## Nurses' Performance Regarding Gravity Gavage Way Versus Injection Force on Gastric Residual Volume Among Preterm Infants in NICU

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**Abstract**

**Background:** Gavage feeding is a common method of feeding preterm infants due to their immature sucking reflex. Gavage feeding performed on preterm infants in different ways, including continuous and intermittent bolus gavage, by using force of gravity or injection with a syringe **Aim:** evaluate the effect of nurses' performance regarding gravity gavage and injection force ways on gastric residual volume. **Design:** A quasi-experimental design. **Settings**: The study was conducted in the NICU department at Benha University Hospital, Benha Teaching Hospital and Specialized Pediatric Hospital. **Subjects:** A convenient sample of 100 nurses and purposive sample of 60 preterm infants. **Tools I:** A structured Interviewing questionnaire sheet consisted of 4 parts: Part 1, personal characteristics of nurses. Part 2, preterm infants' characteristics. Part 3, feeding assessment sheet**.** Part 4, nurses' knowledge regarding gavage feeding in preterm infants. **Tools II:** An observation checklists sheet **Tool III:** Assessment sheet for gastric residual aspiration. **Results:** More than half of the studied nurses had an incompetent level of practice, and (52.0%) of them had a good level of knowledge with highly statistically significant difference. **Conclusion:** there was a highly statistically significant positive correlation between nurses' performance regarding gavage feeding by injection force way and gastric residual volume. While there was negative correlation between gavage feeding by gravity way and gastric residual volume.  **Recommendations:** Implementation of training programs for nurses regarding gavage feeding methods and their effect on gastric residual.

### Introduction

Preterm infants are born before 37 weeks of gestational age. They experience greater medical complications and are more likely to be physiologically immature. One of these complications is ineffective sucking and an uncoordinated sucking and swallowing motion. So, preterm infants are frequently fed through gavage feeding **(Hendy, et al.,2020)**.

The most popular and recommended way to start enteral feeding in premature infants is by gavage feeding. In which a tube is inserted into the stomach through the mouth or nose to administer milk feeds. Infants are given bolus gavage in a variety of ways, including intermittent and continuous, utilizing a syringe and the force of gravity. A syringe can be used to gently push milk into an infant's stomach during intermittent bolus milk meals (push feed). Alternatively, milk can be fed gravity feed by pouring it into a syringe that is linked to the tube **(Dawson et al., 2021)**.

A bolus feeding delivers in which milk is given to preterm infants over a period like that on oral feeding. Intermittent feedings can

be either as a 4- to 6-hour volume fed over 20 to 30 minutes, or as a feeding that is administered by a pump that operates constantly during the day and is stopped every night. Pump-assisted intermittent feedings provide the stomach with the opportunity to relax at night and more closely resemble natural eating and nutrient absorption patterns. Continuous feeding, which is fed via a pump twenty-four hours a day, enables the administration of modest amounts over an extended period **(Akindolire et al., 2020).**

Intermittent feeding helps the growth of the digestive system and the secretion of intestinal hormones, that improves bowel movement. Intermittent feeding is given either by using force of gravity or force of injection. It is preferable to feed using the force of gravity, as it helps to reduce gastroesophageal reflux and maintain the alimentary canal and perform its functions, in contrast to feeding using the force of injections, which may cause vomiting, and leads to other complications such as cyanosis and suffocation **(Terrin, et al., 2022).**

The amount of milk and digestive secretions that are still in the stomach after a specific amount of time is known as the "gastric residual.". Preterm infants frequently have increased gastric residual because of the gastrointestinal system's innate immaturity, which manifests as delayed gastric emptying, slower intestinal transit, and insufficient release of gut hormones and enzymes. So, routine monitoring of gastric residuals in preterm infants receiving gavage feeds is a frequent procedure as it considered a guide to the advancement of gavage feeds **(Akindolire et al., 2020)**.

Gastric residuals must be measured before each feeding by aspiration of gastric contents. Feeding formula should be done if only tiny amounts of mucus or air are obtained. However, the feeding rate needs to be lowered or stopped if all or most of it is aspirated **(Dawson et al., 2021).**

NICU nurses are highly skilled professionals who have received specialized training in interpreting the behavioral cues of preterm infants. Because even a small mistake on the part of the NICU nurse can put the preterm infant in danger of death, their job is extremely important and complex. Nurse role during the gavage feeding of preterm infants, include following aseptic techniques for preventing infection, insertion the gastric tube, observing premature infants during gavage feeding and recording the start and end time of feeding and amount of feeding **(Lin et al., 2022)**.

