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*Original Research Article*

# Transport from the Community and Preterm Survival: Study from a Rural Based Sick Newborn Care Unit of South India

Sathya Jeganathan, Ravi Kumar

Associate Professor of Pediatrics, Sick Newborn Care Unit, Department of Pediatrics, Chengalpattu Medical College and Hospital, Chengalpattu, Tamilnadu, India 603111.

Corresponding Author: Sathya Jeganathan

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## ABSTRACT

Annually 15 million babies are born as preterm that is more than 1 in 10 babies. The complications of preterm birth are the reasons for almost one million deaths every year. A Study was done in Chengalpattu Medical College Hospital, a large perinatal centre in district of Kanchipuram, South India to study the transport and survival of preterm babies among intramural deliveries and babies born extramurally. We utilized SNCU (Sick Newborn Care Unit) online database of National Rural Health Mission supported by UNICEF to assess the effect of hospital births (inborn versus out born) on Preterm mortality. Three hundred and thirty eight preterm neonates were admitted for preterm care at Chengalpattu Medical College SNCU from May 2015 to September 2015. Two hundred and eighty two cases were delivered at CMCH and were shifted to SNCU, whereas 56 were delivered outside and transported from the community. The place of delivery is significantly related to the death due to preterm births. (p=.025). Multiple logistic regression was conducted, variables namely, sex of the child, mode of transport, place of delivery, gestational age, age of the new born and social category were analyzed. The significant risk factors for the outcomes are Gestational Age (OR = 0.203, p< 0.05), Age at Admissions (OR = 0.134, p<0.05) and Social Category (OR= 2.03, p<0.05).

***Key Words:*** Transport, Preterm, Mortality.

## INTRODUCTION

Annually 15 million babies are born as preterm that is more than 1 in 10 babies. The complications of preterm birth are the reasons for almost one million deaths every year. Preterm birth is a major determinant of neonatal mortality and is associated with adverse long term outcomes. [(1-3)] The rate of preterm births varies between 5-7% in developed countries, the rate is higher among the developing nations and the incidence of preterm deliveries appears to be increasing. Secular trends in preterm births were studied in the advanced developed Scandinavian nation, Norway. It was found that the preterm birth rate increased over time, but was mainly due to an increase in obstetric interventions. [(4,5)] Estimate of preterm birth rate for 184 countries and time series for 65 countries in 2010 revealed that worldwide 14.9 million babies (uncertainty range: 12.3-18.1 million) were born before completion of 37 weeks of gestation, contributing to 11.7% of all live births. [(6)] The rate of preterm birth has increased from 1990-2010 in spite of the various efforts in high income nations, though United States has reported a slight decrease since 2013. [(7-12)]

The WHO fact sheet states that "Every year, an estimated 15 million babies are born preterm. Preterm birth complications are the leading cause of

death among children less than 5 years of age, responsible for nearly 1 million deaths in 2013.Three-quarters of them could be saved with current, cost-effective interventions. The preterm babies after the treatment in NICU face a lifetime of disability, including learning disabilities and visual and hearing problems. [13] Global analysis of disease burden reveals that preterm birth is the single largest contributor for child mortality and a risk for lifelong impairment. [14] The survival rate of the preterm babies around the world is different. Lack of basic amenities, cost effective care such as providing warmth, breast feeding support, respiratory care for preterm and infection control are lacking in low income countries. [11-14]

India contributes to a quarter of global child mortality, 2 million under five deaths each year. As per the WHO report India tops the 10 countries with the greatest number of preterm births: 3 519 100, followed by China: 1 172 300, Nigeria: 773 600, Pakistan: 748 100 and Indonesia 675 700. [14,15]

Studies were done to estimate the neurodevelopmental impairment at regional and global levels for 2010; it was found that there were 13 million preterm births in 2010, who survived beyond one month. Among the survivors 2.7 % had moderate to severe and 4.2 % had minor neurodevelopmental impairment. [16] Educational and behavior problems with poor school performance was noted among the children born at 32 to 35 weeks of gestation to mothers resident in oxford Shire in 1990, when the follow up study was done at seven years of age. [17]

Neonatal risk factors for cerebral palsy in very preterm babies were studied, among the babies born between 1980 -90: hypotension prolonged ventilation, sepsis and pneumothorax were considered as the risk factors, but the mode of transport was not mentioned. [18,19]

Various international networks for evaluating the incidence outcome of very low birth, very preterm neonates are available to study the healthcare services in the developed countries [20,21] but such health system intervention studies not available in rural India.

