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# Assessment of Midwives' Knowledge on Neonatal Resuscitation

**Sara Muqdad Mohammed*[1]**

1. Master of Nursing Science, Kirkuk Health Directorate, Kirkuk, Iraq
* Correspondence: sarababani22@gmail.com

**Abstract:** Background: Immediate and effective resuscitation of newborns is considered one of the most life-saving interventions in the delivery room, and its quality directly depends on the knowledge and skills of midwives. There is insufficient local data on the level of this knowledge in Kirkuk hospitals. Objective: Assessment the level of midwives' knowledge about neonatal resuscitation, identifying strengths and weaknesses according to resuscitation components, and demonstrating the relationship between knowledge and demographic and professional characteristics, particularly specialized training. Methods: This is a cross-sectional descriptive study of 41 midwives working in three hospitals located at the city of Kirkuk (Azadi Teaching Hospital, Kirkuk Teaching hospital and Maternity &children's hospital). Data collection was performed using a questionnaire that consisted of demographic/occupational characteristics and multiple-choice questions, which were corrected according to the Neonatal Resuscitation Program recommendations as well as American Heart Association/American Academy of Pediatrics guidelines. Knowledge level was categorized poor (<50%), average (50–74%) and good (≥75%). Level of significance was set to 0.05 for (Mann-Whitney) non-parametric tests. Results: The average knowledge score was 9.10 ± 3.35 out of 20 (45.5%), with a median of 10 (interquartile range 8–11). The level of knowledge was poor among 19 midwives (46.3%), average among 20 (48.8%), and good among only two midwives (4.9%). The highest percentages of correct answers were recorded in the sections on the purpose of resuscitation (85.4%), the method of administering medications (85.4%), the significance of grunting (82.9%), and signs of inadequate ventilation (82.9%). The lowest percentages were in the ventilation effectiveness index (14.6%), the initial oxygen concentration for a full-term newborn (19.5%), and the compression-to-ventilation ratio (26.8%). The weakest area was respiration, oxygen, and ventilation (38.5%) compared to 55.3% for the general principles and initial assessment area ($p < 0.001$). No statistically significant differences were observed in the overall score based on demographic or professional characteristics (9.76 vs. 8.40; $p = 0.158$). However, the trainers clearly excelled in the selective airway suctioning section (95.2% vs. 35.0%; $p < 0.001$). Conclusion: The neonatal resuscitation knowledge level of midwives is insufficient; there are significant gaps in the priorities (ventilation and oxygen) and timing to initiation for chest compressions. The reflections suggest the need for timely simulation-based competency assessment and even-updating of knowledge in accord to contemporary guidelines.

**Keywords:** Neonatal resuscitation, midwives, knowledge, positive pressure ventilation, Kirkuk, Iraq.

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## 1. Introduction

The early days of birth are the most critical points in life: a newborn suddenly goes from living inside with everything they need provided by support through their placenta, to being out here and breathing supported purely by its lungs pumping blood instead of a heart. While most newborn infants go through this transition without assistance, nearly 5-

10% requires help to breathe and some (about 1%) need advanced resuscitation techniques for restoring heart and respiratory function [1]. Approximately half of child deaths worldwide, under the age of five years are neonatal [2]. One of these is neonatal asphyxia (NA) which refers to events at birth and associated with hypoxia, which alone contribute significantly [3,4]. The greatest burden is in low- and middle-income countries where resources are limited, and care can be substandard [5, 6]. Data from systematic analyzes estimate that effective neonatal resuscitation can up to 30% of all neonatal deaths at birth which makes it one of the most efficient and cost-effective, lifesaving interventions [7].

According to the recent neonatal resuscitation guidelines published by the American Heart Association and American Academy of Pediatrics, effective lung ventilation is the single most important factor in resuscitating those newborns [1, 8]. A key aspect of the guidelines is recognizing that starting positive pressure ventilation (PPV) during first minute of life should occur, and each 30 seconds delay results in a substantial increase in risk for mortality or prolonged hospital stay [1]. Field observations in resource limited countries have also demonstrated that early initiation of mask ventilation may reduce deaths from neonatal asphyxia [9], further supporting this finding.