**Significance of the study: -**

Each year, almost 15 million infants are born prematurely. In addition to approximately (904) preterm infants admitted to NICUs in Specialized Pediatric Hospital **(Statistical department of Specialized Pediatric Hospital, 2020**). Numerous of these infants need intensive medical care as they are unable to coordinate sucking, swallowing & breathing **(Deindl & Diemert, 2020)**. Moreover, preterm infants face many problems that affect their immaturity of gastrointestinal tract development and suffering from feeding intolerance. So, gavage feeding, and gastric residual aspiration are considered the most important procedures in NICU. As gavage feeding guarantees nutritional intake that allows growth and progress in feeding function. In addition to, gastric residual aspiration considered a method for identification of gastrointestinal tract development and feeding tolerance. So, this study assesses the effect of gravity gavage way and injection force on gastric residual in preterm infants **(Unal et al., 2019).**

# Nurses' Performance Regarding Gravity Gavage Way Versus Injection Force on Gastric Residual Volume Among Preterm Infants in NICU

**Aim of the study:**

The aim of the study was to evaluate the effect of gravity gavage and injection force ways on gastric residual volume through the following:

- ❖ Assessing nurses' knowledge regarding nasogastric tube feeding.
- ❖ Assessing nurses' practices regarding care of nasogastric feeding.
- ❖ Assessing the effect of nurses' performance regarding gravity gavage way and injection force way on gastric residual volume.
- ❖ Assessing the difference between gravity gavage and injection force ways on gastric residual volume.

**Research questions:**

- ❖ Does nurses' performance regarding gavage feeding by gravity way affect gastric residual?
- ❖ Does nurses' performance regarding gavage feeding by injection force way affect on gastric residual?
- ❖ Is there difference between gravity gavage and injection force ways on gastric residual?

**Subjects and method:**

**(a) Research design.**

For this study, a quasi-experimental design was employed., which defined as establishing a cause-and-effect relationship between dependent and independent variables (**Rogers & Revesz, 2019**).

**(b) Research Settings.**

This study was implemented at Neonatal Intensive Care Units in Benha University Hospital, which located at (4th) floor, Benha Teaching Hospital at (1st) floor and Specialized Pediatric Hospital at (3rd) floor, which affiliated to Ministry of Health and Population in Egypt and each unit composed of 24 incubators.

**(c) Subjects.**

The subjects of this study were included.

1. A convenient sample of (100) nurses, who are available during the six months in previously mentioned settings.
2. A purposive sample of (60) preterm infants who undergoing gavage feeding in previously mentioned settings with certain criteria.

**Inclusion Criteria**.

- Preterm infants who are less than 34weeks of gestational age.
- Receiving artificial feeding through nasogastric tube.

**Exclusion criteria.**

Preterm infants who: -

- Suffering from gastric intestinal disease.
- Having congenital anomalies of gastrointestinal tract.
- Take medications affect on gastric motility.

**(d) Tools of data collection.**

**Tool (I): A structured interview questionnaire sheet.**

This tool was designed, adjusted, and produced in Arabic by the researcher following a review of relevant literature and the supervisor's examination. It was consisted of 4 parts:

**Part 1: Personal characteristics of nurses.**

It included age, gender, years of experience, level of education & attending previous program regarding gavage feeding.

**Part 2: Characteristics of preterm infants.**

It included gestational age, current age, gender, medical diagnosis, admission & current weight.

**Part 3: Feeding assessment sheet.**

It was designed by researcher from medical sheet of preterm infants and reviewed by supervisors. It consisted of five questions that concerned the feeding pattern of preterm

infant such as amount of feeding, frequency of feeding/day, amount of gastric residual, feeding type and type of milk.

**Part 4: Nurses' knowledge regarding gavage feeding in preterm infants.**

This section evaluated nurses' knowledge regarding gavage feeding in preterm infants. It consisted of (3) groups (16) questions that included:

**A-**Nurses' knowledge about preterm infants that consisted of (4) questions about definition, causes, complication& nursing care.

**B-** Nurses' knowledge about gavage feeding that consisted of (8) questions about definition, indication, contraindication, different methods of gavage feeding, ways of intermittent gavage feeding, complications of gavage feeding, nursing care during gavage feeding, definition of gavage feeding by gravity and injection force ways.

**C-** Nurses' knowledge about gastric residual that consisted of (4) questions about definition of gastric residual feeding, complication of gastric residual aspiration, nursing care before and after gastric residual aspiration and nurse role if there is gastric residual amount.

**Scoring system for nurses' knowledge**

The responses of the studied nurses' answers were contrasted with a sample key response and scored as correct answer had score (1), incorrect answer had score (0).

**Total knowledge categorized as the following:**

❖ Good knowledge if nurses scored > 85%
❖ Average knowledge if nurses scored 75% <85%
❖ Poor knowledge if nurses scored <75%
❖ Complete correct answers ranged from 0-32.

