# Neonatal Mortality Rate in the Special Care Baby Unit (SCBU) at Gharian Teaching Hospital

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## ABSTRACT

**Objective:** The aim of this retrospective study was to determine the incidence and risk factors of neonatal mortality among cases admitted to the Special Care Baby Unit (SCBU) at Gharian Teaching Hospital.

**Methodology:** The study included all admitted newborn cases to the Special Care Baby Unit (SCBU) over a one-year period from January to December 2009. They were 1267 newborns. Records about Gestational age, sex, birth weight, mode of delivery, early or late neonatal deaths, duration of stay, main cause of admission and outcome of patients were taken.

**Results:** Results of study revealed that mortality rate among studied newborns was (4.57%) from the total number of admitted newborns; the higher rate was observed among: premature newborns (70.69%), cases suffering from respiratory problems (39.66%), birth asphyxia (25.86%), congenital malformations (20.69%) and also among artificially ventilated patients (80%).

**Conclusion:** It is concluded that neonatal mortality is quite common at our SCBU with a rate of (4.57%).

**Key Words:** Newborn, Mortality rate, Preterm, Artificial ventilation.

# INTRODUCTION

Neonatal mortality is a reflection of the effectiveness of obstetric and neonatal services in any particular community \({}^{[1]}\). It contributes to about two thirds of infant mortality worldwide and most of these occur in the first week of life \({}^{[2]}\). Worldwide, the major causes of early neonatal deaths are birth asphyxia, birth trauma, infections, prematurity and malformations, while sepsis, pneumonia, meningitis, diarrheal disease and tetanus account for most of the mortality during the rest of the neonatal period \({}^{[2]}\).

The neonatal mortality rate is defined as number of neonatal deaths per 1000 live births. Across the globe neonatal mortality rates range from 5 per 1000 in developed countries to 50 per 1000 in the least developed countries; early neonatal mortality represents about 75% of neonatal mortality \({}^{[3]}\). Globally, approximately 7.5 million infants die annually, more than half of these deaths occur during the neonatal period and 98% of the neonatal deaths occur in the developing regions \({}^{[3]}\). High neonatal mortality rate remains a problem in developing countries where the economic situation and poor planning of health services have led to little appreciable advancement in neonatal care \({}^{[4]}\). This is in contrast to what obtains in developed countries where the technological advances in neonatal intensive care have brought about reductions in mortality among the newborns \({}^{[5]}\). These advances include perinatal monitoring of maternal and fetal well-being and thermoregulation.

Neonatal medical services as a paediatric subspeciality were established on a wide scale in Libya in 1985. The first report on morbidity and mortality rates in Libyan neonates in Algala Children and Obstetric Hospital was issued in 1990 \({}^{[6]}\). The perinatal mortality rate at that time was 26.3 per 1000 total births, which was high compared to western European and North American countries. The major causes of neonatal deaths in Tripoli during the early 1990s were premature birth and its complications, low birth weight, congenital malformations, infections, perinatal asphyxia and birth trauma.

The SCBU at Gharian Teaching Hospital has evolved as a unique unit that provides services for all newborns of high risk pregnancies together with critical and emergency neonatal cases delivered at the hospital, despite the effort to provide excellent care at this unit, mortality and complications continue to occur. So the aim of this study was to determine the incidence and risk factors of neonatal mortality rate (NMR) among cases admitted to the SCBU at Gharian Teaching Hospital in an attempt to evaluate the quality of care at the unit and to minimize or prevent subsequent deaths.

## SUBJECTS AND METHODS

This was a retrospective study from the records of newborns admitted to the SCBU at Gharian Teaching Hospital during the period from January to December 2009. The SCBU provides services for newborns of high risk pregnancies together with emergency neonatal care of infants delivered inside the hospital. The quality of man power inside the unit over 24 hours was divided into two shifts each shift included 2 doctors, 2 nurses. The unit is followed up daily by a pediatric specialists, and the total number of incubators were 12 incubators. Records were collected from the admission files including: sociodemographic data regarding: gestational age, sex, residence, date of birth (DOB), primary diagnosis, birth weight, duration of stay inside the unit, use of mechanical ventilation and outcome of patients whether alive or died and the cause of death.

## STATISTICAL ANALYSIS

Data in this study were Statistically presented and analyzed using SPSS software statistical package version 10 (SPSS, Chicago, IL). Data were expressed as Numbers and percentage and tested by $\chi^2$. A P-value less than 0.05 were considered significantly.