It is assessed based on three questions: Is the pregnancy term? What about the newborn breathes or cries? And is muscle tension good? [1, 10]. Room air (21% oxygen) is the gas used for newborns > 35' weeks of gestation, and O2 to be given as per pulse oximetry. It has been proposed that an increase in heart rate is the principal measure of effective ventilation [1, 11]. While excessive aspiration of the airway is not recommended [8, 12], whenever an obstructed way prevents ventilation routine suctioning should be performed. For chest compressions, they will need to start if HR remains <60 after 30 seconds of effective ventilation with associated visible movements in the thorax at a compression: breath ratio of 3:1 (hands on lower third sternum). The umbilical vein catheter is the preferred route for medications [1, 10, 13]. In several nations, including in Iraq midwives and nurses are responsible for attending to the newborn immediately after birth—and may work alone when facing a case of asphyxiation. This is why guidelines mandate that at least one person trained in ventilation should be present at every birth [1]. Cases requiring resuscitation are seldom cultivated [14, 15], thus necessitating intensive and periodic training.

Structured trainings (eg. Helping Babies Breathe program, Neonatal Resuscitation) that show an effect on knowledge and skills availability also have a positive impact on clinical outcomes. Example: Training midwives in Tanzania and who works with facility have been shown to decrease early neonatal and fresh stillbirths [16] Both a multi-site studies and one in Nepal documented improved perinatal outcomes following training [17, 18]. In systematic reviews training was associated with a decrease in neonatal deaths and an increase of caregiver competences [19, 20]. The global establishment of these programs continues [21–23]. Nevertheless, knowledge and skills will deteriorate overtime unless supported by refresher training; peer experiences [24] & studies indicate a significant decrements in resuscitation [25–26]. This is now addressed by recommendations from contemporary guidelines for periodic training and simulations [1].

A broad spectrum of knowledge has been evidenced by regional reviews and study debunking An East African systematic review and meta-analysis reported an overall good knowledge of neonatal resuscitation (59%); previous training and experience associated with the level of knowledge [27]. In contrast, the proportions of midwives and nurses with a good knowledge range in northeast Ethiopia were never greater than 9·8%, whereas level of knowledge was correlated to earlier trainings [28]. Basic skills were also shown not to persist well over time [29]. A study in Ghana on Tamale midwives described their knowledge and experience with neonatal resuscitation, noting the need for improved training [30]. Knowledge and practice gaps in midwives were found to warrant knowledge transfer, enhancement [31] when a study was conducted in Sudan whereas a Turkish study

reported relatively the high levels of nurses/midwifery skills with those having successfully completed an accredited neonatal resuscitation program [32]. Iraqi studies at the local level assessed nurses' practices toward neonatal resuscitation in delivery rooms [33] and nurses' practice of refreshers training program on operating room impact [34]. These studies are older than the current guidelines, did not focus mainly on midwives and do not answer our question: in need of up-to-date data from Kirkuk hospitals.

Local data on midwives' knowledge of neonatal resuscitation is deficient in Kirkuk hospitals, and it remains uncertain whether there are areas requiring reinforcement namely initial assessment, ventilation & oxygen or chest compressions & medications. Finding weaknesses helps point you to where training programs should be directed so as to drive outcomes in the direction that is best for what it looks like.

**Study Objective**

The study aims to assess the level of midwives' knowledge about neonatal resuscitation in hospitals in the city of Kirkuk. The following objectives branch from it:

• Describing the demographic and professional characteristics of the participating midwives.

• Determining the overall level of knowledge and the distribution of midwives according to the level of knowledge.

• Determining the percentages of correct answers according to each item and each aspect of resuscitation.

• Clarifying the relationship between the level of knowledge and each of the hospital, age, educational qualification, years of experience, and specialized training.

## 2. Materials and Methods

### 2.1 Study Design, Location, and Timing

A cross-sectional descriptive study was conducted in three hospitals in the city of Kirkuk, Iraq: Azadi Teaching Hospital, Kirkuk Teaching Hospital, and the Maternity and Children's Hospital. The data were collected during the period from January 5, 2026, to September 10, 2026.

### 2.2 Study Sample

The study included 41 midwives working in the maternity departments of the three hospitals (26 at Azadi Hospital, 6 at Kirkuk Teaching Hospital, and 9 at the Maternity and Children's Hospital).

2.3 Data Collection Tool

The self-administered questionnaire was designed based on the approved neonatal resuscitation guidelines [8, 10, 12, 13], and consisted of two sections:

• The first section – Demographic and professional data: hospital name, age, educational qualification, years of experience in the delivery department, receiving specialized training in neonatal resuscitation and the date of the last training.