The intervention by National Rural Health Mission to introduce Neonatal ambulance to transport neonates is an important milestone in reducing mortality in neonates. This study in Chengalpattu Medical College and Hospital focuses on the transport of preterm neonates from the community.

***Aim of the Study**:* To study the factors affecting the survival of Preterm babies among intramural deliveries and babies born extramurally and then transported from the community in a rural based teaching Hospital, in South India.

## MATERIALS AND METHODS

The Study was done in Chengalpattu Medical College Hospital a large perinatal centre in the district of Kanchipuram, South India. We utilized the SNCU online database of National Rural Health Mission supported by UNICEF to assess the effect of hospital births (inborn versus out born) on Preterm mortality.

**Study Design:** Retrospective observational Study.

All Preterm neonates admitted to Chengalpattu Medical College Hospital (CMCH) were enrolled in the study between May 2015 to September 2015.

Preterm is defined as babies born alive before 37 weeks of pregnancy are completed. Neonatal mortality (defined as death prior to hospital discharge or 28 days, whichever occurred first).

The study enrolled 338 preterm neonates; assessment of the gestational age was from the maternal records, especially ultra sound assessment and by postnatal assessment.

**Subjects:** Subjects enrolled in this study were either born at the participating SNCUs (inborn) or were transported from one of the following sites shortly after birth: Out born- from District Hospitals, Primary Health centers, Home delivery

and Private Hospitals. The post delivery time spent at the referring facility before transport and mode of transport of out born babies were studied.

**Data Collection:** Specially trained personnel collected data at the time of admission, including maternal demographics, obstetric variables, details regarding place of delivery, details about the neonate, mode of transport and various outcome measures. On the day of discharge the duty pediatrician assigned the final diagnosis and the data is entered on the same day and cross verified by the duty pediatrician.

***Statistical analysis:*** To determine if maternal and neonatal demographics were associated with inborn or out born status, we performed t-tests for continuous variables and chi- square test for categorical variables. Logistic regression analyses were used to examine associations between the intramural, extramural births and defined outcomes, while adjusting for gestational age groups (<28 weeks, 28 to 32 weeks and 33 to 36 weeks.). The fit of each logistic model was assessed using the Hosmer–Lemeshow goodness-of-fit test and the global test, that all regression parameters are zero, was tested using the -2 log likelihood statistic. All analyses were performed using the SPSS program (version 19.0) and the critical *p*-value was set at 0.05.

## RESULT

Three hundred and thirty eight preterm neonates were admitted for preterm care at Chengalpattu Medical College SNCU from May 2015 to September 2015. Two hundred and eighty two cases were delivered at CMCH and were shifted to SNCU, whereas 56 were delivered outside and transported for preterm care. Different parameters measured at the time of admission were shown in Table1.

**Table1.Distribution of different parameters considered for the analysis.**

| | Parameters | Inborn (282) | Out born (56) | *P* value |
|---|---|---|---|---|
| **Sex** | Male / Female | 163 / 119 | 29 / 27 | 0.40 |
| **Gestational Age** | <28 weeks | 15 | 10 | 0.002 |
| | 28-32 weeks | 83 | 10 | |
| | 33-36 weeks | 184 | 36 | |
| **Weight** | Low Birth weight | 254 | 51 | 0.82 |
| | Normal | 28 | 5 | |
| **Age on admission (in Days)** | <1 | 252 | 36 | 0.00 |
| | 1-7 | 28 | 19 | |
| | >7 | 2 | 1 | |
| **Gategory** | Gen | 108 | 21 | 0.29 |
| | OBC | 106 | 19 | |
| | SC | 64 | 13 | |
| | ST | 4 | 3 | |
| **Mode of Transport** | Govt Provided | 280 | 51 | |
| | Self Arranged | 2 | 5 | .000 |

(Category Gen – General, OBC – Other Backward Communities, SC – Shedule Caste, ST- Shedule Tribe.)