❖ Total score was 32 complete correct answer, and if total score from
- 28<32, it considered good knowledge level.
- -24<28 complete answers, considered average knowledge level.
- -0<24 complete correct answers, considered poor knowledge level.

**Tool (II): An observation checklists sheet.**

This tool was adapted from **Crisp et al., (2020),** to assess nursing practice regarding gavage feeding. It included five procedures such as Mouth care, nasogastric tube insertion, gavage feeding by gravity way, gavage feeding by injection force way, and gastric residual aspiration. **Scoring system for practice of the studied nurses was classified as**

| Procedures | Steps number |
|---|---|
| Mouth care | 9 |
| Nasogastric tube insertion | 10 |
| Gavage feeding by gravity way | 11 |
| Gavage feeding by injection force way | 10 |
| Gastric residual aspiration | 8 |
| **Total** | 48 |

❖ Score (1) was given for each step done correctly.
❖ Score (0) for each step done incorrectly.

**The total scoring for nurses' practices:**

According to the nurses' actual practice, their total level of practice was divided as the following:
- Incompetent score < 85%.
- competent score > 85%.
- Total practice ranged from 0-48 correctly done steps.
- If total score < (41 – 48), it is considered competent practice.

- If total score < 41, it considered incompetent practice.

**Tool III: Assessment sheet for gastric residual aspiration.**

It was adapted from **Sojasi et al., (2018**), to evaluate abdominal circumference and characteristics of gastric residual such as amount, color before and after 2hrs of giving formula. In addition to, assessment of vomiting characteristics that included amount and color during and after feeding.

**Scoring system for gastric residual aspiration before, during and after feeding.**

| Scoring items | Normal (1) | Abnormal (0) |
|---|---|---|
| Amount of gastric residual | Less than 2ml | more than 2ml |
| Abdominal circumference | 23.5cm – 24cm | More than 24cm |
| Color | white | Any color except white |
| Amount of vomiting | Less than half of formula | More than half of formula |

**3. Operational design**.

The operational design was composed of preparatory phase, tool validity and reliability, ethical consideration, pilot study and field work.

**(a) Preparatory phase.**

Using books, magazines, papers, and periodicals, a review of previous and current literature was conducted to familiarize oneself with the various facets of the research subject and to build the data collection tools.

**(b) Tools validity and reliability.**

 **Content validity.**

A panel of three specialists from the Faculty of Nursing at Benha University who specialize in pediatric nursing reviewed the data collection instruments to assess their context, clarity, relevance, comprehensiveness, simplicity, and applicability. The necessary additions were made.

**Testing reliability**

The internal consistency of the tools was tested using Cronbach's alpha coefficient test to ensure their reliability as the following:

- Knowledge reliability statistics was 0,817.
- Practice reliability statistics was 0,831.
- Gastric residual aspiration sheet reliability statistics were 0,796.

This suggests that the study instruments had a good level of reliability.

**(c) Ethical consideration.**

The Faculty of Nursing, Benha University's Scientific Research Ethical Committee gave its permission. The nurses' written and verbal consents were acquired prior to the collection of data, guaranteeing ultimate confidentiality and privacy for their information. Nurses received a thorough explanation of the nature and goal of the study. Every nurse is aware of their freedom to leave the study at any moment.

**(d) Pilot study.**

Ten percent of the overall sample size — six preterm infants and ten nurses — were included in a pilot study to examine feasibility, clarity, objectivity, and application of the study research instruments. The study sample includes the pilot study because no changes were made to the study instruments.

**Field of work.**

The data was collected from study settings two times per week (Sunday and Wednesday) from 9 A.M. to 2 P.M. until reaching the size of sample through six months started from the beginning of November 2021 till the end of April 2022.

The total number of nurses was 100 nurses divided into 16 groups and the average number of nurses was (6 - 7) per week. To collect the essential data for the study, each nurse was interviewed separately. The study instruments were used to guide the nurses' responses. Then, the questionnaire sheet given to the studied nurses for filling it to assess their knowledge about gavage feeding in the time ranged between 20-25 minutes. The data of preterm infants were collected by researcher from their medical record in about 15 minutes for each preterm infant. Separate observations were made of each nurse while they were actually performing gavage feeding procedures to assess their practice by using observational checklists (nurses were not aware that the researcher observes their practices). The time needed to fill in each observational checklist ranged from 30- 45 minutes. The assessment sheet for gastric residual aspiration was filled by the researcher after performing gastric residual aspiration procedure by the nurse to evaluate characteristics of gastric residual in the time ranged between 10- 15 minutes.

**3. Administrative design:**

Following the submission of a letter from the dean of the Benha Faculty of Nursing, official approval was acquired for the study's data collection from the administrators of the prior settings. The nature, significance, and anticipated results of the study were also explained to them.

