

## Early Neonatal Assessment with Detection of Cases of Hypocalcemia and Nursing Implication

Thoraya Mohamed Keashiea <sup>(1)</sup>, Sanaa Ali Nour Eldin <sup>(2)</sup>  
& Ali Mohammed Abo-Zaid <sup>(3)</sup>

<sup>(1)</sup>Assistant lecturer, *Obstetrics and Gynaecology Nursing Dep., Faculty of Nursing, Zagazig University*, <sup>(2)</sup> *Professor of Obstetrics and Gynaecology Nursing, Faculty of Nursing, Zagazig University*, <sup>(3)</sup> *Professor of Pediatric, Faculty of Medicine, Zagazig University*

### Abstract:

**Background:** In Egypt the neonatal mortality is 25 per 1000 live births. Half the deaths occurred in the first two days of life. Immediate assessment of the newborn helps to determine the initial condition, establishes a baseline for subsequent care, and identifies potential and existing problems and ensures the newborn adaptation to extrauterine life is progressing normally. An important component of assessment is the investigation done for hypocalcemia. The nurse must be able to know how to perform essential basic interventions and to take care of the hypocalcemic infant. Skilled care and early identification of problems could reduce the incidence of death and disability. **Aim:** To assess the neonatal condition and detect cases of hypocalcaemia. **Setting:** This study was carried out in the obstetric hospital and NICU (Newborn Intensive Care Unit), at Zagazig University Hospital, on 100 newborn infants. **Sample:** Twenty nurses were selected for the training program which was designed to upgrade nurse's knowledge and skills pertaining to neonatal assessment and detection of hypocalcemia. **Results:** The majority of neonates were normal. Meanwhile, prematurity, still birth and twins accounted for 26.5%, 3.9% and 3.9%, respectively. The incidence of hypoglycemia and hypocalcemia accounted for 29.6% and 27.6%, respectively. At the pre-test, and before the educational program implementation, the percent knowledge scores were low for most nurses. However, significant improvement in nurses' knowledge and practice, regarding assessment of neonates with detection of hypocalcemia, was noted at the post-test and it recommended that the education training program is effective in increasing the knowledge and practice of nurses pertaining to the assessment of the newborn infants and the detection and management of neonatal hypocalcemia and neonatal assessment. **In Conclusion:** The education – training program is effective in increasing the knowledge and practice of nurses pertaining to the assessment of the newborn infants and the detection and management of neonatal hypocalcemia. **Recommendation:** It was recommended that maternity nurse should be alert for early detection and identification of risk factors of the newborn. Proper care is needed during prenatal, natal and postnatal periods to prevent most neonatal complications. Implementation of the developed training program for all nurses in labor departments is suggested.

**Keywords:** early neonatal assessment, early neonatal hypocalcemia

### Introduction:

Newborns undergo many profound physiological and psychological changes at the moment of birth because they have been released from a warm, close dark, liquid-filled environment that has met all of their basic needs into unbounded, brightly lit, gravity-based, outside world (Merritt, 2005).

Newborn assessment is an important part of newborn care and very important for detecting any problems in their earliest days of life. Immediate assessment of the newborn helps to determine the initial condition, establishes a baseline for subsequent care, and identifies potential and existing problems and ensures the

newborn adaptation to extrauterine life is progressing normally (**Georgieff, 1999**). A complete neonatal examination must be performed, with particular attention to major, minor malformations and to physical variations. Assessment of the newborn includes a review of the newborn mother history, physical examination of the newborn, analysis of the newborn laboratory report Discharge evaluation s, the major components of routine care for neonate in Delivery room (**Martin et al., 2009**).

An important component of assessment is the investigation done for hypocalcemia. This is made by testing the newborn blood for the amount of calcium. Hypocalcemia is defined as a total serum calcium concentration less than 2 mmol/L (8 mg/dL) in term neonates, and less than 1.75 mmol/L (7 mg/dL) in preterm neonates (**Lous et al., 2001**). The role of the nurse in relation to a newborn liable to the problem of Hypocalcemia is a more common clinical problem than hypercalcemia and may occur as frequently as 15% to 50% in acutely and critically ill patients. When calcium levels drop, neuromuscular excitability occurs in smooth, skeletal, and cardiac muscle, thus causing the muscles to twitch. The result can lead to cardiac dysrhythmias. Hypocalcemia can also cause increased capillary permeability, pathological fractures, and decreased blood coagulation. Most severe cases result in tetany, and respiratory arrest (**Li, Fein & Grummer-Strawn, 2010**).