## RESULTS

## Table (1): Characteristics of studied newborns

| Parameter | Total number 1267 newborn (No.) | Percentage (%) |
|---|---|---|
| **Gestational Age** | | |
| - < 37 weeks | 280 | 22.09 |
| - > 37 weeks | 987 | 78.91 |
| **Sex** | | |
| - Male | 570 | 44.98 |
| - Female | 697 | 55.02 |
| **Mode of delivery** | | |
| - NVD | 1217 | 96.05 |
| - CS & instrumental | 50 | 3.95 |
| **Cause of admission** | | |

| | | |
|---|---|---|
| - Respiratory distress | 519 | 40.96 |
| - Birth asphyxia | 278 | 21.94 |
| - Cong. Anomalies | 125 | 9.87 |
| - Infections | 93 | 7.34 |
| - IDM | 120 | 9.47 |
| - Others (Hyperbilirubinemia, bleeding.....etc) | 132 | 10.42 |
| **Use of mechanical ventilation:** | | |
| - Ventilated | 10 | 00.07 |
| - Not ventilated | 1257 | 99.93 |
| **Outcomes:** | | |
| - Alive | 1209 | 95.43 |
| - Dead | 58 | 4.57 |

*Note: NVD: normal vaginal delivery | CS: caesarian section | IDM: infant of diabetic mother*

## Table (2): Mortality outcome among studied cases according to gestational age & sex

| Parameter | Total Number | Dead (No.) | Dead (%) | Alive (No.) | Alive (%) | $\chi^2$ | P |
|---|---|---|---|---|---|---|---|
| **Gestational age** | | | | | | | |
| < 37 weeks | 65 | 41 | 70.69 | 239 | 16.78 | | |
| > 37 weeks | 1202 | 17 | 29.31 | 1185 | 83.22 | 102.19 | < 0.001 |
| **Sex:** | | | | | | | |
| Male | 570 | 30 | 51.72 | 540 | 35.86 | | |
| Female | 697 | 28 | 48.28 | 966 | 64.41 | 1.087 | > 0.05 |

## Table (3): Mortality outcome among studied cases according to cause of admission

| Causes of admission | Total | Dead (No.) | Dead (%) | Alive (No.) | Alive (%) | $\chi^2$ | P |
|---|---|---|---|---|---|---|---|
| **Resp. distress** | 519 | 23 | 39.66 | 496 | 41.03 | | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Birth asphyxia** | 278 | 15 | 25.86 | 263 | 21.75 | | |
| **Congenital anomalies** | 125 | 12 | 20.69 | 113 | 9.35 | | |
| **Infections** | 93 | 5 | 8.62 | 88 | 7.28 | | |
| **IDM** | 120 | 0 | 0.00 | 120 | 9.93 | | |
| **Others** | 132 | 3 | 5.17 | 129 | 10.67 | 15.167 | < 0.001 |

## Table (4): Mortality outcome among studied cases according to use of mechanical ventilation

| Parameter | Total No. | Dead (No.) | Dead (%) | Alive (No.) | Alive (%) | $X^2$ | P |
|---|---|---|---|---|---|---|---|
| **Use of mechanical Ventilation** | | | | | | | |
| - Ventilated | 10 | 8 | 8.00 | 2 | 20.00 | | |
| - Not ventilated | 1257 | 50 | 3.98 | 1207 | 96.02 | 114.48 | < 0.001 |

## Detailed Summary of Results

This retrospective study was carried out over a period of one year and included 1267 newborns admitted to the SCBU. The main number of cases/ month were (105.58), and per day (3.51). The total number of incubators inside the unit was 12 incubators and the main number of cases per incubator per month was (8.75). The mean duration of stay was 11.2 days.

The characteristics of studied cases are summarized in Table (1):- The proportion of male to female in the sample was (44.98% versus 55.02%), 22.09% were premature less than 37 week, Most newborns (96.05%) were products of normal vaginal deliveries. Regarding cause of admission (41.03%) of cases were due to respiratory distress, (21.75%) admitted because of birth asphyxia, (9.35%) had congenital anomalies & syndromatic diseases, (9.93%) were infants of diabetic mothers and (10.67%) were due to other illnesses e.g. hyperbilirubinemia, bleeding tendencies .....etc.

Among our cases 10 cases (0.075%) were exposed to artificial ventilation, all were premature. Out of 1267 cases admitted to the SCBU over one year over one year 58 cases were died with an overall mortality rate (4.57%).