**4. Statistical analysis:**

Data was entered and analyzed by SPSS (Statistical Package for Social Sciences) version 20. The Microsoft Office Excel 2010 program was the tool utilized to create software graphics. Quantitative data was introduced by means, standard division and qualitative data by frequency distribution, tables, number, and percentage. Also, Chi-square test $(X^2)$ and correlation coefficient test were used.

**Results:**

**Table (1)** shows that, (52.0%) of the studied nurses age were ranged between 25- <30 years, with Mean ±SD 29.47 ± 6.09 years. As regard to gender, (82.0%) of studied nurse were females, in addition to, (55.0%) of them attended training course regarding nasogastric tube feeding. Moreover, more than half (54.0%) of the studied nurses had 5-10 years of experience, with Mean± SD 9.70 ± 5.11 years.

**Figure (1)** shows that, (54.0%) of the studied nurses had nursing technical institute. While one-fifth (20.0%) of them had a Bachelor of Nursing.

**Table (2)** displays that, (38.3%) of the studied preterm infants had respiratory distress, and (55.0%) of them were age between 28 < 32 weeks of gestation. In relation to age of preterm infants in days, (53.3%) of them were aged between 1 < 5 days. Regarding preterm infants' weight, 1.479 ± 0.253 gm at admission while the Mean ± SD of current weight of preterm are 1.526 ± 0.268 gm respectively.

**Figure (2)** shows that, (52.0%) of the studied nurses had good level of total knowledge about gavage feeding in preterm infants. Although one-quarter (25.0%) of the studied nurses had poor level of knowledge about gavage feeding.

**Figure (3)** showes that, more than half (56.0%) of the studied nurses had incompetent level of practice regarding gavage feeding in preterm infants. While more than one third (44.0%) had competent level of practice.

**Table (3)** indicates that, there was highly significant difference between the studied nurses' total knowledge and their total practice regarding gavage feeding in preterm

infants at (P < 0.00) with positive correlation (r = 0.501).

**Table (4)** displays that, there was highly significant difference between nurses' performance regarding gavage feeding by injection force way and gastric residual volume of preterm infants at (P < 0.00) with positive correlation (r = 0.501).

**Table (5)** indicates that, there was highly significant difference (P < 0.00) with negative correlation (r = -0.501) between nurses' performance regarding gavage feeding by gravity way and gastric residual volume of preterm infants.

**Table (1): Distribution of the studied nurses according to their personal characteristics (n=100).**

| Personal Characteristics | studied nurses (n=100) | |
|---|---|---|
| | No. | % |
| **Age (year)** | | |
| **< 20** | **0** | **0.0** |
| **20-<25** | **14** | **14.0** |
| **25-<30** | **52** | **52.0** |
| **≥ 30** | **34** | **34.0** |
| **Mean ± SD          29.47 ± 6.09** | | |
| **Gender** | | |
| **Male** | **18** | **18.0** |
| **Female** | **82** | **82.0** |
| **Training courses regarding nursing care for preterm infants during enteral feeding** | | |
| **Nasogastric tube insertion & removal** | **50** | **50.0** |
| **Nasogastric tube feeding** | **55** | **55.0** |
| **Nasogastric tube care** | **49** | **49.0** |
| **Years of experience** | | |
| **1-<5** | **18** | **18.0** |
| **5-<10** | **54** | **54.0** |
| **10-<15** | **20** | **20.0** |
| **≥ 15** | **8** | **8.0** |
| **Mean ± SD                9.70 ± 5.11** | | |

**Table (2): Distribution of the studied preterm infants according to their characteristics (n=60).**

| Characteristics of preterm infants | preterm infants (n=60) | |
|---|---|---|
| | No. | % |
| **Medical Diagnosis** | | |
| Respiratory distress | **23** | **38.3** |
| Sepsis | 15 | 25.0 |
| Patent ductus arteriosus | 7 | 11.7 |
| Necrotizing enterocolitis | 15 | **25.0** |
| **Gestational age (weeks)** | | |
| < 28 weeks | **5** | **8.3** |
| 28 < 32 weeks | **33** | **55.0** |
| 32 ≤ 34 weeks | **22** | **36.7** |
| **Mean ± SD**             **30.81 ± 2.54 weeks** | | |
| **Current age (days)** | | |
| 1-< 5 days | **32** | **53.3** |
| 5-<10 days | 20 | **33.3** |
| 10-<15 days | 6 | **10.0** |
| ≥ 15 days | 2 | **3.3** |
| **Mean ± SD**             **4.91 ± 2.01 days** | | |
| **Admission weight** | | |
| 1000 -<1500 gm | 15 | **25.0** |
| 1500 -<2000 gm | **38** | **63.3** |
| 2000 -<2500 gm | 6 | **10.0** |
| ≥ 2500 gm | 1 | **1.7** |
| **Mean ± SD**             **1.479 ± 0.253 gm** | | |
| **Current weight** | | |
| 1000 -<1500 gm | 14 | **23.3** |
| 1500 -<2000 gm | **37** | **61.7** |
| 2000 -<2500 gm | 7 | **11.7** |
| ≥ 2500 gm | 2 | **3.3** |
| **Mean ± SD**             **1.526 ± 0.268 gm** | | |