The most frequent cause of hypocalcemia is a low albumin level, but if serum ionized (free) calcium is normal, then no disorder of calcium metabolism is present and no treatment is needed. Causes of low ionized calcium, which is needed for enzymatic reactions and neuromuscular function, include renal

failure, hypoparathyroidism, severe hypomagnesaemia, hypermagnesemia, and acute pancreatitis (**Li, et al., 2010**).

Nursing care plan assessment and physical examination started with Assess airway, breathing, and circulation (ABCs). Hypocalcemia can lead to laryngospasm, dyspnea, and heart failure. Auscultate for heart sounds. The patient may have dysrhythmias, especially heart block and ventricular fibrillation. Tetany, increased neural excitability, accounts for the majority of signs and symptoms of hypocalcemia( **Field et al. ,2010**).

Inspect the patient's skin to see if it is dry, coarse, or scaly, which are signs of hypocalcemia. Severe hypocalcemia may produce confusion. hypocalcemia may be is asymptomatic and resolves without treatment. Thus, management is directed at providing adequate  $Ca^{+2}$  intakes by initiating early feedings if possible (**Hazinski et al., 2010**). Nursing care plan intervention and treatment plan. Hypocalcemia is treated pharmacologically. Acute hypocalcemia with tetany is a medical emergency that requires parenteral calcium supplements. A too-rapid infusion rate can lead to bradycardia and cardiac arrest; therefore, place newborns who are receiving a continuous calcium infusion on a cardiac monitor. The infusion rate should be adjusted to avoid recurrent symptomatic hypocalcemia and to maintain serum calcium levels between 8 and 9 mg/dL. Monitor the patient's serum calcium levels every 12 to 24 hours, and immediately report a calcium deficit less than 8.5 mg/dL. If the deficiency is caused by hypoparathyroidism, Vitamin D supplements are prescribed to facilitate gastrointestinal calcium absorption reactions (**Sutor, Rummans & Smith, 2001**).

There are striking variations from

nurse to nurse in the patterns of care that newborn infants receive and the nurse must be able to perform essential basic interventions and to take care of the hypocalcemic infant. Skilled care and early identification of problems could reduce the incidence of death and disability (Beblo et al., 2005). So the nurse should have a proper training to assess the newborn. In many cases of hypocalcemia there is a lack of knowledge of what is needed for optimal newborn care, and neglect the basic needs of newborns. Interventions that improve nurse skills and knowledge will have a major impact on the health of newborns (Beblo et al., 2005).

#### **Aim of the study:**

To assess the neonatal condition.

#### **The objectives of study were to:**

- \* Assess the physical condition of the neonates.
- \* Estimate serum calcium of the newborn.
- \* Develop and implement a nursing information guide about the newborn assessment and detection of neonatal hypocalcemia.

#### **Hypothesis:**

1. Early neonatal assessment revealing many neonatal abnormalities and many cases of abnormal calcium levels.
2. The program increasing effectiveness, knowledge and the skills of maternity nurses about the neonatal assessment and detect the cases of neonatal hypocalcemia.

#### **Significance of study:**

In Egypt the neonatal mortality is 25 per 1000 live births (17 early and eight late). Half the deaths occurred in the first two day of life. Neonatal causes of death were pre-maturity (39%), asphyxia (18%), infections

(7%), congenital malformation (6%) and unclassified (29%). The most common causes of neonatal mortality, morbidity and disability including prematurity, neonatal respiratory infection neonatal sepsis, neonatal tetanus and cord infection, heart defect, congenital anomalies, and birth trauma or asphyxia (American Academy of Family Physicians, 2000).

#### **Subjects and methods:**

##### **Research design:**

A Quasi- experimental design was utilized for the study.

##### **Setting:**

The study was conducted in labor room and intensive newborn care unit. Affiliated to Zagazig University hospital.