Among the preterm babies whether inborn or out born there was no sex preference for treatment in SNCU. (*p*=0.40). The gestational age is significantly lower among the out born as compared to inborn preterm babies. 20 out of 56 were less than 32 weeks of gestation among the out born babies when compared to 98 out of 282 among in born babies. (*p*=.002).

The sick preterm neonates were immediately admitted in SNCU (252out of 282) in CMCH deliveries while 20 babies out of 56 were brought to SNCU after completion of 1 day.(*p*=.00).

Social status has not shown any significant difference (*p*=0.29), but the ST (Scheduled Tribe) seeking tertiary care services is only 4 out of 7 which were significantly less.

Overall for both intramural and extramural deliveries 331 out of 338(98%) have utilized the ambulances provided by the government, but 5 out of 56(9%) of preterm babies have reached the SNCU by self-arranged vehicle when they are born outside the tertiary care facility. Out of 338 cases only 7 came by self arranged vehicle and one died among this group.

The mean duration of stay in SNCU among the in born was 12.2 (SD10.81) days and for out born was 9.46 (SD9.47) days. ($p$=0.07). The mean duration of stay was marginally significant ($p$=0.07).

**Table 2: Discharge status of Preterm babies**

| Discharge status | Inborn (282) | Out born(56) | *P* value |
|---|---|---|---|
| Improved | 245(86.9) | 47(83.9) | (0.046) |
| Expired | 26(9.2) | 7(12.5) | |
| LAMA | 1 (0.4) | 2((3.6) | |
| Referred | 10 (3.6) | 0 | |

LAMA – Left Against Medical Advice.

Table 2 shows the distribution of discharge status by Intramural and referred babies. 245 survived among inborn admissions (86.9%) and 47 survived among out born admissions (83.9%). The survival among the CMCH delivered and transported preterm neonates were statistically significant. ($p$=0.046).

**Table 3 Distribution by Sex**

| | | Discharge status | | | | Total |
|---|---|---|---|---|---|---|
| | | Improved | Expired | LAMA | Referred | |
| **sex** | F | 126 | 13 | 2 | 5 | 146 |
| | M | 167 | 19 | 1 | 5 | 192 |
| ***Total*** | | ***293*** | ***32*** | ***3*** | ***10*** | ***338*** |

**Table 4 Distribution by place of delivery**

| Place of Delivery | Discharge status | | | | Total |
|---|---|---|---|---|---|
| | Improved | Expired | Lama | Referred | |
| CMCH | 245 | 26 | 1 | 10 | 282 |
| DH | 13 | 3 | 1 | 0 | 17 |
| PHC | 24 | 3 | 0 | 0 | 27 |
| Private | 9 | 0 | 1 | 0 | 10 |
| Home | 1 | 1 | 0 | 0 | 2 |
| ***Total*** | ***292*** | ***33*** | ***3*** | ***10*** | ***338*** |

Among the preterm's admitted 192 were male babies and 146 were female babies. The mortality is shown in table 3 is found to be equal. ($p$=0.81).

Among the preterm neonates admitted 26 out of 282 died in CMCH (9.0%), where as death in preterm's referred from district hospital was 3 out of 17(17.6%), from the PHCs 3 out of 27 (11.1%), one out of 2 from home delivery (50%). 10 preterm's were admitted from the private hospitals, one left against medical advice (10%) and nine survived. The place of delivery is significantly related to the death due to preterm births. ($p$=.025).