Table (2) displayed the mortality outcome among studied cases according to gestational age & sex. The incidence of mortality was increased as the gestational age decreased being (70.69%) among premature infants less than 37 weeks, and (29.31%) among full term infants more than 37 weeks, the difference was statistically significant (P< 0.001 ). However regarding sex there was no statistical difference between sexes and the mortality rate was statistically non significant (P> 0.05).

Table (3) showed the mortality outcome among studied cases according to cause of admission, the incidence of mortality is increased among cases admitted with respiratory distress (39.66%), birth asphyxia (25.86%), congenital anomalies (20.69%), and infections (8.82%). The differences were statically significant (P< 0.001).

Table (4) showed: More deleterious outcome with the use of mechanical ventilation where mortality rate was 80% among ventilated cases compared to 3.98% among non ventilated newborn (P<0.001).

## DISCUSSION

It is important to review the pattern of diseases and neonatal deaths at regular intervals so the planning of neonatal care can be improved \({}^{[7,8,9]}\). In our study the overall death rate was 4.75% among the inborn neonates admitted to the SCBU of Gharian teaching hospital during the study period; the same results were reported in a regional referral hospital in Sudan where also only inborn neonates were included \({}^{[10]}\). In a recent study done in the SCBU of the Tripoli children's hospital a mortality rate of 22.1% was reported \({}^{[11]}\), because they included also the outborn babies in their study. A study from Nigeria reported overall mortality of 25.5%; 20.3% among inborn neonates and 64.2% among outborn neonates \({}^{[12]}\). A study from Bangladesh \({}^{[13]}\) reported 8% mortality in inborn neonates and 25.6% in outborn neonates. But in the United States of America a mortality rate of 0.8% was reported among inborn neonates \({}^{[14]}\). This illustrates that while neonatal mortality in developed countries has fallen dramatically, developing countries continue to experience unacceptably high neonatal mortality. The variations in mortality probably reflect local and national differences in care pattern of newborn babies.

Our study revealed that respiratory distress and prematurity were the most important risk factors for neonatal mortality (39.66% and 25.86% respectively). RDS is a well known very frequent complication of prematurity due to lung immaturity, and babies with RDS had the highest case fatality in our study, which is also reported elsewhere \({}^{[15,16,17,18]}\). The high case fatality in infants with RDS reflects the inadequate care of these neonates in developing countries \({}^{[19,20]}\).

About 70.69% of the neonatal deaths were premature newborns. Deaths among the extremely low birth weight and very low birth weight infants were largely attributed to respiratory insufficiency. The mortality rates of very low and extremely low birth weight neonates are still high in most of the developed countries \({}^{[21]}\). But the overall survival rate for very low birth weight newborns in Japan was around 90% \({}^{[22]}\). This improvement of survival of such infants reflects the improvement in medical care \({}^{[23]}\) and better knowledge of the pathophysiology of the neonatal medicine \({}^{[24]}\). Very low birth weight is a preventable risk factor of neonatal deaths and the decline in very low birth weight births will result in a decline of neonatal deaths in general \({}^{[23]}\). In our study there was strong association between neonatal mortality and gestational age where mortality rate is strongly increased with the decrease in gestational age and maturity.

Management of premature babies requires highly specialized equipment, highly trained personnel and financial support \({}^{[24,25]}\). In countries where ventilation technology and the use of surfactant as a preventive measure have been implemented, the survival rate of premature babies has improved \({}^{[23]}\). Some specific and simple measures has been identified which could be implemented to reduce deaths related to low birth weight and preterm in low income countries \({}^{[26,27,28]}\). These include prophylactic use of steroids during premature labor, strict hygienic conditions, antibiotic use for premature rupture of membrane, early breast feeding, treatment of infection, hospital-based kangaroo mother care, prevention of hypothermia, feeding and nutritional support. A recent meta-analysis review found that hospital-based Kangaroo mother care (skin-to-skin contact) implemented within the first week of life for stable preterm and low birth weight neonates was effective and could reduce neonatal mortality up to 51% \({}^{[29]}\).

In this study male newborns had higher mortality rate than females (51.72% versus 48.28%) but this was not statistically significant, which concurs with previous reports which indicate that sex is not a significant predictor of mortality \({}^{[30,31,32]}\).

