of data collection:

Data were collected through using the following tools:

I: A structured interview questionnaire:

It was designed by the researcher in the light of related literature and studies. It was written in simple Arabic language to suit the understanding level of the studied nurses, it was consisted of three parts as the following:

Part I: Characteristics of the studied subjects.

- 1- **Characteristics of the studied nurses:** it concerned with gender, level of education, marital status, years of experience at NICU and attendance of sensorimotor stimulation courses.
- 2- **Characteristics of the studied preterm infants:** it included diagnosis, gender, gestational age, birth weight, using mechanical ventilation and length of hospital stay.

Part II: Nurses' knowledge regarding the following:

- 1- Preterm infant that was consisted of 7 questions in relation to definition of preterm infant causes of preterm birth, common health problems, feeding problems and feeding reflexes of preterm infants.
- 2- Oral feeding process and initiation of oral feeding for preterm infants. It was consisted of 12 questions namely definition of oral feeding process, routes, importance of oral feeding, criteria of hospital discharge, suitable age to initiate oral feeding, duration of oral feeding, skin appearance, hunger

cues, warning signs and obstacles to initiate oral feeding to preterm infants.

- 3- Sensorimotor stimulation and its importance to preterm infants. It was consisted of 40 questions and divided into:
 - A. Knowledge about sensorimotor definition and its types, definition of oral stimulation, non-nutritive sucking, tactile-kinaesthetic stimulation, aims of sensorimotor stimulation and difficulties to initiate sensorimotor stimulation (8 questions).
 - B. Knowledge about importance of oral stimulation (peri and intraoral stimulation) (8 questions).
 - C. Knowledge about physiological and psychological importance to NNS (14 questions).
 - D. Knowledge about importance of Tactile-kinaesthetic stimulation (10 questions).

❖ Scoring system:

Nurses' knowledge was checked with a model key answer and accordingly classified into either correct answer or incorrect answer. The total score was 59 marks (100%) where the correct answer scored (one) and an incorrect answer scored (zero). Then the total level of knowledge was categorized into either good knowledge ($75 \leq 100\%$) with 45-59 marks, average knowledge ($65 < 75\%$) with 39-44 marks and poor knowledge ($< 65\%$) with less than 38 marks.

II: Observational checklists

The observational checklists were designed from related studies to assess the nurses' actual practice regarding:

- A. Preparations before initiation of sensorimotor stimulation to preterm infants: It was adopted from **Montiroso, (2012)** and consisted of 9 steps each step scored 1 to make total scores of 9.
- B. Oral stimulation (perioral and intraoral stimulation) combined with non-nutritive sucking: It was adopted from **Fucile et al., (2013)** and **Hwang et al., (2010)** and consisted of 9 steps each step scored 1 to make total scores of 9.

- C. Tactile kinaesthetic stimulation: It was adopted from **Field et al., (2017)** and consisted of 10 steps each step scored 1 to make total scores of 10.
- D. Gavage feeding: It was adopted from **Corria, (2017)** and consisted of 10 steps each step scored 1 to make total scores of 10.
- E. Bottle feeding: It was adopted from **Corria, (2017)** and consisted of 13 steps each step scored 1 to make total scores of 13.

❖ Scoring system:

The total practices of the nurses was actually assessed where the total level of studied nurses' actual practices was categorized into either competent level of practice score ($39 \leq 75 \leq 100\%$) and incompetent level of practices score ($<39 = <75\%$).

II. Operational design:

The operational design for this study consisted of three phases namely preparatory phase, pilot study and field work.

Preparatory phase

It included a reviewing of the past and current related literature using review articles, scientific journal, textbooks, and web references to develop the study tools and get acquainted with the various aspects of the research problems.

Validity and reliability:

The study tools were tested and evaluated for its face and content validity, by a jury of three experts (professor and two assistant professors in the field of paediatric nursing at Ain Shams University. The experts' elicited responses were either "agree", "disagree" or "agree with modifications". Modifications of the tools were done according to the experts' opinion in the form of rephrasing some statements and appropriateness of some content.

Cronbach's Alpha coefficient test was used to measure the internal consistency of the tools used in the current study. The internal consistency was measured to identify the extent to which the items of the tool measured the same concepts and correlated with each other, test-retest was done statistically by Cronbach's Alpha coefficient test (0.84).