##### **Sample:**

the study sample consists of

- 100 neonates (inclusion criteria for neonates: normal delivery neonates, abnormal delivery neonates, 37 > neonates < 37 weeks are taken).
- 20 nurses working at the labor room or NICU at Zagazig University Hospital who have agreed to participate in the program.

##### **Study tools:**

Five instruments were used for data collection and developed by the researcher and revised for content validity by experts in the field.

#### **1. Assessment of the neonate:**

Assessment of neonates was carried out by the attending neonatologist and investigator. Newborn status alive, stillborn, or twins. Maturity whether the newborn was premature, full term, or post term Sex (male – female – unidentified sex). General condition and signs of nerve irritability such as; activity, lethargy, tremulousness, abdominal distension, apnea, seizures

(fits)Skin color (pallor, cyanosis, jaundice).Birth weight and measurements, head, chest and abdominal circumference, and length .In addition, complete assessment of the newborn from head to toe was done, to detect any abnormalities.

2. **Cord blood for serum calcium:** To collect an umbilical cord blood sample after an infant is born; the healthcare worker may use a needle and syringe to draw blood from the umbilical cord while the cord is still attached to the infant. Blood samples may also be collected from the part of the umbilical cord that has been detached from the infant (Dickerson, et al., 2004).
3. **Nurses' knowledge questionnaire.**
4. **Observational checklist:** This include socio-demographic data of nurses involved in the study such as age, experience years, educational level, previous training, as well as their knowledge and practice about neonatal assessment and detection of hypocalcemia. This was used before and after program application.
5. **Nursing Training Program:** A program for upgrading nurse's knowledge and skills pertaining the neonatal assessment and detection of cases with hypocalcemia.

#### ***Pilot study:***

A pilot study was carried out on a sample of 10% of the newborn admitted to NICU and labor room and five nurses to test the study tools in terms of clarity and feasibility, and the time required to be applied. Necessary modification was done for the study and nursing program. those subjects in the pilot study were excluded from the final study sample .

#### ***Filed work:***

Data collection was carried out within the period from the first of October 2009 till the end of March 2010. After the baby is born, umbilical cord blood was collected from the portion of the umbilical cord that is not attached to the baby or from a catheter which may be inserted into the baby's umbilical artery or vein for medical purposes.

#### ***The program technique:***

Consisted of 5 sessions and the total time of sessions were 10 hours. The number of nurses in each session was 5 nurses only in order to facilitate learning process and allow each nurse to participate as well as ensure adequate supervision. One session was conducted daily for nurses in either the morning or the afternoon shift. The session started at 1 PM. And end at 3 PM. It was the most suitable time for the nurses after they have completed their duties. At the beginning of the first session an orientation to the program such as; the rationale, purpose, contents, activities, time and location were elaborated in order to establish good communication. The program was conducted in Arabic and English language to be easily understood by nurses. The aim of the nursing program; was to upgrade nurses' knowledge and improve their performance towards the management of neonates detected with hypocalcemia. The objectives of the nursing program: assess neonates correctly and recognize neonates suspected to have hypocalcemia.

#### ***Administrative & ethical considerations:***

An official approval with written letter was being obtained from the Dean of the Faculty of Nursing, Zagazig University. It was addressed to the directors of Obstetric and Gynecological units and neotology units at Zagazig University Hospitals.

Aim of the study was explained for each class prior to data collection also, they were assured that the information would be confidential and used for the research purpose only.

**Statistical Analysis:**

Data were collected, entered and checked to an SPSS version 15. Data were expressed as mean  $\pm$  standard deviation ( $X \pm SD$ ) in quantitative variables, number and percentage for qualitative variables, Chi square and student "t" test were used for analysis of data. Data were summarized using: The arithmetic mean ( $X$ ), the standard deviation ( $SD$ ), Chi-squared ( $\chi^2$ ), Level of significance ( $P$ -value).

**Results:**

**Table (1):** Reveals that out of 102 neonates, ninety four (92.2%) were single alive newborn and 2 twines (4 neonates) were also born alive, while 4 neonates were still born. As regards maturity, 66 (64.7%) were full term, 27(26.5%) were preterm and 9 (8.8%) were post term. According to sex, 59.8% were females and 40.2% were males. The same table shows that the mean Apgar score at the first minute was  $6.7 \pm 1.8$ , while at the fifth minute it was  $8.3 \pm 1.7$ . Almost one fourth of the neonates (24.5%) were less than 2500 gm.