**Nurses' Performance Regarding Gravity Gavage Way Versus Injection Force on Gastric Residual Volume Among Preterm Infants in NICU**
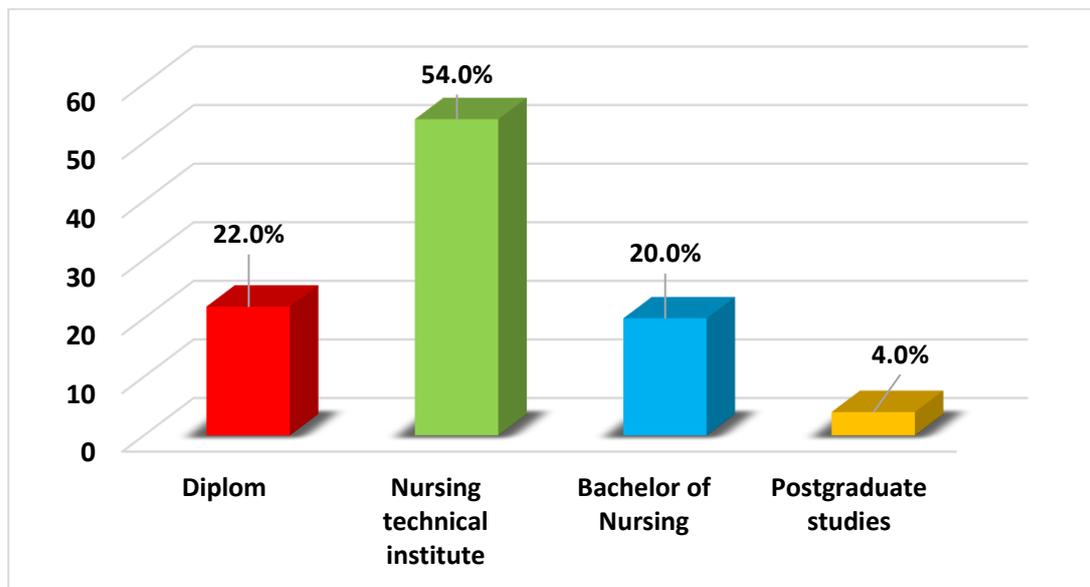


**Figure (1): Distribution of the studied nurses according to their educational level (n=100).**
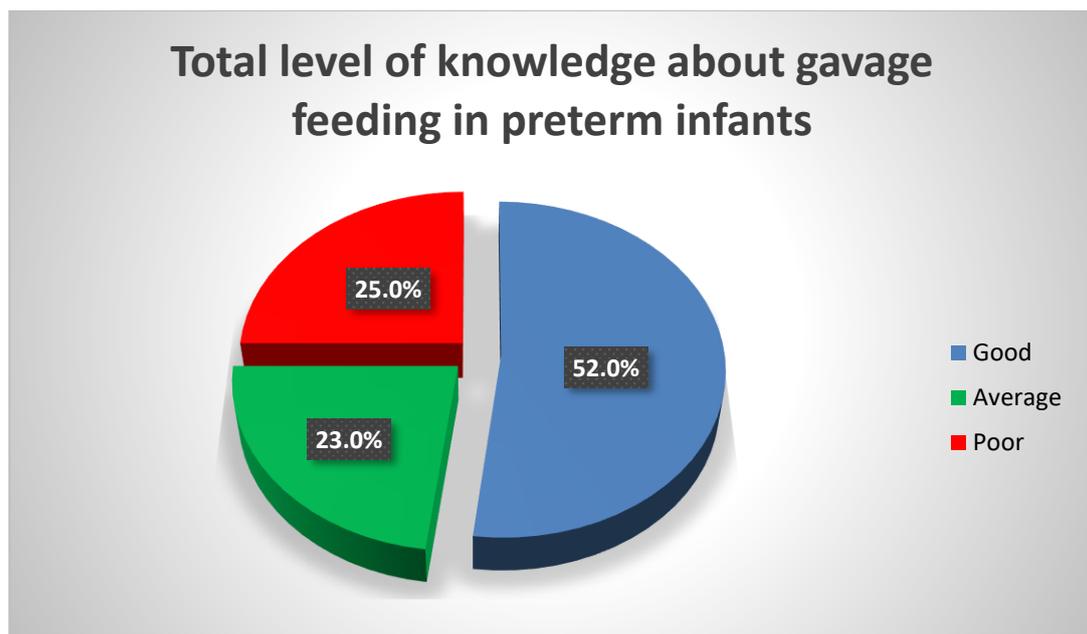