Among the total preterm babies admitted to the SNCU, 25 were less than 28 weeks of gestational age and 12 of them died (48%). Out of 93 in the group of 29-32 weeks of gestation 12 of them died (12.9%). Out of 220 in the 33-36 weeks of gestational age 9 died (4%).The mortality is related to the gestational age, lower the gestational age, higher the mortality. ($p$=.00)

Among the marginalized section 82 preterm neonates were treated in SNCU (22.7% of SC and 2.1% ST). Three out of 7 from the ST group have died (75%) and 13 out of 77 from SC group died (16.9%).129 preterm from the general group were admitted and 8 died (6.2%). Mortality is significantly high among the lower strata of economic development especially among the tribal population. (p=.047).

**Table 5 Distributions by GESTATIONAL AGE**

| Gestational Age (Weeks) | Discharge Status | | | | Total |
|---|---|---|---|---|---|
| | Improved | Expired | LAMA | Referred | |
| <28 | 11 | 12 | 1 | 1 | 25 |
| 29-32 | 75 | 12 | 1 | 5 | 93 |
| 33-36 | 206 | 9 | 1 | 4 | 220 |
| ***Total*** | ***292*** | ***33*** | ***3*** | ***10*** | ***338*** |

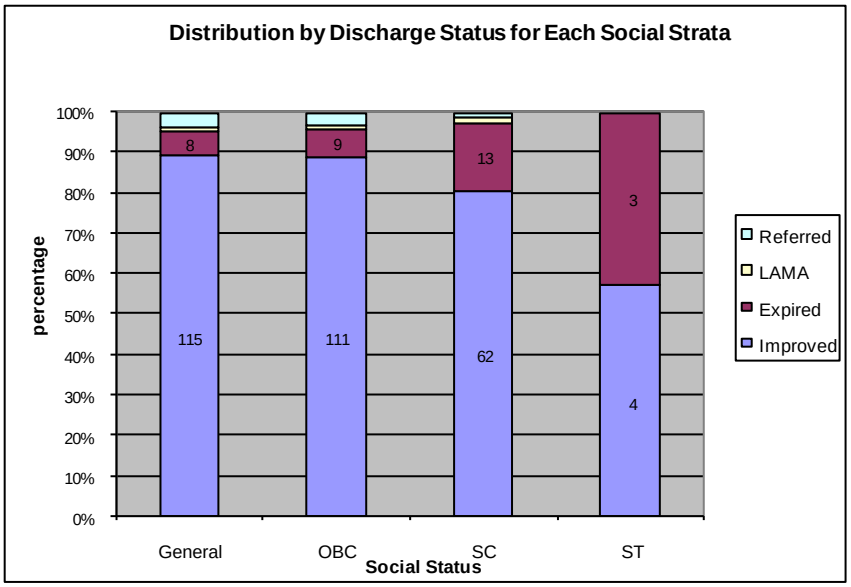


**Fig 1 Distributions by Social Status**

**Mulivariate Logistic Regression**

| | B | S.E. | Wald | df | Sig. | Exp(B) |
|---|---|---|---|---|---|---|
| Gestational age | -1.595 | .279 | 32.675 | 1 | .000 | .203 |
| Age at admissions | -2.009 | 1.068 | 3.540 | 1 | .060 | .134 |
| Social Category | 0.700 | .240 | 8.468 | 1 | .004 | 2.013 |
| Constant | 2.351 | 1.392 | 2.851 | 1 | .091 | 10.492 |

Multiple logistic regression was conducted for variables namely, sex of the child, mode of transport, place of delivery, gestational age, age of the new born and social category. The factors sex of the child, mode of transport, and place of delivery were not significant. The significant risk factors for the outcomes are Gestational Age (OR = 0.203, p< 0.05), Age at admissions (OR = 0.134, p<0.05) and Social Category (OR= 2.03, p<0.05).