**Table (2):** shows that upon early neonatal assessment Of 98 newborn babies, 53 (54.1%) were normal and 45 (45.9%) were abnormal. Abnormalities in the newborns, included respiratory distress in 11 (16.7%), Seizures in 7 (10.6%), lethargy in 17 (25.7 %), severe pallor in 8 (12.0 %), congenital malformation 4 (6.1 %), hepatosplenomegaly in 5 (7.6 %), tachycardia in 4 (6.1%), birth injures in 4 (6.1 %), and 6 (9.1 %) received resuscitation immediately after birth.

**Table (3):** describes the laboratory investigations that done for the 98 newborns to detect hypoglycemia and

hypocalcaemia. It shows that almost one third (33.7%) had hypoglycemia  $<40$  mg/dl, documented by glucotest and 29.6% by laboratory investigation. Twenty seven (27.7%) suffered from hypocalcaemia.

**Table (4):** reveals that Prematurity was the most common with the highest percentage (55.8%), followed by infant of diabetic mothers (29.4%). Meanwhile, the percentage of preeclampsia was 17.7%, while perinatal asphyxia and respiratory distress were the least reported (5.9%).

**Table (5):** Shows that the relation between the incidence of hypocalcaemia and neonatal outcome is presented in table 10. As regards maturity, the highest percentage of hypocalcaemia occurred among premature and post term babies (70.4% and 22.2% respectively) compared to those among newborns without hypocalcaemia (11.3% and 0.0%). Differences observed are statistically significant ( $p = 0.002$ ). Moreover, there is a statistically significant relation between the incidence of hypocalcaemia and birth weight ( $p < 0.001$ ). Thus, more than half of the low birth weight newborns (51.9%) had hypocalcaemia versus 14.1% who had no hypocalcaemia.

**Table (6):** presents that highly significant relation between the incidence of hypocalcaemia and the presence of hypoglycemia,  $p < 0.001$ . Thus the majority of the newborns who suffered hypocalcaemia (88.9%) had hypoglycemia compared to those who had no hypocalcaemia (7.0%). As the table shows, almost one thirds of the newborns who had hypocalcaemia were being infants of diabetic (37.6%) or Pre eclamptic mothers (22.2%) versus those who had no hypocalcaemia (7.04% and 5.6% respectively). Also, newborns with hypocalcaemia were more likely to have prenatal asphyxia and respiratory

distress (7.4%, 7.4% and 0.0%, 0.0% respectively). Differences observed were statistically significant  $p < 0.001$ .

**Figure (1):** illustrated that nurses' level of education, it was noticed that the majority of nurses (75%) had bachelor of nursing, few of them had nursing school or technical institute diploma.(15.0% and 10.0% respectively). Finally concerning nurses' years of experience, it was revealed that more than half of the sample (55.0%) had < 5 years of experience.

**Table (7):** points to highly significant improvements in nurses knowledge about newborn assessment and detection of hypocalcaemia at the post-test  $P < 0.001$ . As the table shows, the percent of the satisfactory knowledge scores for the newborn assessment at the pre-test was less than half (40.0%). At the post test, it rises up to 90.0%. Also, the total knowledge score for the detection of hypocalcaemia was only 25.0% at the pre-test versus 80.0% at the post- test.

**Figure (2 & 3)** present's distribution of nurses according to their practice about neonatal assessment and detection of neonates with hypocalcaemia. The total score of practice about neonatal assessment has increased from 40.0 % at the pre-test to reach 85.0 % at post-test, with significant difference ( $P = 0.003$ ). Meanwhile, the total nurses' score of practice about detection of neonatal hypocalcaemia had increased from 55.0 % at pre-test to reach 80.0% at post-test with highly significant references ( $p < 0.001$ ).