• Axis Two  Assessment of Scientific Knowledge: Multiple-choice questions with four alternatives, one of which is correct, covering the goal of resuscitation, initial assessment, timing of ventilation, oxygen, signs of respiratory distress, effectiveness of ventilation, suctioning, head position, criteria for starting chest compressions and their ratio, hand position, and method of drug administration. And 20 items were included in the final analysis.

### 2.4 Statistical Analysis

The data was encoded and analyzed using Python (the pandas and SciPy libraries). Categorical variables were presented with frequency and percentage, and quantitative variables with mean and standard deviation. The normal distribution of the total score was

examined using the Shapiro-Wilk test. Since the distribution was not normal ($p = 0.043$), the sample size was small, and the category distribution was unbalanced, non-parametric tests were adopted: Mann-Whitney for comparison between two groups, Kreskas-Wallis for three or more groups, Spearman's rank correlation coefficient for ordinal relationships, Fisher's exact test for contingency tables, and Friedman and Wilcoxon tests for comparing medians. The effect size (Cohen's d) was calculated when comparing trainers to non-trainers, and a Welch's t-test was conducted for sensitive analysis. The difference was considered statistically significant at $p < 0.05$ (two-tailed test), and a Bonferroni correction ($p < 0.0025$) was applied when comparing the twenty items by training.

## 3. Results

### 3.1 Demographic and Professional Characteristics

Forty-one midwives from three hospitals participated in the study; 26 (63.4%) at Azadi Teaching Hospital, nine (22·0%) at Maternity and Children's hospital, and six (14·6%) at Kirkuk Teaching Hospital. The ages of participants were predominantly with 25–35 year (53.7%) and the majority had a nursing/midwifery diploma degree (80.5%), none held postgraduate degrees. Among them, 63.4% with less than five years of obstetrics-related work experience; 21 (51·2%) midwives reported having specific training in the field and they were very close to proportional values compared to those without this prior training —20 (48 ·8%, Table 1).

**Table 1.** Demographic and professional characteristics of the participating midwives (n = 41)

| Variable | Category | Number | Percentage |
|---|---|---|---|
| Hospital | Azadi Teaching Hospital | 26 | 63.4% |
| | Kirkuk Teaching Hospital | 6 | 14.6% |
| | Maternity and Children's Hospital | 9 | 22.0% |
| Age (years) | <25 | 13 | 31.7% |
| | 25–35 | 22 | 53.7% |
| | 36–45 | 5 | 12.2% |
| | >45 | 1 | 2.4% |
| Educational qualification | Nursing/Midwifery Diploma | 33 | 80.5% |
| | Higher Diploma | 2 | 4.9% |
| | Bachelor's degree | 6 | 14.6% |
| Experience in the delivery room (years) | <5 | 26 | 63.4% |
| | 5–10 | 12 | 29.3% |
| | 11–20 | 2 | 4.9% |
| | >20 | 1 | 2.4% |
| Specialized resuscitation training | Yes | 21 | 51.2% |
| | No | 20 | 48.8% |

### 3.2 General level of knowledge among midwives

The total knowledge score was 9.10 ± 3.35 out of 20 (45- 5%±16- 7) with a median of ten (interquartile range, 8–11). Scores ranged from 3 to17 with a mean of 8.04–10.15 (95% confidence interval). Not a single midwife scored perfectly. A poor level of knowledge was found in 19 (46.3%) midwives, and an average level among 20 (48.8%), with only two midwives who were classified as good levels. The data are summarized in Table2 and their histograms present the distribution of scores; Figures 1 and 2 show how we did this visually from scatterplot to histogram boxplots respectively KR20 reliability coefficient was 0.69

**Table 2.** Overall Knowledge Score and Levels of Knowledge in the Sample (n = 41).

| Indicator | Value |
|---|---|
| Mean ± standard deviation (out of 20) | 9.10 ± 3.35 |
| Mean percentage score | 45.5% |
| Median (interquartile range) | 10 (8–11) |
| Minimum–maximum score | 3–17 |
| 95% confidence interval for the mean | 8.04–10.15 |
| Poor knowledge level (<50%) | 19 (46.3%) |
| Moderate knowledge level (50–74%) | 20 (48.8%) |
| Good knowledge level (≥75%) | 2 (4.9%) |