**Figure (2): Distribution of the studied nurses according to their total level of knowledge about gavage feeding in preterm infants (n=100).**
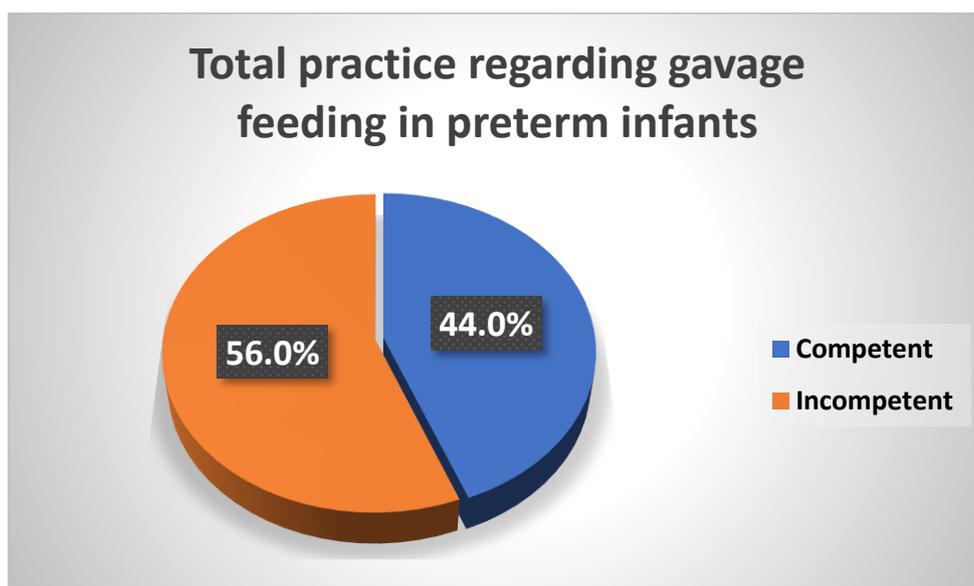
**Figure (3): Distribution of the studied nurses according to their total practice regarding gavage feeding in preterm infants (n = 100).**

**Table (3): Correlation between the studied nurses' total knowledge and total practice regarding gavage feeding in preterm infants(n=100) .**

| Items | studied nurses (n=100) | |
|---|---|---|
| | **Total practice** | |
| **Total knowledge average** | **r** | **P value** |
| | **0 .501** | **0.000**** |

**Table (4): Correlation between the studied nurses' performance regarding gavage feeding by injection force way and gastric residual volume of preterm infants (n=100).**

| Items | studied nurses(n=100) | |
|---|---|---|
| | **Total gastric residual volume** | |
| Nurses' performance regarding gavage feeding by injection force way | **r** | **P value** |
| | **0 .501** | **0.000**** |

**Table (5): Correlation between the studied nurses' performance regarding gavage feeding by gravity way and gastric residual of preterm infants(n=100).**

| Items | studied nurses (n=100) | |
|---|---|---|
| | **Total gastric residual volume** | |
| **Nurses' performance regarding gavage feeding by gravity way** | r | P value |
| | - 0.501 | 0.000** |

# Nurses' Performance Regarding Gravity Gavage Way Versus Injection Force on Gastric Residual Volume Among Preterm Infants in NICU

**Discussion:**

Preterm infants' feeding purpose is to achieve the highest growth and minimal intestinal damage by using gavage feeding. That is the most common technique utilized for feeding in neonatal intensive care units and is administered through the mouth or nose to the stomach. Two methods are used to provide infants with intermittent gavage feeding: gravity force and injection force (**Sojasi et al., 2018).**

Gastric residual volume when increased, it is considered an indication of infants' feeding intolerance which is thought to be the initial phase of necrotizing enterocolitis, a condition that contributes to low-birth-weight infant deaths. Therefore, one of the key interventions for preventing the consequences of feeding intolerance, necrotizing enterocolitis and aspiration is selecting the gavage feeding technique that is most appropriate for infants (**Richards, et al., 2021**). Hence, this study aimed to evaluate the effect of nurses' performance regarding gravity gavage and injection force ways on gastric residual volume of preterm infants.

**Part I: Personal Characteristics of the studied nurses.**

Regarding personal characteristics of the studied nurses, the current study's findings showed that, on average, the nurses' ages ranged from 25 to less than 30 years old, with Mean ±SD 29.47 ± 6.09 years. As regard to gender, the majority of them were female. As viewed by the researcher, this may be due to female more than male in nursing education.