Congenital malformations are an important contributor to neonatal mortality (20.69%); the death rate was highest among those infants with neural tube

defects, complex congenital heart diseases, chromosomal and other genetic anomalies. Some congenital anomalies are preventable \({}^{[23,33]}\), such as neural tube defects that can be prevented by using folic acid during the preconception period \({}^{[33]}\). Consanguineous marriage, extreme maternal age (over 40 years or very young mothers), socio-economic factors and chronic maternal disease such as diabetes are all factors associated with a higher incidence of congenital anomalies \({}^{[6,34,35]}\). Although the consanguinity rate in this study was not known, the traditional pattern of consanguineous marriage in Arab and Islamic countries, including ours, may influence the frequency of autosomal recessive conditions and the incidence of congenital anomalies \({}^{[34,36]}\). Many congenital anomalies can be treated surgically but we lack the facilities for the management such as the lack of total parenteral nutrition, the well trained neonatal surgeons and a qualified nurses in neonatal care. The frequent use of nasogastric and endotracheal tubes leaves babies highly susceptible to infections, especially among premature.

Mortality due to infection in this study was low (8.62%) compared to the global pattern as well as the pattern in low income countries \({}^{[37,15,13,38]}\). The low number of deaths due to infection might in part be explained by the inclusion of only inborn neonates, since appropriate treatment of infection or suspected infection can start with a minimum of time delay after delivery. Recent reports \({}^{[39]}\) showed that, the use of Gentamycin and Cloxacillin instead of Gentamycin and Ampicillin for neonatal infections may have played a role in increased survival in infected neonates. A similar change in antibiotic treatment in Nigeria resulted in a 32% reduction in mortality associated with septicemia \({}^{[16]}\). The routine transfer to NCU of all neonates at risk of infection or suspected infection due to premature/prolonged rupture of membrane for antibiotic prophylaxis \({}^{[40]}\), might also have contributed to low mortality due to infection in this setting. It has been previously shown that babies of mothers with premature/prolonged rupture of membranes had a 2 fold risk of being transferred to NCU for antibiotic prophylaxis due to risk of infection \({}^{[40]}\).

Birth asphyxia was a common cause of neonatal mortality among our cases (25.86%), this was in consistent with, the global pattern and studies from many universities and tertiary care hospitals \({}^{[41,12,38]}\). One explanation of the high number of deaths due to asphyxia in our data may be the definition criteria for asphyxia that we used, which included some of the preterm babies. Of particular interest is the high number of deaths attributable to asphyxia in our study (quarter of all deaths) because they may represent a potential for prevention. A good Antenatal care is lacking in our community which increases the number of asphyxiated babies. A basic training on newborn resuscitation, skills and proper newborn resuscitation immediately after birth, has proved to reduce mortality among babies born with birth asphyxia up to 40% \({}^{[16,26]}\). A recent study in six developing countries showed that training on essential Newborn Care which includes training on basic resuscitation had no effect on

early neonatal mortality. However, there was a significant reduction in the rate of stillbirths primarily fresh, most likely as an effect of resuscitation of babies who would have been misclassified as stillbirths before training \({}^{[19]}\). On the other hand, there was no additional effect of training in the Neonatal Resuscitation Program once the Essential Newborn Care training was already in place \({}^{[19]}\).

In this study neonatal mortality was significantly higher among ventilated cases (80%) compared with non-ventilated ones. This is in agreement with a study by Magid et al. who reported that the mortality rate among ventilated patients was 87.5% \({}^{[43]}\). Mechanical ventilation, while frequently life-saving is also associated with numerous iatrogenic complications and some of which are themselves life-threatening, such as ventilator-associated pneumonia of patients ventilated for longer than 48 hours, Tension pneumothorax, lung collapse, decreased cardiac output, hypotension and death\({}^{[44]}\).

## CONCLUSION & RECOMMENDATION

Neonatal mortality is quite common at our SCBU with a rate of (4.57%) and it is significantly associated with prematurity, respiratory distress, birth asphyxia, congenital malformations and use of mechanical ventilation. We strongly recommended to improve the quality & quantity of man power with continuous supervision, training and improve facilities e.g artificial ventilatory support, Surfactant administration for premature, strict hygiene and good Infection Control program inside the SCBU.

To reduce neonatal mortality, enhanced screening and early referral mechanisms for high-risk pregnancies are essential, alongside comprehensive care for premature infants including thermal management, nutritional support, and infection prevention. Establishing structured feedback loops—such as joint reviews of maternal and newborn deaths by pediatricians and obstetricians—can identify gaps and guide clinical strategies. Furthermore, implementing standardized local classification systems and robust registries will improve outcome tracking and inform future preventive measures across the institution and outreach networks.