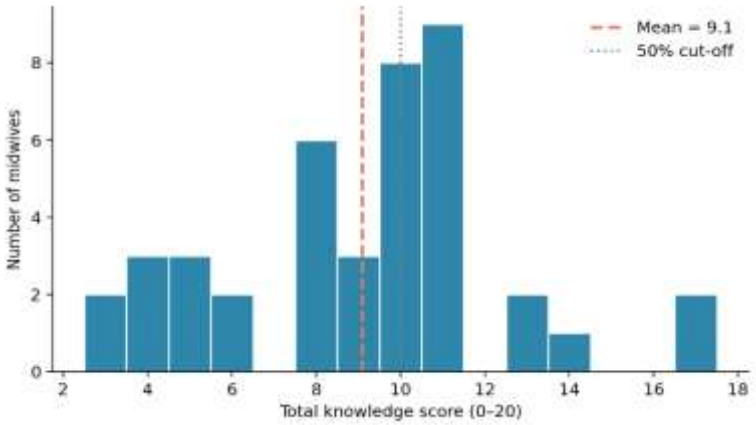



**Figure 1.** Distribution of the total knowledge score (0–20).

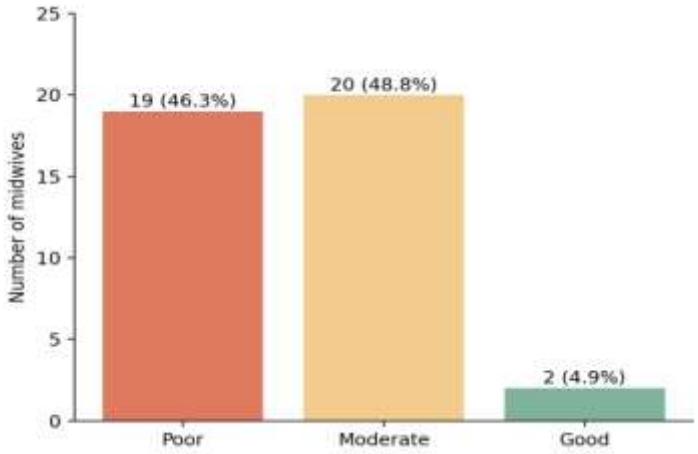



**Figure 2.** Distribution of midwives by level of knowledge.

### 3.3 Correct Answers by Paragraphs

Q1 (Purpose of resuscitation), and Q21 (Route related to the drug administration) showed recording maximum correct answers: 85.4% each, respectively. 82.9% received the same response for items referring to importance of grunting (Q6) and inadequate ventilation signs (Q7). Followed by appropriate procedure for a normal newborn (Q15) 68.3% and selective airway suctioning(Q11),65.9%. In contrast, the lowest percentages were recorded in Section Q12 on the most important indicator of ventilation effectiveness (mean 14.6% [only 6 midwives]), an initial oxygen for a term newborn (Q5) at mean 19.5%, initiation of chest compressions (Q18), and ratio of compression/ventilations(Q19 )at means(24.4[11]and26.8%) respectively Regarding the two items regarding management of Q2, a resuscitation most important step and for oxygen administered to at 30 weeks -old premature infant (Q8), the correct answer did not exceed 29.3% (Table 3).

**Table 3.** Number and percentage of correct answers by paragraph and their discrimination index (N = 41)

| Item | Topic | Domain | Correct (n) | Percentage | Discrimination Index* |
|---|---|---|---|---|---|
| Q1 | Goal of resuscitation | A | 35 | 85.4% | 0.34 |
| Q2 | Most important step in resuscitation | A | 12 | 29.3% | 0.02 |
| Q3 | Timing of initiation of ventilation | A | 14 | 34.1% | −0.15 |
| Q4 | Three assessment criteria | A | 13 | 31.7% | 0.10 |
| Q5 | Initial oxygen concentration – term newborn | B | 8 | 19.5% | 0.51 |
| Q6 | Significance of grunting | A | 34 | 82.9% | 0.22 |
| Q7 | Sign of inadequate ventilation | B | 34 | 82.9% | 0.37 |
| Q8 | Initial oxygen concentration – 30-week preterm newborn | B | 12 | 29.3% | 0.21 |
| Q9 | Action when heart rate is 80 bpm | B | 12 | 29.3% | 0.39 |
| Q10 | Airway suctioning | B | 27 | 65.9% | 0.55 |
| Q11 | Indicator of effective ventilation | B | 6 | 14.6% | 0.13 |
| Q12 | Action when heart rate is 50 bpm | C | 21 | 51.2% | 0.03 |
| Q13 | Head position | B | 15 | 36.6% | 0.34 |
| Q14 | Vigorous healthy newborn | A | 28 | 68.3% | 0.40 |
| Q15 | Ventilation rate | B | 12 | 29.3% | 0.19 |
| Q16 | Failure of chest rise | B | 16 | 39.0% | 0.52 |
| Q17 | Initiation of chest compressions | C | 10 | 24.4% | 0.11 |
| Q18 | Compression-to-ventilation ratio | C | 11 | 26.8% | 0.39 |
| Q19 | Hand placement | C | 18 | 43.9% | 0.51 |
| Q20 | Route of medication administration | C | 35 | 85.4% | −0.01 |