Pilot study:

A pilot study was carried out including 8 nurses and 8 preterm infants that represent 10% of the expected total study sample to test the feasibility of the study, its application and time required to fill in the tools. The study subjects involved in the pilot study were excluded from the study sample.

Field work:

The actual field work was carried out over a period of six months from the first of June / 2020 to the end of November / 2020 for data collection. The researcher was available in the study settings 2 days per week (Sunday and Thursday) one day for each hospital during morning shift from 8 a.m. to 2 p.m. by scheduled rotation using the previously mentioned study tools. Where 1-2 nurses/day were met. First the researcher introduced herself to each nurse and gave a brief idea about the aim of the study and its expected outcomes. Questionnaire was distributed to be filled by nurses in 20-25 minute. Then the researcher filled checklists during actual nurses' practices (45-60 minutes).

III. Administrative design:

An official letter for approval and cooperation that included the title and purpose of the study was submitted from the dean of Faculty of Nursing, Ain Shams University to the administrators of NICU at Tanta University hospital and Tanta University Educational Hospital to collect the necessary data for the current study.

Ethical Considerations:

An approval was obtained from the research ethics committee / faculty of nursing Ain Shams University. Then an oral permission was obtained from the nurses and reassured that, the study is safe, confidential and all the gathered data will be used for research purpose only. All the studied nurses had the right to withdraw from the study at any time without giving any justification. Also an oral permission was obtained from the preterm infants' parents to participate in the study after clear and simplified clarification of the study aim and expected outcomes.

IV. Statistical design:

Data collected from the studied sample were revised, coded and entered using computer. Data entry and statistical analysis were fulfilled using the statistical Package for Social Sciences (SPSS) software version 21.

The obtained data were organized, tabulated, analysed and represented in tables and graphs as required. Data were presented using qualitative statistics in the form of frequencies, percentages, means (\bar{X}), standard deviation (SD), chi-square (χ^2) and correlation coefficient (r).

Results:

Table (1): illustrates that, more than three quarters (77.5%) of studied nurses' age ranging between 20:30 years ($\bar{X} \pm SD$ 31.26±5.81 years). Also, more than half (52.5%) of them had Bachelor of nursing sciences and nearly half (45%) of them had years of experiences at NICUs ranging between 3:<6 years with $\bar{X} \pm SD$ 3 ± 1,006 years.

Figure (1): portrays that more than four fifths (81.25%) of the studied nurses had competent actual practices and less than fifth

(18.75%) of them had incompetent actual practices about oral stimulation to enhance oral feeding of preterm infants.

Figure (2): displays that more than two thirds (70%) of the studied nurses had competent actual practices but nearly one third (30%) of them had incompetent actual practices about Tactile-Kinesthetic stimulation to enhance oral feeding of preterm infants.

Figure (3): shows that, more than four fifths (81.25%) of the studied nurses had competent actual total level of practices regarding sensorimotor stimulation to enhance oral feeding to preterm infants.

Table (2): illustrates that there was a highly statistical significant difference between nurses' total actual practices and their level of education ($\chi^2=23.533$, $p < 0.001^*$) and years of experience at NICUs ($\chi^2=19.751$, $p < 0.001^*$).

Figure (4): shows that there was a high statistical significant positive correlation ($r= 0.484$, $P=<0.001^*$) between the studied nurses' total knowledge and their total actual practices regarding sensorimotor stimulation to enhance oral feeding of preterm infants.

Table (1): Distribution of the studied nurses according to their characteristics (n= 80).