#### **Discussion:**

Concerning newborn condition after labor, the majority of neonates (77.5%) had an Apgar score (at one min) of 7, while the majority of neonates (54.08%) had an Apgar score (at 5 min) of 9. The majority of neonates (70.4%) had a birth weight of

2500-3500 g. As regards neonatal maturity, 66 neonates were full term and 27 neonates preterm –labor out com included 94 neonates (92.2%) who were born alive, 4 (3.9%) were 2 twins each for 2 women and 4 (3.9%) were stillborn. In this study, 54.1% (53/98) of neonates were completely normal. Meanwhile, abnormal clinical presentations included seizures in (10.6 %), lethargy / poor cry in (25.7 %), and pallor in (12.0%), followed by neonatal sepsis, hepatosplenomegaly, congenital heart disease (presented as tachycardia and heart murmurs), delayed passage of meconium and neonatal jaundice, six neonates received immediate postnatal resuscitation. In agreement with the present results (**Al-Zwaini, 2009**), reported in his study that respiratory distress (tachypnea, apnea and cyanosis) was detected in a good proportion of the neonates. In this study, laboratory investigations revealed that more than one third of neonates had hypoglycemia (blood sugar < 40mg/dl), documented by glucotest strips and 29.6% documented by laboratory measurement, 27.6% of neonates had hypocalcaemia. The causes of hypocalcaemia included prematurity, IDM, pre-eclampsia, prenatal asphyxia and respiratory distress. Similar results were obtained by **Jaber 2006**.

Central nervous system (CNS) changes occur as a result of prenatal asphyxia, glucose and electrolyte abnormalities (including hypocalcaemia), polycythemia, vascular slugging and birth trauma (**Kicklighter, 2004**). The timing of the neurologic symptoms may provide clues as to the cause. Symptoms from perinatal depression or hypoglycemia typically have their onset in the first 24 hours post partum, whereas symptoms from hypocalcaemia are present between 24 and 72 hours of life. Cerebral symptoms may include

seizures, jitteriness, lethargy, changes in tone, and movement disorders (**Mahmood & Kayes, 2008**).

In this study, out of 98 neonates, 27 (27.6%) were identified to have early-onset hypocalcaemia. The most commonly encountered causes of early-onset neonatal hypocalcaemia included prematurity, IDM, and pre-eclampsia. Similar results were reported by other studies (**Sharma et al., 2002, Singh et al., 2003 & Jain et al., 2010**).

In prematurity, hypocalcaemia may be related to premature termination of trans-placental calcium supply. In IDM, hypocalcaemia may be related to increased calcium demands of macrosomic baby, in addition, magnesium depletion in diabetic mothers causes hypomagnesemic state in the fetus which induces functional hypoparathyroidism and hypocalcaemia in the infant (**Schwartz & Teramo, 2000**). The second part of the present work consisted of an intervention study; the study has revealed that the percent knowledge scores at the pretest, before the program implementation was low. However, a statistically significant improvement in nurses' knowledge was noticed at the post test. These findings are in agreement with the results of the study carried out by **Raby, Dowse and Bennet (2008)** who have similarly found that nurses' knowledge in the pretest was inadequate to allow them to be competent in providing nursing care for parturient women and newborn infants. They reported a significant improvement in nurses' knowledge and practice at the post test about care of parturient women, neonatal assessment and detection of hypocalcaemia.

Moreover (**Kicklighter, 2004**) have emphasized that nurses must be

accountable for the role they play in the management of neonates during the immediate post natal period. Their performance must be based on sound physiological principles and supported by the literature and national standards. Such findings support the need for implementation of the present training program. The present study also assessed nurses' practice during the care of parturient women and their neonates. It revealed that, the majority of nurses were unable to identify labor problems, neonatal problems and signs of hypocalcaemia and its management before the program. This could be attributed to the traditional practice prevalent among nurses that they are mostly responsible for following doctor's orders in relation to the administration of drugs, while other tasks are not relevant for them. It is surprising to find a significant improvement in nurses' practice after the program regarding the other important tasks that should be practiced in relation to the assessment of the high risk newborn and detection of hypocalcaemia.

Similarly **El-Sayed (2008)** in Egypt has demonstrated that the competency training program conducted for nurses was statistically significant in improving nurses' knowledge and practice regarding this aspect. She attributes her finding to the structure, content, and the process of running such program. In this respect **Williams and Mitchell (2007)** emphasized that, nurses should be accountable to intervene immediately when emergency care is required as a result of drug therapy, as well as recognize accepted prescribing limits and report deviations to the medical staff and instruct patient regarding the medication.