REFERENCES

1- World Health Organization. Pernatal mortality: a listing of available information. Geneva: World Health Organization. 1996, FRH/MSM/96.7.
2- World Health Organization. Technical Seminar-Sick Young Infant: IMCI. Geneva: World Health Organization. 1996, WHO/FCH/CAH/1.10.
3- World Health Organization. Maternal and newborn health safe motherhood estimates. Geneva: World Health Organization. 1997.
4- Behrman RE, Kliegman RM, Jenson HB. Nelson textbook of pediatrics, 19th ed., United States, Elsevier Science, 2010 :519, 550–553, 566–567, 623–630.
5- Babara JS, Robert MK. Overview of mortality and morbidity. In: Nelson's Textbook of Pediatrics. Behrman ER, Vaughn CV, Jenson HB, eds. Philadelphia: WB Saunders (Publ) 2000:451-4.
6- Dekna M et al. Morbidity and mortality in Libyan neonates: a study from Aljala hospital Tripoli. Libya Jamahiriya Medical Journal, 2002, 2(1):48–53.
7- Pollack MM., Ruttiman UE. And Getson PR. Pediatric Risk of Mortality score. Crit Care Med,1988;16:1110-1116.
8- Ye TS, Pollack MM, Holbrook PR. And Ruttiman U. Assessment of pediatric intensive care. Crit Care Med ,1982;10:497-500.
9- Earlie M. Jr, Natera OM. Zaslavsky A., et al. Outcome of Pediatric intensive care . Crit CARE Med,1997; 25:1462-1467.
10- Elhassan EM, Hassanb AA, Mirghani OA, Adam I. Morbidity and mortality parten of neonates admitted into nursery unit in Wad Medani Hospital, Sudan. Sudan J Med Science 2010, 5(1):1316.
11- Abushhaiwi AM, Ziyani MM, DeknaM. Mortality in the special care baby unit of the main children's hospital in Tripoli, Libyan Arab Jamahiriya, EMHJ, 2010; 16: 1137-1142.
12- Omoigberale AI, Sadoh WE, Nwaneri DU. A 4 year review neonatal outcome at the University of Benin teaching hospital, Benin city. Nigerian J Clinic Pract 2010, 13(3):321-325.
13- Nahar J, Zabeen B, Akhter S, Azad K, Nahar N. Neonatal morbidity and mortality pattern in the special care baby unit of BIRDEM. Ibrahim Med Coll J 2007, 1(2):1-4.
14- Marcin JP et al. Long-stay patients in the pediatric intensive care unit. Critical Care Medicine, 2001, 29(3):652–657.
15- Klingenberg C, Olomi R, Oneko M, Sam N, Langeland N. Neonatal morbidity and mortality in Tanzanian tertiary care referral hospital. Ann Trop Paediatr 2003, 23:293-299.
16- Dawodu AH, Effiong CE. Neonatal mortality. Effects of selective pediatric interventions. Pediatr 1985, 75(1):51-57.
17- Modi N, Kirubakaran C. Reasons for admission, causes of death and costs of admission to a tertiary referral neonatal unit in India. J Trop Pediatr 1995, 41:99-102.
18- Mlay GS, Manji KP. Respiratory Distress Syndrome among neonates admitted at Muhimbili Medical Centre, Dar Es Salaam, Tanzania. J Trop Pediatr 2000, 46(5):303-307.