These findings were in the same context of **Seferoglu et al., (2021)**, who found that the majority of the nurses (80%) were females. Also, these findings in line with a study by (**Mohamed, 2019)**, who stated that, over half of the nurses in the study were female and in

the age range of 23 to 30. These results were disagreed with **Abo Elezz et al., (2021),** who reported that nearly half of studied nurses were 20- < 25 years old with mean age 26.75±5.08 years old.

According to the studied nurses attending training courses on nursing care for preterm infants during enteral feeding, the present study results stated that, over half of the studied nurses had attended training course regarding nasogastric tube feeding. This study fully agreed with a study carried out by **Mohammed& Abdelfattah, (2018)**, who clarified that Over half (52%) of the nurses in the study had previously participated in low-birth-weight newborn training concerned with gavage feeding in Benha Hospitals.

The current study's results regarding years of experience showed that over half of the studied nurses had five to ten years' experience with Mean±SD =9.70± 5.11 years. This finding was in line with **El-Morsy et al., (2020)**, who stated that more than two thirds of nurses had experience ranging from 5 to less than 10 years of working in the Neonatal Intensive Care Unit.

As regards the educational level of the studied nurses**,** the study illustrated that over half of them held nursing technical institute degrees. This finding was in accordance with **Mahdy et al. (2019),** who showed that nearly half of nurses (46.7%) obtained a degree in nursing from the Technical Institute.

**Part (II): Personal characteristics of preterm infants.**

The current study findings regarding personal characteristics of the studied preterm infants showed that, more than one-third of the studied preterm infants were diagnosed as respiratory distress syndrome. This result on the same line with **Lin et al., (2022),** who

indicated that more than one-third (34.5 %) of the studied preterm infants had respiratory distress syndrome. This may be because of the prematurity of infants' lungs.

Regarding gestational age of the studied preterm infants, the present study revealed that more than half of them had gestational age ranged between 28 < 32 weeks, with Mean ±SD 30.81 ± 2.54 weeks. These findings agreed with **Hendy et al., (2020)**, who mentioned that more than half of the studied high-risk neonates (56.7%) were 28 < 32 weeks.

Regarding the studied preterm infants' weight, the present study showed that, the Mean ±SD was (1.479 ± 0.253 gm) of admission weight and current weight was (1.526 ± 0.268 gm) respectively. These results were in accordance with **Khatony et al., (2019)**, who reported that the Mean ±SD of admission weight was 1.750 ± .533 gm. On the other hand, these findings were against a study conducted by **Hesham, (2022)**, who stated that nearly half of (46%) the studied neonates' admission and weight was 2000-<2500 gram. This discrepancy may be related to the difference between the studied samples.

As well, the current study clarified that more than half of the studied preterm infants were males. This result was congruent with **Mahdy et al., (2019)**, who mentioned that more than half of the studied neonates (54.6%) were boys. Researcher interpreted this result as the males is more susceptible to be born preterm than females.

**Part (IV): Nurses' knowledge regarding gavage feeding in preterm infants.**

According to the studied nurses' total knowledge about gavage feeding in preterm infants, the present study displayed that, slightly more than half of them had good level of total knowledge about gavage feeding in preterm infants. Although, one-quarter of them had poor knowledge. This may be related to nurses' attending training courses that positively affect their level of knowledge. This result was congruent with **Abo Elezz et al., (2021),** who demonstrated that slightly more than fifty percent of the studied nurses had sufficient knowledge regarding gavage feeding. Additionally, the study results matched **Harjit, (2019)**, who mentioned that the majority of the studied nurses (80%) had good level of total knowledge about gavage feeding. While **Gomaa et al., (2022)**, disagreed with the study result and mentioned that approximately two-thirds of the studied nurses had inadequate knowledge regarding enteral feeding of preterm neonates. Also, **Abukari& Acheampong, (2021)**, who noticed that the majority of nurses had poor knowledge regarding gavage feeding.

**Part (V): Nursing practices regarding gavage feeding in preterm infants.**

According to total nurses' practice, the present study portrayed that, more than half of the studied nurses had incompetent level of practice while more than one third had competent level of practice. This may be due their educational level, lack of adequate knowledge, and inadequate training about gavage feeding in preterm infants. This result was in agreement with **Jalali et al., (2022),** who indicated that more than half of the studied nurses (59%) had incompetent level of practices regarding care provided for enteral nutrition in preterm infants. Although the study is unsimilar with **Gomaa et al., (2022)**, who stated that over half of the nurses in the study practiced in a way that was satisfactory. Also, **Abo Elezz et al. (2021),** disagreed with the study findings and found that approximately three-quarters of the studied nurses had a satisfactory practice regarding gavage feeding.