#### **Conclusion:**

It is concluded that early neonatal

assessment is very important to detect any neonatal health problems and development of adequate successful management of the neonatal patient. In this study, 54.1% (53/98) of neonates were completely normal. Abnormal clinical presentations included seizures in (10.6 %), lethargy / poor cry in (25.7 %), and pallor in (12.0%), followed by neonatal sepsis, hepatosplenomegaly, congenital heart disease (presented as tachycardia and heart murmurs), delayed passage of meconium and neonatal jaundice, six neonates received immediate postnatal resuscitation. Hypocalcemia is a common metabolic problem in newborns. the highest percentage of hypocalcaemia occurred among premature and post term babies (70.4% and 22.2% respectively) compared to those among newborns without hypocalcaemia (11.3% and 0.0%). Highly significant improvements in nurses knowledge about newborn assessment and detection of hypocalcaemia at the post-test  $P < 0.001$ .

**Recommendations:**

Based on the study findings, it is recommended that:

- Immediate assessment of the newborn after delivery helps to establish a baseline for subsequent care, and identifies potential and existing problems
  - Routine cord sample for all neonates after delivery to check Ca and glucose level especially in preterm new born.
  - ICU nurses should know how to diagnose and manage hypocalcemia
- It is recommended to do a weekly team conference for nurses with their supervisors, aiming at exchanging ideas and discussing the difficulties facing them in management of women and their neonates.
  - Further researches should be conducted to study the same problem in different obstetric health agencies, using large sample of nurses.



**Table (1): Distribution of the studied newborn according to their maturity, Apgar score and birth weight**

<b>Newborn (outcomes)</b>	<b>No.</b>	<b>%</b>
<b>Born alive</b>	94	92.2
• Twins(2)	4	3.9
• Still birth	4	3.9
<b>Maturity(gestational age)</b>		
• Premature( >37wks)	27	26.5
• Fullterm (37-40wks)	66	64.7
• Post mature(+40wks)	9	8.8
<b>Sex</b>		
• Females	61	59.8
• Males	41	40.2
<b>Apgar score (1 min): (n=98)</b>		
• > 7	12	12.2
• 7-9	76	77.5
• 9 +	10	10.2
Mean ±SD	6.7 ± 1.8	
<b>Apgar score (5 min): (n=98)</b>		
• > 7	8	8.2
• 7	37	37.8
• 9 +	53	54.08
Mean ±SD	8.3 ± 1.7	
<b>Baby weight (gm) (n=98)</b>		
• > 2500	24	24.5
• 2500 -3500	69	70.4
• < 4000	5	5.1

**Table (2): Results of early neonatal assessment among 98 newborn**

<b>Health problems</b>	<b>No.</b>	<b>%</b>
• Normal newborn	53	54.1
• Abnormal newborn	45	45.9
<b>Causes of health problem in newborn (n = 45)</b>		
• Respiratory distress*	11	16.7
• Seizures**	7	10.6
• Lethargy/poor cry	17	25.7
• Pallor	8	12.0
• Congenital anomalies #	4	6.1
• Hepatosplenomegaly###	5	7.6
• Tachycardia/ heart murmur*	4	6.1
• Need for resuscitation	6	9.1
• Birth injuries**	4	6.1
<b>Total</b>	<b>66</b>	<b>100.00</b>

\*the total is not exclusive\* 8 due to transient tachypnea of the the newborn, 2 due to congenital heart disease and one due to meconium aspiration. \*\*3 due to hypoglycemia, 3due to hypocalcemia and 1 due to hypoxemia. #one had congenital hare lip, one had club foot and 2 neonates had congenital heart disease.

**Table (3): Laboratory investigations of 98 study neonates immediately after delivery**

Laboratory result	No.	%
<b>Hypoglycemia (&lt; 40 mg/dl)</b>		
• By gluco-test	33	33.7
• By laboratory	29	29.6
<b>Hypocalcemia (mg/dl )</b>	27	27.6

**Table (4): Causes of early neonatal hypocalcaemia among 27 newborns**

Causes	No.	%
<b>Early-onset neonatal hypocalcaemia</b>		
• Prematurity	19	55.8
• Infant of diabetic mother	10	29.4
• Preeclampsia	6	17.7
• Perinatal asphyxia	2	5.9
• Respiratory distress	2	5.9
<b>Total</b>	<b>34</b>	<b>100.0</b>