### 3.4 Knowledge by Resuscitation Axs

The scores of the axs varied significantly (Friedman test: $\chi^2 = 17.0$, $p < 0.001$). The general principles and initial assessment axis was the highest (55.3%), followed by the circulatory system, pressures, and medications axis (46.3%), while the respiratory, oxygen, and ventilation axis was the weakest (38.5%) with a significant difference from the first axis (Wilcoxon: $p < 0.001$). The average scores of the axs were higher among the trained individuals than among the untrained in the three axes, but without reaching statistical significance (Table 4 and Figure 4).

**Table 4.** Overall knowledge domain scores (%) by specialized training

| Domain | Number of Items | Overall (Mean ± SD) | Trained (n=21) | Untrained (n=20) | p-value* |
|---|---|---|---|---|---|
| General Principles and Initial Assessment | 6 | 55.3 ± 18.8 | 59.5 | 50.8 | 0.083 |
| Breathing, Oxygenation, and Ventilation | 9 | 38.5 ± 23.1 | 41.3 | 35.6 | 0.265 |
| Circulation, Chest Compressions, and Medications | 5 | 46.3 ± 24.7 | 49.5 | 43.0 | 0.360 |

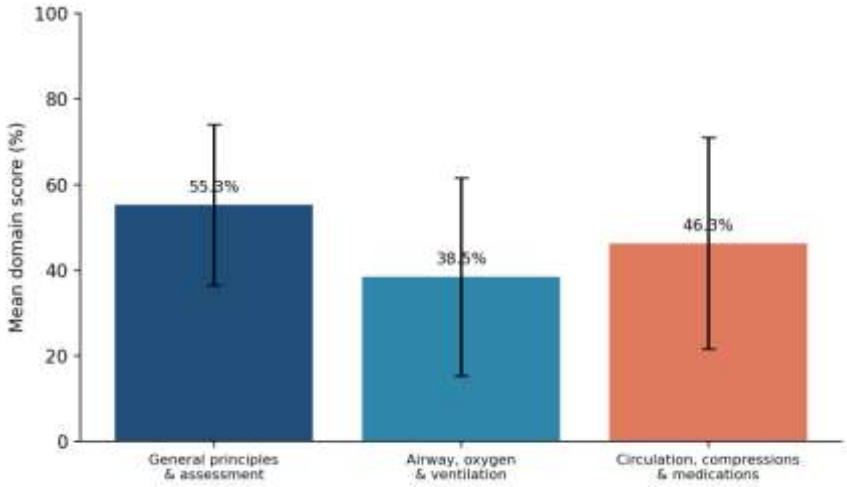



**Figure 4.** Mean score (%) by resuscitation domain.

**3.5 The relationship between knowledge and demographic and professional characteristics**

No statistically significant differences were recorded in the overall knowledge score by hospital (Kreskas-Wallis: H = 4.32; p = 0.115), although the average was highest at Kirkuk General Hospital (11.50 ± 2.81) compared to 8.50 ± 2.97 at Izadi Hospital. The scores did not differ by age groups (p = 0.598; ϱ = 0.14), educational qualifications (p = 0.374; and when comparing diploma holders to those with higher qualifications, p = 0.343), or years of experience (p = 0.299; and when comparing less than 5 years to 5 years or more, p = 1.000; ϱ = 0.03). The average score of the trainers was 9.76 ± 2.32 compared to 8.40 ± 4.11 for non-trainers, with a statistically insignificant difference (Mann–Whitney: U = 264, p = 0.158; Welch: p = 0.204), and a small to medium effect size (d = 0.41) (Table 5).