Items	Number (No)	Percentage (%)
Age (years)		
20 : <30	62	77.5
30 : < 40	10	12.5
40 ≤ 45	8	10
$\bar{X} \pm SD$		31.26±5.81
Level of education		
Nursing school graduates	10	12.5
Technical nursing institute graduates	24	30
Bachelor of nursing science	42	52.5
Master of nursing graduates	4	5
Years of experiences		
< 1	12	15
1:< 3	4	5
3:< 6	36	45
≥6	28	35
$\bar{X} \pm SD$		3 ± 1,006

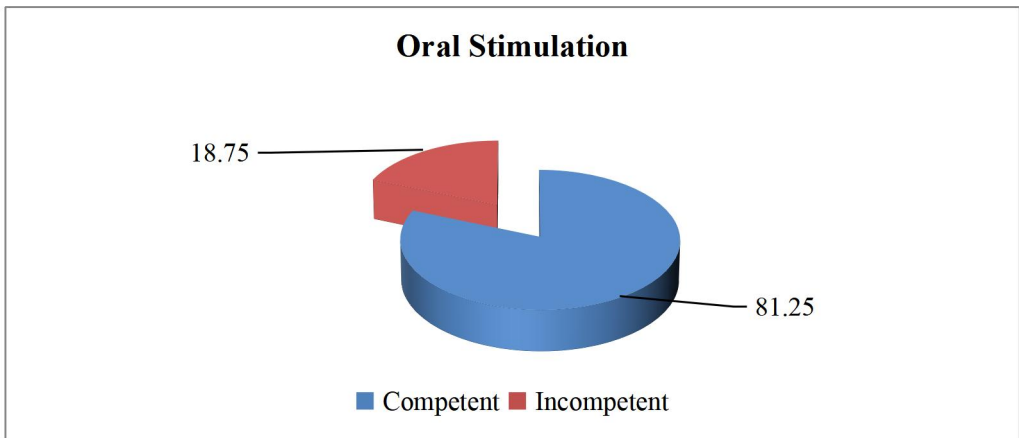


Figure (1): Percentage distribution of the studied nurses regarding their total actual practices about oral stimulation to enhance oral feeding of preterm infants (n=80).

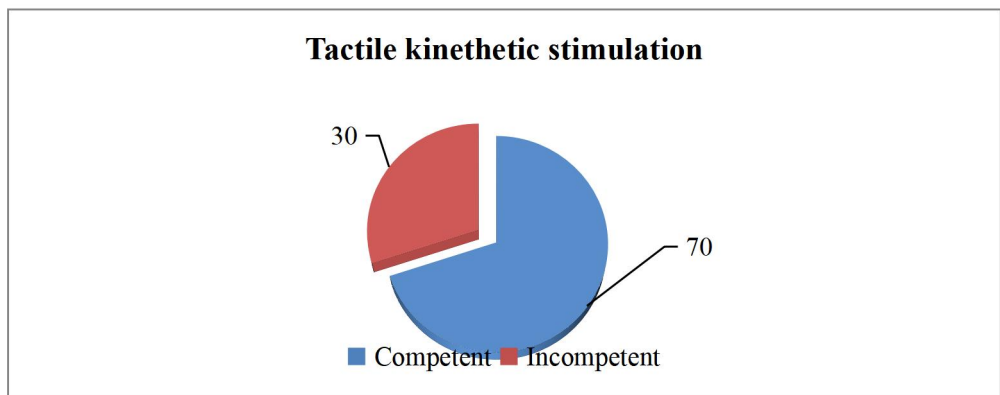


Figure (2): Percentage distribution of the studied nurses regarding their total actual practices about tactile kinesthetic stimulation to enhance oral feeding of preterm infants (n=80).

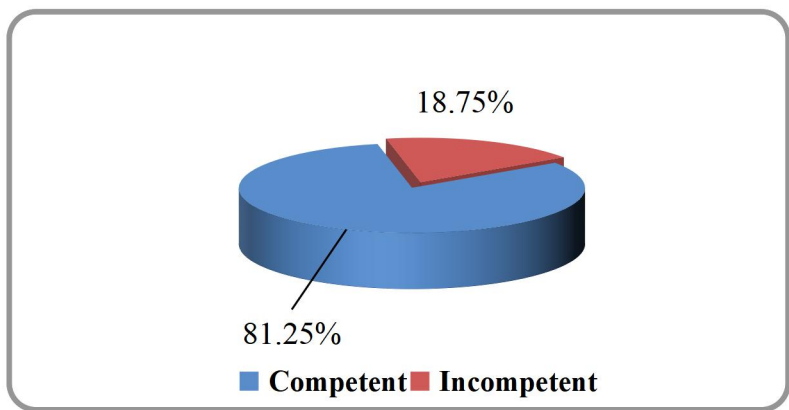


Figure (3): Percentage distribution of studied nurses according to their total level of actual practices regarding sensorimotor stimulation to enhance oral feeding of preterm infants (n=80).

