

Transport of Referred Sick Neonates: How Far From Ideal?

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Transportation of sick neonates under controlled conditions has a direct relationship with morbidity and mortality(1). Poor transportation is one of the iatrogenic factors significantly associated with greater neonatal mortality(2). Attention is now being paid to intra-hospital transport of babies. However, care during referral to hospital is largely a neglected field in India and no documentation is available regarding the existing practices. Unsatisfactory and unorganized transportation has been very frequently observed among sick neonates referred to our hospital, which prompted us to carry out an in depth assessment of neonatal transportation in the region.

Subjects and Methods

The study included 110 neonates referred from various places to our institution. A structured proforma was used to record information categorized into pretransport, during transport and at admission. Highlights of pretransport protocol included documentation of information about infant and mother, evaluation and stabilization of infants

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*Received for publication: January 31, 1996;
Accepted: May 7, 1996*

condition, investigation, diagnosis, treatment given and reasons for transfer. Information recorded regarding transport procedure included type of vehicle, distance and time taken, composition of transport team like mother and medical, paramedical, or other personnel, emergency kit, monitoring and warming methods used during transport, and problems encountered. At admission detailed clinical assessment of the baby was done and recorded. Statistical analysis was done by Chi square test.

Results

A vast majority (84.6%) of the referred neonates were males. Seventy eight per cent were born by normal vaginal delivery and 22% by cesarean section. Delivery was conducted by a doctor in 80%, untrained dai in 16.4% and nurse in 3.6%. Most babies (78.1%) were hospital born and 21.9% were home deliveries. Common indications for referral were hyperbilirubinemia in 39 (35.4%), prematurity in 30 (27.3%), birth asphyxia in 19 (17.3%) and sepsis in 17 (15.5%). All the babies were referred by doctors.

Complete pretransport information was obtainable only in 2 cases. Record of evaluation, investigations and treatment given was missing in most of the cases. The baby had been shown to the mother in all cases. Transport vehicles used were car (73.6%), open jeep (6.4%), bus (5.4%), ambulance (3.6%) and rickshaw, etc. (10.8%). The distance traveled was less than 100 km in 46.3% and more than 100 km in 53.7%. Transport time was less than 4 hours in 80% cases, 4-6 hours in 17% and more than 6 hours in 3%. In 46.4% cases, nothing specific was used for warming during transport. In the remaining cases, blanket (25.4%), cotton (24.5%)

quilt (11.8%) and hotwater bottle (8.1%) were used. No medical personnel accompanied the baby in any case and no monitoring was carried out during transport. No emergency kit or equipment were available.

At admission 16 (14.5%) babies had hypothermia and 21 (19.1%) were hyperthermic. Sixty three per cent of babies who were hypothermic were admitted in the winter months and 31.3% of them were admitted in the summer months. All hyperthermic babies were admitted in the summer months.

Hypothermia was more common in preterms (27%) and asphyxia (26.3%) and hyperthermia in sepsis (30%). Hypothermia was also more frequent in babies where blanket, quilt or cotton (56%) was used as warming method and hyperthermia in cases where nothing specific (76%) was used; most of them were admitted in summer months. The mortality was significantly higher in hypothermic ($p < 0.001$) and hyperthermic ($p < 0.01$) babies in comparison to normothermic subjects (Table I).

Of the total 19 babies with asphyxia, 9 (47.4%) were referred within 24 hours, 2 at 24-72 hours and 8 (42.1%) after 72 hours. The outcome of the babies referred after 72 hours of age was quite unfavorable as 7 of the 8 babies died.

TABLE 1-Outcome in Relation to Temperature at Admission.

Temperature	No. (%)	Deaths No. (%)
Normal	73 (66.4)	9 (12.3)
Hypothermia	16 (14.5)	9 (56.2)
Hyperthermia	21 (19.1)	11 (52.4)

$p < 0.001$ for normal versus hypothermic.
 $p < 0.01$ for normal versus hyperthermic.

Of the total 110 babies referred, 29 (26.3%) died; 55.2% of them within 48 hours of admission, 41.3% between 48 hours to 1 week and 3.5% more than 1 week later.

Discussion

The findings in this study clearly indicate that the transportation of neonates in the region is far from satisfactory. There was lack of documentation of pretransport evaluation, investigations, treatment given and stabilization of infants condition. Deterioration during transport cannot be dissociated from pretransport condition of the baby. Stabilization prior to departure is the most critical aspect of inter-hospital care because it minimizes subsequent deterioration(3). An open vehicle was used for transport in 22.6% cases where temperature maintenance cannot be possible. In 53.7% cases the distance traveled was more than 100 km. Ground transport is appropriate only for distance up to 100-120 km of flat area(3), beyond which air transport is recommended though is hardly feasible in developing countries. Only 8.1% cases used hot water bottle as warming method during transport. Other methods used like cotton, extra clothing, *etc.* do not actually provide heat to the baby but simply prevent loss of body heat. Hypothermic babies need external warming rather than simply preventing heat loss(4). In general, a hypothermic infant should not be moved until warmed. The incidence of hypothermia and hyperthermia observed in this study is in consonance with earlier reports(3).

Medical personnel, emergency kit and monitoring of baby's vital parameters during transportation were uniformly absent. The role of skillful management during a journey to a neonatal center is well documented(1).

Overall 55.2% deaths occurred within 48 hours indicating their poor condition at

admission. Many factors come into play in relation to mortality. Death in the first hours of life more closely reflect skills in intrapartum management and neonatal resuscitations. Infant transport may effect the mortality pattern that emerges beyond the immediate newborn period(5).

To conclude, transport of sick neonates is far from ideal in the region and needs attention. Pretransport workup does not exist and no data is available regarding the condition prior to transport. The transport facilities are poor and temperature instabilities occur during transport. Various factors may be responsible for this situation like lack of awareness, financial constraints, improper road conditions and lack of skilled manpower(1, 6-9). Outreach educational programmes should be organized to educate the personnel involved in the neonatal care. The importance of early at risk identification, *in utero* transport, pretransport stabilization and role of skilled manpower during transport needs to be stressed upon during educational programmes. Feedback to the referring doctors incorporating suggestions for future referrals would go a long way in eliminating the more easily preventable adverse factors.

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