**Table 5.** Total knowledge score (out of 20) by demographic and professional characteristics

| Variable | Category | N | Mean ± SD | p-value |
|---|---|---|---|---|
| Hospital | Azadi Teaching Hospital | 26 | 8.50 ± 2.97 | 0.115 |
| | Kirkuk Teaching Hospital | 6 | 11.50 ± 2.81 | |
| | Maternity and Children's Hospital | 9 | 9.22 ± 4.24 | |
| Age (years) | <25 | 13 | 8.38 ± 3.40 | 0.598 |
| | 25–35 | 22 | 9.23 ± 3.58 | |
| | 36–45 | 5 | 10.60 ± 2.19 | |
| | >45 | 1 | 8.00 ± 0.00 | |
| Educational qualification | Nursing/Midwifery Diploma | 33 | 8.82 ± 3.29 | 0.374 |
| | Higher Diploma | 2 | 11.00 ± 0.00 | |
| | Bachelor's degree | 6 | 10.00 ± 4.15 | |

| | | | | |
|---|---|---|---|---|
| Years of experience | <5 | 26 | 9.08 ± 3.77 | 0.299 |
| | 5–10 | 12 | 8.67 ± 2.35 | |
| | 11–20 | 2 | 12.50 ± 2.12 | |
| | >20 | 1 | 8.00 ± 0.00 | |
| Specialized training | Yes | 21 | 9.76 ± 2.32 | 0.158 |
| | No | 20 | 8.40 ± 4.11 | |

### 3.6 Level of Knowledge and Sections According to Specialized Training

The percentage of midwives who achieved 50% or more (average or good) among the trained (13 out of 21; 61.9%) increased compared to the untrained (9 out of 20; 45.0%), without statistical significance (Fisher: p = 0.354). There were no midwives with a good level among the trainers, while the two midwives with a good level were among the non-trainers (Table 6).

**Table 6.** Level of Knowledge According to Specialized Training

| Knowledge Level | Trained (n=21) | Untrained (n=20) | Total (n=41) |
|---|---|---|---|
| Poor (<50%) | 8 (38.1%) | 11 (55.0%) | 19 (46.3%) |
| Moderate (50–74%) | 13 (61.9%) | 7 (35.0%) | 20 (48.8%) |
| Good (≥75%) | 0 (0.0%) | 2 (10.0%) | 2 (4.9%) |

At the paragraph level, the only difference that remained significant after Bonferroni correction was in the selective airway suctioning item (Q11): 95.2% of the trained nurses answered it correctly compared to 35.0% of the untrained nurses (Fisher: p < 0.001). The trainers outperformed the non-trainers numerically in the questions about the healthy newborn (Q15), hand positioning (Q20), and signs of inadequate ventilation (Q7). However, the non-trainers answered correctly more than the trainers in the questions about ventilation rate (Q16) and ventilation effectiveness index (Q12), without statistical significance in these questions (Table 7).

**Table 7.** Percentages of correct answers by item and specialized training.

| Item | Topic | Trained (n=21) | Untrained (n=20) | p-value* |
|---|---|---|---|---|
| Q1 | Goal of resuscitation | 90.5% | 80.0% | 0.410 |
| Q2 | Most important step in resuscitation | 38.1% | 20.0% | 0.306 |
| Q3 | Timing of ventilation initiation | 38.1% | 30.0% | 0.744 |
| Q4 | Three assessment criteria | 23.8% | 40.0% | 0.326 |
| Q5 | Initial oxygen – term newborn | 19.0% | 20.0% | 1.000 |
| Q6 | Significance of grunting | 85.7% | 80.0% | 0.697 |
| Q7 | Sign of inadequate ventilation | 90.5% | 75.0% | 0.238 |
| Q8 | Initial oxygen – 30-week preterm newborn | 28.6% | 30.0% | 1.000 |
| Q9 | Action when heart rate is 80 bpm | 23.8% | 35.0% | 0.505 |
| Q10 | Airway suctioning | 95.2% | 35.0% | **<0.001** |
| Q11 | Indicator of effective ventilation | 4.8% | 25.0% | 0.093 |
| Q12 | Action when heart rate is 50 bpm | 47.6% | 55.0% | 0.758 |
| Q13 | Head position | 42.9% | 30.0% | 0.520 |
| Q14 | Vigorous healthy newborn | 81.0% | 55.0% | 0.100 |
| Q15 | Ventilation rate | 19.0% | 40.0% | 0.181 |
| Q16 | Failure of chest rise | 47.6% | 30.0% | 0.341 |
| Q17 | Initiation of chest compressions | 19.0% | 30.0% | 0.484 |
| Q18 | Compression-to-ventilation ratio | 33.3% | 20.0% | 0.484 |
| Q19 | Hand placement | 57.1% | 30.0% | 0.118 |
| Q20 | Route of medication administration | 90.5% | 80.0% | 0.410 |