*\*the total is not exclusive*

**Table (5): Factors associated with hypocalcaemia among the 98 newborns.**

Factors	Without hypocalcaemia (n =71)		With hypocalcaemia (n = 27)		$\chi^2$	P
	No.	%	No.	%		
<b>Maturity</b>						
• premature	8	11.3	19	70.4	12.28	0.002(S)
• Full term	63	88.7	2	7.4		
• post term	0	0.0	6	22.2		
<b>Gender</b>						
• Female	41	57.7	16	59.3	0.02	0.89
• Male	30	42.3	11	40.7		
<b>Birth weight</b>						
• Low birth weight	10	14.1	14	51.9	15.09	<0.001(HS)
• Average	61	85.9	13	48.1		

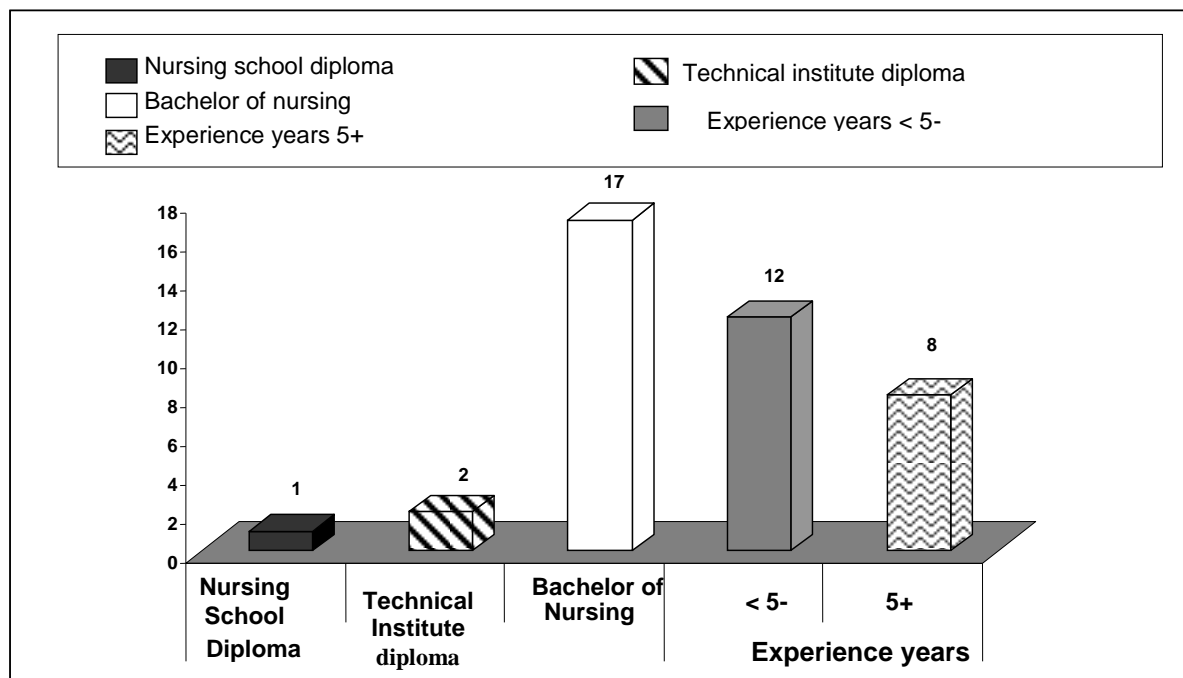
*P < 0.05 S: significant*

*P < 0.001 HS: no significance*

**Table (6): Laboratory and diagnostic factors associated with hypocalcaemia**

Factors	Without hypocalcaemia (n =71)		With hypocalcaemia (n = 27)		$\chi^2$	P
	No.	%	No.	%		
<b>Hypoglycemia</b>						
• By glucotest	8	11.3	25	92.6	57.93	<0.001 (HS)
• By LAB	5	7.0	24	88.9	42.4	
<b>Prematurity</b>	8	11.27	19	70.4	34.23	<0.001 (HS)
<b>Infant of diabetic mother</b>	5	7.04	10	37.6	38.72	<0.001 (HS)
<b>Preeclampsia</b>	4	5.6	6	22.2	4.2	0.04 (S)
<b>Prenatal asphyxia</b>	0	0.0	2	7.4	5.37	0.02 (S)
<b>Respiratory distress</b>	0	0.0	2	7.4	5.37	0.02 (S)