Table (2): Relation between total level of actual practices of the studied nurses and their level of education and years of experiences (n=80).

Nurses Characteristics	Total actual practice			Chi-square			
	Competent No	Competent %	Incompetent No	Incompetent %	Total	χ^2	P-value
Level of education							
Nursing school graduates	4	40.0	6	60.0	10	23.533	<0.001*
Technical nursing institute graduates	22	91.7	2	8.3	24		
Bachelor of nursing sciences	38	90.5	4	9.5	42		
Master of nursing graduates	1	25.0	3	75.0	4		
Years of experiences							
<1	6	50.0	6	50.0	12	19.751	<0.001*
1- <3	1	25.0	3	75.0	4		
3- <6	33	91.7	3	8.3	36		
≥6	25	89.3	3	10.7	28		

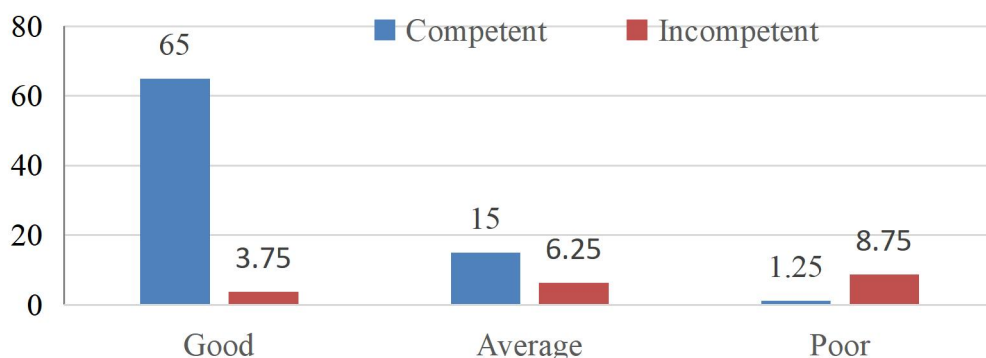


Figure (4): Correlation between total knowledge and total actual practices among the studied nurses regarding sensorimotor stimulation to enhance oral feeding of preterm infants (n=80).

Discussion

Oral feeding is a critical milestone needed for proper growth and development in infants. Ability to orally feed is one of the most prominent developmental issues among infants who are in the neonatal intensive care unit (NICU) (*Park et al., 2015*).

Sensorimotor interventions may be used to optimize infants' oral feeding skills. It consists of providing developmentally appropriate sensory inputs, including oral (stroking of cheeks, lips, gums, and tongue), tactile (stroking of trunk and limbs), kinesthetic (range of motion of limbs), auditory (sound) and olfactory (smell) to maintain and facilitate infants' development. It is also referred to in the literature as sensory stimulation, sensory intervention, supplemental stimulation, or

modification of external stimuli (*Rhooms et al., 2019*).

The current study aimed to assess the nurses' practices for sensorimotor stimulation to enhance oral feeding of preterm infants.

Concerning the characteristics of the studied nurses (**Table 1**), the present study revealed that, more than three quarters of the studied nurses belonged to the age group of 20- <30 years. This finding was in the line with *Abdallah, (2019)*, who studied "Assessment of nurses' knowledge regarding care of preterm babies" and found that, more than three quarters of them belonged to the age group of 20- <30 years. From the researcher point of view this similarity of findings could be the result of increasing number of graduates from nursing institutes and faculties at this age category.

Regarding nurses' level of education (**Table 1**), the current study finding revealed that, more than half of the studied nurses were having bachelor of nursing science. This finding was supported with *Amoula and Kambal, (2016)*, who studied "Pediatric nurses' knowledge and practices regarding nursing management of premature babies in neonatal intensive care unit" and found that, more than half of the studied nurses were having bachelor of nursing science. The researcher believes that, most NICU staff should be university graduates for better quality of nursing care of preterm infants.