## DISCUSSION

In this study the overall mortality among the preterm neonates admitted to the SNCU was 10.65%. The mortality among the transported preterm neonates compared to inborn neonates was statistically significant. This finding is similar to the previous studies, [(22-26)] where the out born mortality is higher. Amany from Cairo showed overall mortality in the out born group as 43.7% and inborn mortality as 29.59%. The main reasons for the higher out born mortality are hypothermia during transport and related complications, e.g. hypoglycemia, hypothermia and shock etc. [(23-26)]

A study by Sehgal et al showed that none of the referred was accompanied by trained staff and none were pre informed. Studies from Nigeria showed poor thermal care and sub optimal resuscitation were associated with poor outcome. The NEOPAIN trial studied the outcome of very low birth infants who were ventilated. In this study it was shown that the location of birth alone did not have significant effect on the survival of transported out born versus inborn neonates. [(27-31)]

The study at Chengalpattu shows that the overall mortality among the preterm is significantly different among the out born and inborn babies. When the place of referral was analyzed the preterm neonates had a higher mortality when transported from district hospital than from Primary health center or private hospital.

This study also reveals that day of admission to NICU is significant factor affecting the outcome. If the baby is referred after one day of life from the referred centre (district hospital) the mortality is higher than if is referred earlier.

This finding may be due to Comprehensive Emergency Obstetric and Neonatal care services available in district hospitals, where the preterm neonates are already treated for complications and then transferred. The delay of transfer of one day and more causes the mortality to be higher. This is similar to study by Berry which also showed that neonates transferred from another NICU were associated with higher mortality. [(25)]

The study at CMCH also shows gestational age as a significant factor. The mortality is higher among the group < 28weeks of gestation (48%) when compared to the 29-32weeks group (12.9%) and 33-36weeks group (4%). Regarding the use of ambulances, previous studies showed out born neonates who did not use neonatal transport, had 30-60% more mortality. Presence of skilled team improved the quality of neonatal care. [(26,30)]

Study in Chengalpattu had showed 98% of neonates were transferred by ambulance. The neonatal ambulances are equipped with incubator, oxygen facility and ventilator care. The neonates were accompanied by trained transport team. The population is aware of the ambulance facility for transport of the mothers.

In the district of Kanchipuram the medical officers at the Primary Health Centre and 108 ambulance personnel have the list of high risk mothers and their Expected Date of Delivery (EDD) and motivate the family to call the ambulance when the need arises. Hence greater proportions of the mothers with preterm deliveries have utilized the government provided transportation.

## CONCLUSION

The study shows that the vast majority (98%) of mothers are utilizing the transportation to reach the health care facilities for their delivery. It is clear that the in-utero transport for high-risk pre-term delivery is happening from the community to the referral care/ tertiary center (CMCH). This shows the advancement of care from the efforts of the National Rural Health Mission (NRHM) and that the communities are aware of and utilizing the transport services.

The district hospitals transfer preterm babies for respiratory care such as surfactant therapy and ventilator care to CMCH using the neonatal ambulance services. The CMCH team is informed about the transport, if ventilator beds are available they are received in CMCH or else they are transferred to Chennai. In spite of increased utilization of transport services, pre-term newborns transferred from the district hospital, after one day of treatment at the health facility, have shown higher mortality compared to those born at referral care center (CMCH) itself.

Regarding the preterm care in CMCH, the mortality is higher (48%) for preterm deliveries less than 28 weeks of gestation, when compared to the 33-36 weeks (4%). The care of preterm neonates less than 28 weeks needs man power especially higher patient nurse ratio (1:1) and adequate facility for central line, total parental nutrition, and advanced ventilator care etc.

Strengthening the care at district hospital for respiratory therapy and imparting knowledge and improving the manpower in the referral centers (District and Medical College) is the need of the

hour. Hence it is advisable to focus the interventions at health care services.

## RECOMMENDATION

Based on the study findings are as follows:

**Community:**

**1. Prevention of preterm in the community:** This study shows that the marginalized sections of the populations (especially Scheduled Tribe), though small in number, have a higher mortality. Hence, special tracking of high risk mothers should be improved especially in the marginalized sections of the populations, focused on identifying danger signs earlier and early transportation to the referral care center.