19- Carlo WA, Goudar SS, Jehan I, Chomba E, Tshefu A, Garces A, Parida S, Althabe F, McClure EM, Derman RJ, Goldenberg RL, Bose C, Krebs NF, Panigrahi P, Buckens P, Chakraborty H, Hartwell T, Wright LL, First Breath study group. High mortality rates for very low birth weight infants in developing countries despite training. Pediatr 2010, 126(5):e1072-e1080.
20- Poudel P, Budhathoki S: Perinatal characteristics and outcome of VLBW infants at NICU of a developing country. An experience at easternNepal. J Matern Fetal Neonatal Med 2010, 23(5):441–447.
21- Sankaran K et al.; Canadian Neonatal Network. Variations in mortality rates among Canadian neonatal intensive care units. Canadian Medical Association Journal, 2002, 166:173–178.
22- Kusuda S et al. Morbidity and mortality of infants with very low birth weight in Japan: center variation. Pediatrics, 2006, 118(4):e1130–e1138.
23- Ho NK. A study of 8 year neonatal deaths (1982–1989) of Toa Payoh Hospital. Singapore Medical Journal, 1991, 32:138–141.
[06/11/2026 05:46 على غريبة [م: 24- Wilkinson DJ et al. Death in the neonatal intensive care unit: changing pattern of end of life care over two decades. Archives of Disease in Childhood. Fetal and Neonatal Edition, 2006, 94(1):F268–F271.
25- Wall SN, Lee ACC, Carlo W, Goldenberg R, Niermeyer S, Darmstadt GL, Keenan W, Bhutta ZA, Perlman J, Lawn JE; Reducing intrapartum-related neonatal deaths in Low- and Middle-income countries-What works? Semin Perinat 2010, 34(6):395-407.
26- Darmstadt GL, Bhutta ZA, Cousens S, Adam T, Walker N, de Bernis L: Evidence-based, cost-effective interventions: how many newborn babies can we save? Lancet 2005, 365(9463):977-988.
27- Vinod PK. The current state of newborn health in low income countries and the way forward. Semin Fetal Neonatal Med 2006, 11(1):7-
28- Barros F, Bhutta Z, Batra M, Hansen T, Victora C, Rubens C, Group tGR. Global report on preterm birth and stillbirth (3 of 7): evidence for effectiveness of interventions. BMC Pregnancy and Childbirth 2010, 10(Suppl 1):S3.
29- Lawn JE, Mwansa-Kambafwile J, Horta LB, Barros CF, Cousens. Kangaroo mother create to prevent neonatal death due to preterm birth complications. Int J Epidemiol 2010, 39:i144-i154.
30- Kambarami RA, Matibe P, Pirie D. Risk factors for neonatal mortality: Harare Central Hospital Neonatal Unit-Zimbabwe. Central African Journal of Medicine, 1999, 45(7):169–173.
31- Kambarami R, Chidede O, Chirisa M. Neonatal intensive care in a developing country: outcome and factors associated with mortality. Central African Journal of Medicine, 2000, 46:205–207.
32- Copper RL et al. A Multicenter study of preterm birth weight and gestational age-specific neonatal mortality. American Journal of Obstetrics and Gynaecology, 1993, 168(1):78–84.
33- Abusrewil S et al. Pattern of disease in neonates: a twelvemonth study. Jamahiriya Medical Journal, 2002, 2:44–48.
34- Bassuni W et al. Neonatal deaths in the Asir Region of Saudi Arabia: Experience in a Referral Neonatal Intensive Care Unit. Annals of Saudi Medicine, 1997, 17:522–6.
35- Kelnar CJ, Harvey D, Simpson C. The sick newborn baby, 3rd ed. London, Bailliere

Tindall, 1995:197–248, 344–350.
36- Singh R, Al-Sudani O, Major congenital anomalies at birth in Benghazi, Libyan Arab Jamahiriya. Eastern Mediterranean Health Journal, 1995, 6(1):65–75.
37- Kidanto HL, Massawe SN, Nystrom N, Lindmark G: Analysis of Perinatal mortality at a teaching hospital in Dar es Salaam, Tanzania. Afr J Reprod Health 2006, 10(2):72-80.
38- Fazlur R, Amin J, Jan M, Hamid I: Pattern and outcome of admissions to neonatal unit of Khyber teaching hospital, Peshawar. Pakistan J Med Science 2007., 23(2): part 1
39- Swai M, Olomi R, Kinabo G, other KCMC paediatrician, past, and, present: Paediatric management schedules at hospital level. 7th edition. CPEP-KCMCPaediarics,7th edition. New Millennium Books: Moshi Lutheran Printing Press; 2009.
40- Mmbaga BT, Lie RT, Kibiki GS, Olomi R, Kvale G, Daltveit AK: Transfer of newborns to neonatal care unit: a registry based study in Northern Tanzania. BMC Pregnancy Childbirth 2011, 11(1):68.
41- Winbo I, Serenius F, Dahlquist G, Kallen B: NICE, a new cause of death classification for stillbirths and neonatal deaths. Int J Epidemiol 1998, 27(3):499-504.
42- Lawn JE: 4 million neonatal deaths: When? Where? Why? Lancet 2005, 365(9462) 891.
43- Magid A, Hanan M, Waheeb N. Outcome of Ain Shams pediatric intensive care unit in two years duration [Masters thesis]. Cairo Egypt, Department of Paediatrics, Faculty of Medicine, Ain Shams University 2001.
44- Katz S et al. Outcome of non-invasive positive pressure ventilation in paediatric neuromuscular disease. Archives of Disease in Childhood, 2004, 89:1214.