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# Assessment of The Neonatal Transport Service in Benha

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**Abstract**
**Objectives**: to evaluate neonatal transport service in Benha city to assess the outcome of transported newborn and the risk factors of poor outcome. **Study Design:** prospective observational study. **Results:** The inter-facility transport of critically ill newborns is an important part of regionalised perinatal care. It enables ill or preterm neonates to receive the best possible care from medical staff with an appropriate level of expertise. The median age on admission was 3 days, ranging from 0.1 to 25 days. The mean gestational age was 35 ±3. Regarding gender, about two-thirds were males (61%). The median birth weight was 2.4 kg, ranging from 1 – 4.6 kg. The most frequent mode of delivery was cesarean section (91%). The median transport duration was 12 minutes, ranging from 5 – 70 minutes. About two-thirds were accompanied by paramedical personnel only. **Conclusion** Interhospital transport of very low birth weight (VLBW) infants may cause deterioration in their physiologic status, the likelihood of which is increased with longer duration of transport. Better temperature regulation during interhospital transport may decrease the chances of deterioration in physiological status of low birth weight infants.

**Keywords:** physiological, status of low birth , weight, infants.

## Introduction

Neonatal transport represents an additional risk factor for a critically ill patient, especially for very preterm infants**(1)**

The presence of a well-organized Neonatal Emergency Transport Service is mandatory for a perinatal regional network, as it represents the link between birth centers and neonatal intensive care units (NICUs) and can reduce risks of transportation, especially for very preterm infants**(2)** In the past years, a program of regionalization of perinatal care was implemented and Neonatal Emergency Transport Service have been progressively activated in Italy**(3)**

Many of the delivered neonates are in settings without adequate resources for newborn care and they would require immediate transportation to better equipped facilities where they could have further care. Sick neonates in developing countries often require to be transported from places of birth to other health facilities for better care in suboptimal conditions that may result in compromising survival even if they get to such centres alive(4)

The conditions of most transported neonates on arrival at the neonatal care centres can be poor because of inadequate attention given to pre- and intra-transport stabilization. Many of the babies thus transported are cold, blue, hypoglycaemic and as many as 75% of the babies transferred this way have been reported to have serious clinical complications(5)

It is difficult practically to predict and prevent all the possible conditions requiring neonatal care that cannot be provided in the referral centre and there will always be a number of neonates who undergo acute inter-facility transport(6)

Neonatal morbidity and mortality continue to be major public health burden in developing countries despite the availability of proven cost-effective interventions for addressing it(7)

## Patients and Methods

### Type of Study

The present study was a prospective observational study.

### Study setting

This study was carried out in conducted at Benha Children Specialized Hospital (BENCH), Benha, Egypt.

### Ethical consideration:

- Ethical permission for the study was obtained from all parents of the neonates who were informed about all study steps and their consent were obtained prior to enrolment in the study.
- All the collected data were confidential and secured.
- Confidentiality and personal privacy were respected in all levels of the study.
- Parents felt free to withdraw from the study at any time without any consequences.
- Collected data were not used for any other purpose.

### Study population

The study included all full-term and preterm neonates aged from zero to 28 days.

### Exclusion criteria

Neonates suffering from severe anomalies, those who were arrested upon admission, and those whose parents refused participation in the study were excluded.

**Methods**

Each patient was subjected to the following:

**1-Detailed history taking** including the following items:

gender, gestational age, birth weight, place of birth, gestational age, gender, maternal risk factors, and parents' consanguinity were collected for each neonate enrolled in the study.

- Full Clinical examination:

Upon admission, a detailed clinical assessment of each baby was carried out, and the following parameters were documented: the type of respiratory support provided, rectal temperature, random plasma glucose, respiratory rate, heart rate, oxygen saturation, and blood pressure.

During the study, rectal temperatures were measured by the attending nurse using mercury thermometers. Oxygen saturation levels were recorded using a pulse oximeter, and random plasma glucose levels were determined using a glucometer.

In addition to the data mentioned above, the study also assessed the type of respiratory support provided to each baby, which included nasal prongs, ambu bag and mask ventilation, or intubation. It was also noted whether the case was accompanied by a paramedic, a doctor, or both upon arrival. Hypothermia was defined as temperatures below 36.5 °C, while hypoglycemia was characterized by blood glucose levels below 45 mg/dL. Oxygen saturation levels below 90% were considered as hypoxemia.

**The Transport Risk Index of Physiologic Stability (TRIPS) score:**

TRIPS score was calculated for each neonate, and they were classified into categories based on the score: low (0-10), moderate (11-20), severe (21-30), and very severe (>30).

The TRIPS score, which comprises four empirically weighted items (temperature, blood pressure, respiratory status, and response to noxious stimuli), was validated for infant transport assessment.

Each neonate was reassessed after 48 hours of presentation to determine the outcome in terms of the normalization of the above parameters and/or mortality. Mortality within 24 hours was also noted.

All the procedures were performed following the written protocol in-use at the neonatal ICU during the study. The neonates were weighed using an infant digital weighing scale to the nearest 10g.