## 4. Discussion

This study revealed that the midwives had below average knowledge on neonatal resuscitation, (average score 45.5%). Poor knowledge was present in 46.3% of participants, while two (4.9%) had good knowledge and none scored complete mark on full score scale This figure is lower than the general estimate of good knowledge among caregivers in east Africa (approximately 59%) [27] And similar to that previously recorded for low percentage of good knowledge by midwives& nurses from East Ethiopia (9.8%) [28]. This is in line with the evidence of knowledge and practice gaps among midwives regarding pantograph utilization reported earlier, both Sudan [31] as well as Ghana[30]. This difference should be taken into account when we compare, since measurement tools are different, boundaries of classifications may differ and the professional categories being fitted in. But the overall pattern is similar: for birth care workers, in parts of low-income countries knowledge might be much lower than needed to do resuscitation successfully. The outcome in relation to the Iraqi context is comparable with reports of studies conducted on nurses' practices regarding neonatal resuscitation in Baghdad [33, 34] thus indicating that this gap cannot be attributed to a particular hospital which provides only basic training and non-periodic updates of guidelines. Its KR-20 value of 0.69 indicates acceptable internal consistency for the tool and claims that poor performance should closely reflect an underlying cognitive reality rather than merely representing a shortcoming of the tool itself alone. The highest percentages of correct answers were in the basic conceptual paragraphs: the purpose of resuscitation (85.4%), the significance of grunting as a sign of respiratory distress (82.9%), and signs of inadequate ventilation (82.9%). These are knowledge typically acquired from academic study and daily observation in the ward, and do not require rare resuscitation scenarios. It is also noteworthy that 85.4% of the participants knew that the subclavian venous catheter is the preferred route for administering medications, which aligns with the current recommendation [1, 10]. These results indicate the presence of a theoretical knowledge base that can be built upon during training.

The respiratory, oxygen, and ventilation axis was the weakest (38.5%) despite being the core of neonatal resuscitation. The deficiency is evident in several points. Only 29.3% of the participants recognized effective ventilation as the most important step, and only 34.1% knew that ventilation should start within the first 60 seconds. These sections carry significant clinical weight; guidelines confirm that effective ventilation is fundamental and that any delay in its initiation increases the risk of death and morbidity [1, 8]. Field observations are consistent with the fact that early initiation of mask ventilation reduces deaths associated with neonatal asphyxia [9]. The incorrect answers, the most common of which was choosing drying or other methods as the most important step, may reflect an understanding based on procedural sequence without recognizing the priority of the critical step.

A more significant weakness emerged in the section on primary oxygen; only 19.5% knew that a full-term newborn is ventilated with room air (21%), and only 29.3% answered correctly about the 30-week preterm infant. This is a point of particular clinical importance, as excessive oxygen in newborns can be harmful. Therefore, guidelines recommend starting with a low concentration and then adjusting it based on pulse oximetry measurements [1, 11]. It is worth noting that the 2025 guidelines introduced modifications to the initial concentration for very preterm infants, while the key of this study relied on the well-known recommendation in the eighth edition of the Neonatal Resuscitation Program (21–30%) [10]; therefore, the result for the preterm section should be read with relative caution, while the recommendation for the term infant section remains consistent across the guidelines [1, 8, 12].

As for the ventilation effectiveness indicator, it was the weakest section overall (14.6%), as it seems that the majority relies on the skin turning pink instead of the heart

rate increasing. This belief is practically dangerous because the color response is delayed and may falsely reassure the caregiver, whereas guidelines consider an increased heart rate to be the primary and quickest indicator [1, 8]. In contrast, it seems that the recommendation against routine suctioning has reached a reasonable portion of participants (65.9%), which aligns with the shift in guidelines away from routine suctioning [8, 12].