*P < 0.05 S: significant P < 0.001 HS: highly significant*

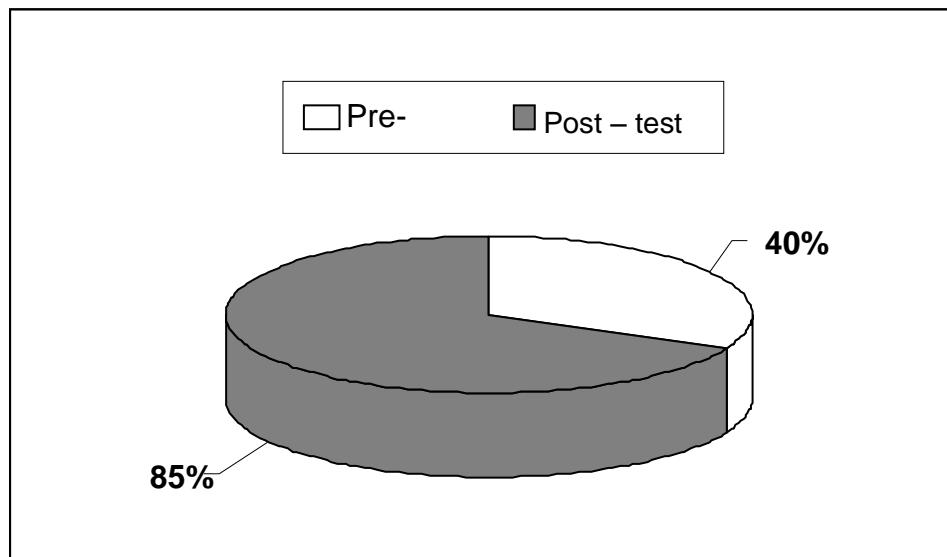


**Figure (1): Distribution of nurse's education and experiences**

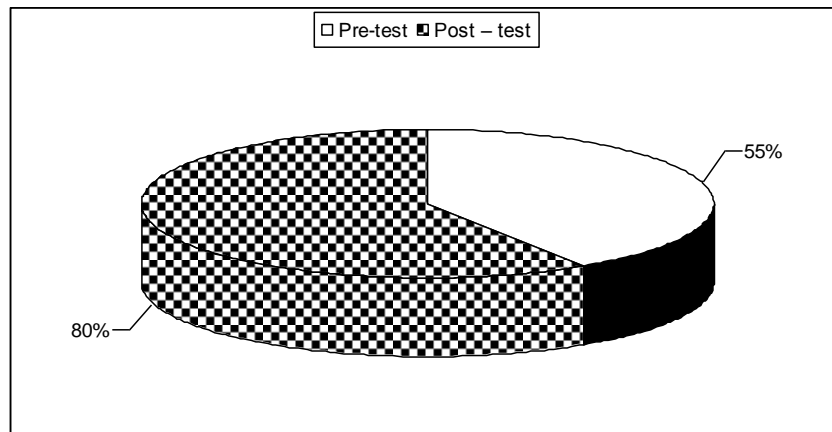
**Table (7): Distribution of nurses according to their knowledge about neonatal assessment and detection of neonates with hypocalcaemia, according to pre- and post-test.**

Knowledge areas	Pre-test (n =20)		Post – test (n = 20)		$\chi^2$	P-value
	No.	%	No.	%		
<b>Total knowledge about neonatal assessment</b>						
• satisfactory	8	40.0	18	90.0	10.99	<0.001 (HS)
• unsatisfactory	12	60.0	2	10.0		
<b>Total knowledge about detection of neonates with hypocalcaemia</b>						
• satisfactory	5	25.0	16	80.0	12.13	<0.001 (HS)
• unsatisfactory	15	75.0	4	20.0		

*P < 0.001 HS: highly significant*



**Figure (2): The total score of practice about neonatal assessment**



**Figure (3): The total nurses' score of practice about detection of neonatal hypocalcaemia**

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