**Statistical Methods**

Data management and statistical analysis were done using SPSS version 28 (IBM, Armonk, New York, United States). Quantitative data were assessed for normality using the Kolmogorov-Smirnov test and direct data visualization methods. Quantitative data were summarized as means and standard deviations or medians and ranges. Categorical data were summarized as numbers and percentages. Paired quantitative data were compared between different time points using repeated measures ANOVA or Friedman’s test. Paired categorical data were compared using Cochran’s Q test. All pairwise analyses were adjusted for multiple comparisons. Quantitative data were compared according to mortality using the independent t-test or Mann-Whitney U test for normally and non-normally distributed quantitative variables, respectively. Categorical data were compared using the Chi-square test. ROC analysis was done for TRIPS to predict mortality. Area Under Curve (AUC) with the 95% confidence interval, the best cutoff point, and diagnostic indices were calculated. Correlation analysis was done using Spearman’s correlation. TRIPS was compared according to different parameters using the Mann-Whitney U test. Univariate and multivariate logistic regression analyses were done to predict mortality. Odds ratios with 95% confidence intervals were calculated. All statistical tests were two-sided. P values less than 0.05 were considered significant.

**Results**

Oxygen support significantly differed in the studied patients within the 1st 48 hours ($P = 0.004$). Post hoc analysis revealed that it was significantly higher immediately (93% needed support) compared to 48 hours (83%), with no significant difference between 24 and 48 hours **(Table 2).**

Rectal temperature significantly differed within the 1st 48 hours ($P < 0.004$). It was significantly higher immediately (36.6 ±0.7) compared to 24 hours (37 ±0.3) and 48 hours (37.1 ±0.2), with no significant difference between 24 and 48 hours **(Table 2).**

**Table (2)** Vital parameters of the studied patients immediately and at follow up

| | Mean ±SD | P-value |
|---|---|---|
| **Oxygen support** | | |

| | | |
|---|---|---|
| Immediately | 93 (93.0) [a] | **0.004** |
| At 24 hours | 89 (89.0) [a, b] | |
| At 48 hours | 83 (83.0) [b] | |
| **Rectal temperature** | | |
| Immediately | 36.6 ±0.7 [a] | **<0.001** |
| At 24 hours | 37 ±0.3 [b] | |
| At 48 hours | 37.1 ±0.2 [b] | |
| **Random blood sugar** | | |
| Immediately | 90 ±30 [a] | **0.006** |
| At 24 hours | 99 ±21 [b] | |
| At 48 hours | 98 ±22 [b] | |
| **Respiratory rate** | | |
| Immediately | 64 ±8 [a] | **<0.001** |
| At 24 hours | 55 ±9 [b] | |
| At 48 hours | 52 ±8 [c] | |
| **Heart rate** | | |
| Immediately | 132 ±23 [a] | **<0.001** |
| At 24 hours | 138 ±16 [b] | |
| At 48 hours | 142 ±13 [c] | |
| **Systolic blood pressure** | | |
| Immediately | 69 ±15 [a] | **<0.001** |
| At 24 hours | 74 ±13 [b] | |
| At 48 hours | 74 ±13 [b] | |
| **$O_2$ saturation** | | |
| Immediately | 92.5 ±4.8 [a] | **<0.001** |
| At 24 hours | 94.9 ±2.8 [b] | |
| At 48 hours | 95.1 ±3.3 [b] | |

Random blood sugar showed a significant difference within the study group at different times (P = 0.006). It was significantly lower immediately (90 ±30) compared to 24 hours (99 ±21) and 48 hours (98 ±22), with no significant difference between 24 and 48 hours (Table 2).

Respiratory rate showed an overall significant difference at different times (P < 0.001). It was significantly higher immediately (64 ±8) compared to 24 and 48 hours (55 ±9 and 52 ±8). Additionally, it was significantly higher at 24 hours than at 48 hours (Table 2).

Heart rate significantly differed among participants at different time points (P < 0.001). It was significantly lower immediately (132 ±23) compared to 24 (138 ±16) and 48 hours (142 ±13). Additionally, it was significantly lower at 24 hours than at 48 hours (Table 2).

Systolic blood pressure revealed an overall significant difference at different follow-up times (P < 0.001). It was significantly lower immediately (132 ±23) compared to 24 (138 ±16) and 48 hours (142 ±13). Additionally, it was significantly lower immediately (69 ±15 mmHg) than at 24 and 48 hours (74 ±13), with no significant difference between 24 and 48-hour values (Table 2).

Oxygen saturation showed a significant difference at different follow-up times (P < 0.001). It was significantly lower immediately (92.54 ±4.8) than at 24 (94.82 ±2.82) and 48 hours (95.1 ±3.29). No significant difference was reported between 24 and 48 hours measures (Table 2).

**Discussion**

Regionalized prenatal care includes a crucial component called the movement of severely sick babies between facilities. It makes it feasible for newborns who are unwell or premature to get the greatest treatment from medical professionals who have the necessary degree of training. When compared to infants treated in lower-level NICUs, it has been shown that treating unwell newborns in higher-level neonatal intensive care units is related with reduced morbidity and death (8). This is why, wherever possible, moms who are expected to have high-risk births should be relocated to more specialist facilities. Unfortunately, not all high-risk deliveries can be anticipated, and when newborns are delivered in facilities that may not be able to provide higher-level neonatal critical care, transfer is often necessary. Additionally, newborns with illnesses that need more complex treatment but are not moved may have a greater chance of dying.(Rasania et al., 2022).

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