Regarding the required knowledge of when to start chest compressions and their ratio, weak scores were noticed: 24.4% for asking timing (timing: When we want to do it) and 26.8% (for-3 =1). Analysis of responses suggested that the most frequent incorrect alternative selected in consideration of ratio question was 15:2 (approximately 44 %) which is a resuscitation for older children receiving two rescuer breaths with confusion between infant and child CPR, where should use three-to-one because they are mostly caused by respiratory problems [1,10]. Likewise, over a quarter of participants (43.9%) did not know the correct hand placement on the lower third of sternum? The risk of these gaps is that she may poorly position or pressure ratio lead to lower circulation and ventilation, basic [1]. In fact, while 85.4% of midwives had knowledge about the route in which the drug should be administered (i.e., intramuscular), this represents that content related to an advanced stage may also better incorporated since it is directed and documented within their training materials more directly than perhaps earlier stages.

Specialist training was not significantly correlated with knowledge overall (9.76 vs 8.40; p = 0.158) Nevertheless, the trend of difference was in favor of trained women across all three axs and among those reaching ≥ 50% (61.9±15 vs. 45.0+16) yielding a small to medium effect size (d = +0.41). This is in line with the studies that found previous training to be associated with knowledge gain [27, 28, 30], and it has been shown empirically elsewhere as well that training improves outcomes [16–19]. The non-significance is likely due to the small sample size and low statistical power; with these numbers it was only about 26% possible that an effect of this size actually existed. Thus, the lack of significance does not equate to a loss of training effect. Strength of the training effect is further supported by a significant individual difference in only that bold section, which survived correction for multiple comparisons (suction successful 95.2% among trained vs. 35.0% among untrained). This is possibly because this specific item was the most made over part of modern training programs, after an existing past routine practice for suctioning all newborns. In contrast, the training was not associated with superiority in other sections — non-trained individuals scored higher on some (e.g. ventilation rate), suggesting both potential content limitations and a time- or chance-dependent decline of knowledge over small sample sizes. Research has demonstrated that knowledge and skill retention from courses is lost over months without ongoing skills training [24–26] and our limited understanding of midwifery or nursing alone resuscitation QRS demonstrated poor retention for basic field rescues by these practitioners [29]. There was no significant correlation among commercial or professional experience, particular age of the individual nor academic qualification that indicated knowledge; people with less than five years in the business averaged 9.08 versus those individuals who possessed more than five (who claimed an average rating score of 9.13), almost identical mean scores for each group respectively [8]. This is in contrast to some studies that reported longer experience related with better knowledge [27], but support the view that practice alone does not ensure contemporary knowledge, and years of practicing may promote bad habits (for example routine suctioning), as removing a habit through repeated training sessions has been proven effective. Regarding the academic qualification, bachelor degree holders (10.0) scored higher than diploma holders (8.8), but without significance and are in line with studies that associate better knowledge when obtained a bigger academic degree [28]. It is found that due to the limited amount of holders on higher qualifications (only 08), conclusions are hard to make. Finally, the top mean was seen in Kirkuk General Hospital 11.50 vs Izadi hospital's respective (8.50) [p = 0.115] but it not match to significance level

by far – and still that is little group at all information midwives were from Kirkuk General hospital -6- thus we needed more precise analysis before institutional conclusion. The finding supports focused training programs rather than rehashing general theoretical content: positive pressure ventilation and timing, ventilation effectiveness index, calibrated oxygen use, chest compression initiation criteria & ratios. There is some evidence which suggests that simulation-based training and feedback as well as periodic supportive training or follow-up are the most suitable methods for skill retention [1, 22, 23] and can be provided at a low cost in resource-limited settings [20, 21]. It is essential to have a trained ventilation person present at every birth [1, 14].

## 5. Conclusions

- The midwives' knowledge on neonatal resuscitation in the participating hospitals (mean 45.5%) was sub-optimal, with around half at a poor level and only two at good levels.
- The large differences were in ventilation and oxygen (particularly the ventilator effectiveness index, initial oxygen column), also standards for starting chest compressions/ratios of compressions to breaths and hand positioning.
- Adequate original training in most basic areas including concepts, respiratory distress signs and drug routes.
- The knowledge as a whole did not differ statistically with respect to the hospital, age, qualification experience and training. Nevertheless, training was linked to an unambiguous enhancement of a number of items (selective suction) and an overall trend in the direction of the trainers.

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