2. **Secondary and Tertiary care units.**

1. Improve newborn care provided at the district hospital.
2. Early diagnosis of danger signs and transport from the district hospital.
3. Special care services for < 28 weeks gestation at referral units (CMCH) with focus on strengthening the manpower and infrastructure.

A comprehensive effort to strengthen the Primary, secondary and tertiary care with good transport system will pave the way for preterm survival.


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## REFERENCES


1. Blencowe H, Cousens S, Chou D, Oestergaard M, Say L, Moller AB, [1]et al. Born Too Soon: The global epidemiology of 15 million preterm births. *Reproductive Health.* 2013; 10(1):S1-S2.
2. Field D, Hodges S, Mason E, Burton P. Survival and place of treatment after premature delivery. Arch Dis Child.1991; 66:408-411.
3. Martin JA, Hamilton BE, Sutton PD, Ventura SJ, Mathews TJ, Kirmeyer S et al. Births: final data for 2007. Natl Vital Stat Rep. 2010; 58:1-85.http://www.ncbi.nlm.nih.gov/pubmed/21254725 *Accessed on 23/10/2015.*
4. Thompson JM, Irgens LM, Rasmussen S, Daltveit AK. Secular trends in socioeconomic status and the implications for preterm birth. Paediatr Perinat Epidemiol. 2006; 20:182-187.
5. Blencowe H, Cousens S, Oestergaard MZ, Chou D, Moller AB, Narwal R et al. National, regional, and worldwide estimates of preterm birth rates in the year 2010 with time trends since 1990 for selected countries: a systematic analysis and implications. Lancet. 2012; 379:2162-2172.
6. Martin, Hamilton BE, Ventura P, Osterman M, Kirmeyer S, Mathews MS et al. Births: Final Data for 2009. National Vital Staistic Reports 2011; 60: 1-72.http://www.cdc.gov/nchs/data/nvsr/nvsr60/nvsr60_01. Accessed on 24/10/2015.
7. WHO: recommended definitions, terminology and format for statistical tables related to the perinatal period and use of a new certificate for cause of perinatal deaths. Modifications recommended by FIGO as amended October 14, 1976. Acta Obstet GynecolScand 1977, 56:247-253.
8. WHO. Fact Sheet on Preterm Birth. http://www.who.int/mediacentre/factsheets/fs363/en/ Accessed on 23/10/2015.
9. Lawn JE, Kinney MV, Belizan JM, et al. Born Too Soon: Accelerating actions for prevention and care of 15 million newborns born too soon. *Reproductive Health.* 2013; 10(1):S1-S6. http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3828574/ Accessed on 23/10/2015
10. Barros Fernando C, Z. A. Bhutto, ManeeshBatra, Thomas N Hansen, Cesar