In relation to the years of experience (**Table 1**), the current study finding revealed that, nearly half of the studied nurses had 3:-<6 years' experience at NICU. This finding was contradicted with *Fadlalmola and Elhusein, (2020)*, who studied "Nurses' knowledge and practice on the care of preterm infants at Khartoum state hospitals" and found that, nearly half of the studied nurses had less than one year of experience at NICU. The researcher believes this could be due to differences in the study subject characteristics.

Regarding nurses' actual total practices about oral stimulation to enhance oral feeding of preterm infants (**Figure 1**), the current study revealed that more than four fifths of the studied nurses had competent actual practices. This finding was clarified by *Greene, (2013)* who mentioned the important role of nurse to apply perioral stimulation that increase oral motor organization, improve muscle contractility and sucking rate as a result increases oral intake and minimize fluid loss, while applied intraoral stimulation and non-nutritive sucking (NNS) enhance the salivary secretions and facilitate swallowing. Also, *Pinelli and Symington, (2011) & Park et al., (2014)* focused on the importance of neonatal nurses to include NNS applications into the enteral feeding process of preterm infants, thus supporting their oral feeding abilities.

Concerning nurses' actual total practices about tactile kinesthetic stimulation to enhance oral feeding of preterm infants (**Figure 2**), the

present study findings revealed that, nearly three quarters of the studied nurses had competent actual practices but more than one quarter had incompetent actual practices about tactile kinesthetic stimulation. This finding is supported with *Younita et al., (2020)* who clarified that, TKS should be performed by caregivers at least for 5 days to achieve a positive effect on growth by increasing epinephrine and norepinephrine levels as a result of elevated catecholamine levels. From the researcher point of view, these findings about total actual practices of oral stimulation and tactile kinesthetic stimulation to enhance oral feeding of preterm infants may be related to actual feeding protocol at NICU.

Regarding the nurses' total level of actual practices about sensorimotor stimulation to enhance oral feeding of preterm infants (**Figure 3**) and relationship between total level of the studied nurses' actual practices and their level of education & years of experiences (**Table 2**). The present study finding revealed that, more than four fifths of the studied nurses had competent practices and there was a highly statistical significant difference between nurses' total actual practices with their level of education and years of experiences ($p < 0.001^*$). This finding was contradicted with *Girgin & Gozen, (2020)*, who found that, the majority of the studied nurses had incompetent practices about sensorimotor interventions of preterm infants that enhance oral feeding. This finding was contradicted with *Ismail & Bayoumi, (2017)*, who found that, there was no significant difference between nurses' practices with their qualification and years of experience at NICU. This finding was agreed with *Ahmed & Jalel, (2011)* who reported that there was a statistically significant difference between nurse's performance scores and their level of education. The researcher believes that, high level of education and years of experiences at NICU affect positively on their actual practices of sensorimotor stimulation to enhance oral feeding of preterm infants.

On investigating correlation between total knowledge and total actual practices of the studied nurses (**Figure 4**), this study revealed

that, there was a statistical significant positive correlation between nurses' total knowledge and their total practices ($p < 0.001$). This finding was contradicted with *Ismail & Bayoumi, (2017)*, who studied "Nurses' performance in premature transition from gavage to breastfeeding: effect of education program" and found that, there was a negative correlation between nurses' total knowledge and their total practices preprogram implementation. The researcher believes that, good knowledge can affect positively on practices where correct knowledge enable the studied nurses to apply competent actual practices.

Conclusion

Based on the findings of the present study, it can be concluded that, the nurses' practices to enhance oral feeding of preterm infants were competent and involved oral stimulation (perioral and intraoral stimulation combined with non-nutritive sucking) and tactile-kinesthetic stimulation.

Recommendations

In the light findings of the present study, the following recommendations are suggested:

- Raising awareness of nurses about sensorimotor stimulation to enhance oral feeding of preterm infants.
- Assess of feeding reflexes of preterm infants.
- Use appropriate sensorimotor stimulation to enhance oral feeding of preterm infants.
- Periodical follow-up for neonatal nurses practices about sensorimotor stimulation to enhance oral feeding of preterm infants.
- Further researches are required involving larger study sample of nurses and preterm infants at different study settings, all over Egypt, in order to generalize the results.

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