**Part (VIII): Correlation between the studied variable.**

As regard correlation between the studied nurses' total knowledge and total practice regarding gavage feeding in preterm infants the present study reported that, there was highly significant positive correlation between their total knowledge and total practice. This finding is in the same line with **Thoene, Lyden & Anderson-Berry, (2018),** who indicated that, there was a significant positive correlation (P< 0.01) between nurses' knowledge and practices regarding nutrition of high-risk neonates. This could be because of the nurses' level of knowledge which influences their level of practice regarding gavage feeding in preterm infants.

Concerning correlation between nurses' performance regarding gavage feeding by injection force way in preterm infants and gastric residual volume the current result illustrated that, there was highly significant positive correlation between nurses' performance and gastric residual volume of preterm infants. This result was consistent with **Pathrose et al., (2021)**, who indicated that there was positive correlation between nurses' practices regarding gavage feeding and gastric residual volume of preterm infants. This can be interpreted as gavage feeding by injection may have adverse effect on gastric residual of preterm infants.

According to correlation between nurses' performance regarding gavage feeding by gravity way and gastric residual volume of preterm infants the current findings indicated that, there was highly significant negative correlation between nurses' performance and gastric residual volume of preterm infants. This finding matched with a study conducted by **Parker et al., (2019)**, who reported that there was negative correlation between gavage feeding by gravity way and gastric residual volume of preterm infants. It can be interpreted as, gavage feeding by gravity way may decrease of gastric residual volume in preterm infants.

**Conclusion**

It was concluded that slightly more than half of the studied nurses had a good level of total knowledge, and more than half of them had incompetent level of practice regarding gavage feeding in preterm infants. Additionally, there was a positive correlation between nurses' performance regarding gavage feeding by injection force way and gastric residual volume of preterm infants. While there was negative correlation between nurses' performance regarding gavage feeding by gravity way and gastric residual volume of preterm infants. Moreover, there was no statistically significant difference between all characteristics of gastric residual before, during and after 2hrs of gravity gavage feeding, while there was statistically significant difference between gastric residual characteristics before, during and after 2hrs of gavage feeding by injection force way.

**Recommendations**

❖ Implementation of training programs for nurses regarding gavage feeding methods and their effect on gastric residual.

❖ Providing nurses at NICUs with regular updates regarding knowledge and practice of gavage feeding in preterm infants through implementation of an orientation programs.

❖ Conducting further researches regarding assessment of factors affecting both gravity and injection force methods of gavage feeding.

❖ Conducting further researches on gastric residual aspiration as indicator of effective gavage feeding method.

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# أداء الممرضين تجاه التغذية المعوية باستخدام قوة الجاذبية مقابل قوة الحقن على حجم المتبقي من التغذية للأطفال المبتسرين داخل وحدات العناية المركزة

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تعتبر التغذية المعوية من الوسائل الشائعة لتغذية الأطفال المبتسرين بسبب عدم قدرتهم على الرضاعة. ويتم إجراء التغذية المعوية بطرق مختلفة تشمل التغذية المستمرة والتغذية المتقطعة وذلك إما بإستخدام قوة الجاذبية أو قوة الحقن. لذلك هدفت هذه الدراسة الى تقييم تأثير أداء الممرضين تجاه التغذية المعوية بإستخدام قوة الجاذبية مقابل قوة الحقن على حجم المتبقى من التغذية للأطفال المبتسرين داخل وحدات العناية المركزة. وتم تطبيق هذه الدراسة على عينة مكونة من (١٠٠) من الممرضين و ٦٠ طفل الذين يخضعون للتغذية المعوية داخل وحدات العناية المركزة لمستشفى بنها الجامعي ومستشفى بنها التعليمى ومستشفى الاطفال التخصصي. وأظهرت نتائج هذه الدراسة أن أكثر من نصف الممرضين لديهم مستوى غير كفؤ في الممارسة، و(٥٢,٠٪) منهن يتمتعوا بمستوى جيد من المعرفة عن التغذية المعوية للأطفال المبتسرين مع وجود فروق ذات دلالة إحصائية عالية. واستنتجت هذه الدراسة ان هناك علاقة إيجابية ذات دلالة إحصائية عالية بين أداء الممرضين فيما يتعلق بالتغذية بالمعوية بطريقة قوة الحقن وحجم المتبقي من التغذية, في حين كان هناك ارتباط سلبي بين التغذية المعوية بطريقة الجاذبية وحجم المتبقي من التغذية. وقد أوصت الدراسة بتنفيذ برامج تدريبية للممرضين عن طرق التغذية المعوية وأثرها على المتبقى من التغذية المعوية.