G Victora et al. "Global Report on Preterm Birth and Stillbirth (3 of 7): Evidence for Effectiveness of Interventions."*BMC Pregnancy and Childbirth,* 2010; 10 (1): S1-S3. http://bmcpregnancychildbirth.biomedcentral.com/articles.Accessed on 23/10/2015
11. Goldenberg RL, Culhane JF, Iams JD, Romero R. Epidemiology and causes of preterm birth. Lancet.2008; 371:75–84. doi: 10.1016/S0140-6736(08)60074-4.
12. Langhoff R J, Kesmodel U, Jacobsson B, and Rasmussen S, Vogel I. Spontaneous preterm delivery in primiparous women at low risk in Denmark: population based study. BMJ 2006; 332:937-939.
13. *International classification of diseases and related health problems* 10th revision. Geneva: World Health Organization; 1992.
14. Huddy CL, Johnson A, Hope PL. Educational and behavioral problems in babies of 32–35 weeks gestation. Arch Dis Child Fetal Neonatal Ed. 2001; 85:23F8.
15. Petrou S. The economic consequences of preterm birth during the first 10 years of life.Brit. J. Obstet. Gynaec. 2005; 112(1): 10–5.
16. Blencowe. H, Anne CC L , Simon C, AdilBahalim, Rajesh Narwal, Nanbert ZhongDorisChou et al. Preterm Birth–associated Neurodevelopmental Impairment Estimates at Regional and Global Levels for 2010. *Pediatric Research*. 2013; 74(1): 17–34.
17. Huddy C, Johnson A, Hope P. Educational and Behavioral Problems in Babies of 32-35 Weeks Gestation. *Arch of Dis Child. Fetal and Neonat Edition* .2001; 85(1) 23–28.
18. Kozuki N, Anne CC L, MariangelaF, Ayesha S, Joshua P V et al. The Associations of Parity and Maternal Age with Small-for-Gestational-Age, Preterm, and Neonatal and Infant Mortality: A Meta-Analysis.BMC Public Health. 2013; 13 Suppl 3:S2. doi: 10.1186/1471-2458-13-S3-S2.http://www.ncbi.nlm.nih.gov/pubmed. Accessed on 23/10/15.
19. Murphy D. J, Hope PL, Johnson.A. Neonatal Risk Factors for Cerebral Palsy in Very Preterm Babies: Case-Control Study.*BMJ : British Medical Journal.* 1997; 314:404–8.
20. Shah PS, Lee SK, Lui K, Sjörs G, Mori R, Reichman B, et al. The International Network for Evaluating Outcomes of very low birth weight, very preterm neonates (iNeo): a protocol for collaborative comparisons of international health services for quality improvement in neonatal care. BMC Pediatr. 2014; 14:110.
21. Beck S, Wojdyla D, Say L, Betran AP, Merialdi M, Requejo JH, et al. The worldwide incidence of preterm birth: a systematic review of maternal mortality and morbidity. Bull World Health Organ. 2010; 88(1):31–8.
22. Boland RA, Dawson JA, Davis PG, Doyle LW. Why birthplace still matters for infants born before 32 weeks: Infant mortality associated with birth at 22-31 weeks' gestation in non-tertiary hospitals in Victoria over two decades. Aust N Z J Obstet Gynaecol. 2015; 55(2):163–9.
23. Amany E, Elwan, M.D. Mortality among out born Versus Inborn Neonates: A Retrospective Comparative Study. Med. J. Cairo Univ. 2009; 77 (4): 209-217.
24. Beeram M, Solarin K., Young M, Abedin M.: Morbidity and mortality of infants born before arrival at the hospital. Clin. Pediatr (Phila) .1995; 34: 313–316.
25. Berry M.A, Shah P.S, Brouillette1 R.T, Hellmann J. Predictors of mortality and length of stay for neonates admitted to children's hospital neonatal intensive care units .J. Perinatol. 2008; 28: 297-302.
26. McNamara P.J, Mak W, Whyte H.E.: Dedicated neonatal retrieval teams improve delivery room resuscitation of out born premature infants. J. Perinatol., 2005; 25: 309- 314.
27. Hood J, CrossA, HulkaB, LawsonE. Effectiveness of Neonatal transport team. Crit care Med. 1983; 11(6); 419-23.
28. Hoque M, HaaqS, IslamR. Causes of neonatal admissions and death at rural hospital in Kwazulunatal, South Africa. South Afr J Epidemiolinfect.2011; 26(1): 27-29.
29. Omoigberale AI, Sadoh WE, Nwaneri DU. A 4 year review of neonatal outcome at the University of Benin Teaching Hospital, Benin City. Niger J ClinPract. 2010; 13(3):321-5.
30. Anna H, Tove R, Christine O, James N, Ryan M, McAdamsDet al. Demographics,

clinical characteristics and neonatal outcomes in a rural Ugandan NICU.BMC Pregnancy and Childbirth 2014, 14:327-29
31. Palmer KG, Kronsberg SS, Barton BA, Hobbs CA, Hall RW, Anand KJ. Effect of inborn versus out born delivery on clinical outcomes in ventilated preterm neonates: secondary results from the NEOPAIN trial. J Perinatol. 2005; 25(4):270-5.

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