# REPORT OF THE MALAYSIAN NATIONAL NEONATAL REGISTRY

# 2017

## A STUDY OF CRITICALLY ILL BABIES IN NEONATAL INTENSIVE CARE UNITS


EDITOR:

- Farah Inaz

WITH CONTRIBUTIONS FROM:

- Boo Nem Yun
- Chee Seok Chiong
- Pauline Choo Poh Ling
- Ang Ee Lee
- Azanna Ahmad Kamar
- Eric Ang Boon Kuang
- Neoh Siew Hong
- Wong Ann Cheng



Perinatal Society of Malaysia

CRC
MINISTRY OF HEALTH MALAYSIA
*Research that matters to patients*

Report of the

# MALAYSIAN NATIONAL NEONATAL REGISTRY 2017

## A STUDY OF CRITICALLY ILL BABIES IN NEONATAL INTENSIVE CARE UNITS


*Editor:*
**Farah Inaz**

*With contributions from:*
**Boo Nem Yun, Chee Seok Chiong, Pauline Choo Poh Ling, Ang Ee Lee, Azanna Ahmad Kamar, Eric Ang Boon Kuang, Neoh Siew Hong, Wong Ann Cheng**



Perinatal Society of Malaysia

MINISTRY OF HEALTH MALAYSIA
CRC
*Research that matters to patients*

**Published by the:**

Malaysian National Neonatal Registry (MNNR)
Unit 2.4 (Suite 3), Level 2
Enterprise 3B, Technology Park Malaysia
Lebuhraya Sungei Besi – Puchong
Bukit Jalil
57000 Kuala Lumpur
Malaysia

| | | |
|---|---|---|
| Direct Line | : | (603)-8996 4505 |
| Fax | : | (603)- 8996 4505 |
| E-mail | : | mnnr@acrm.org.my |
| Website | : | http://www.acrm.org.my/mnnr |


**Important information**



**Disclaimer**

**There is a potential that data for previous years printed in this report are different from what were printed in previous reports. This is because analysis for this report is based on latest dataset in the web which may have been updated by SDP.**

June 2020

## ACKNOWLEDGEMENTS

The Malaysian National Neonatal Registry would like to express its sincere thanks and appreciation to all who have supported and contributed to this report.

We thank the following for their support:

- The Ministry of Health, Malaysia.
- Y.Bhg. Datuk Dr. Noor Hisham Abdullah, Director General of Health, Malaysia for his kind permission for publication
- Dr. Goh Pik Pin, Director, Network of Clinical Research Centre
- Members of the MNNR Steering Committee for their contributions to the registry
- Our 44 source data providers from the Government Hospitals which comprise of doctors and nurses working in the NICUs
- Clinical Research Centre, Ministry of Health, Malaysia
- Ms. Thinisha a/p Mohan, Registry Manager, MNNR
- Pn. Ain Bt Hamdan, Assistant Registry Manager, MNNR
- Other sponsors and supporters from the professional bodies, industries and institutions as listed below:
    - Perinatal Society of Malaysia
    - AbbVie (M) Sdn Bhd

**PARTICIPATING HOSPITALS 2017**

1. Hospital Ampang
2. Hospital Batu Pahat, Johor
3. Hospital Bintulu, Sarawak
4. Hospital Gleneagles, Kuala Lumpur
5. Hospital Raja Permaisuri Bainun, Ipoh, Perak
6. Hospital Kajang, Selangor
7. Hospital Keningau, Sabah
8. Hospital Kluang, Johor
9. Hospital Kuala Krai, Kelantan
10. Hospital Kuala Lumpur
11. Hospital Kulim, Kedah
12. Hospital Likas, Kota Kinabalu, Sabah
13. Hospital Melaka, Melaka
14. Hospital Umum Miri, Sarawak
15. Hospital Pulau Pinang, Pulau Pinang
16. Hospital Putrajaya
17. Hospital Raja Perempuan Zainab II, Kota Bharu, Kelantan
18. Hospital Umum Sarawak, Kuching, Sarawak
19. Hospital Sandakan, Sabah
20. Hospital Seberang Jaya, Pulau Pinang
21. Hospital Segamat, Johor
22. Hospital Selayang, Selangor
23. Hospital Serdang, Selangor
24. Hospital Seri Manjung, Perak
25. Hospital Sibu, Sarawak
26. Hospital Sultan Abdul Halim, Sg. Petani, Kedah
27. Hospital Sultan Haji Ahmad Shah, Temerloh, Pahang
28. Hospital Sultan Ismail, Johor Bahru, Johor
29. Hospital Sultanah Aminah, Johor Bahru, Johor
30. Hospital Sultanah Bahiyah, Alor Setar, Kedah
31. Hospital Pakar KPJ Putri, Johor Bahru, Johor
32. Hospital Pakar Sultanah Fatimah, Muar, Johor
33. Hospital Slim River, Perak
34. Hospital Sultanah Nur Zahirah, Kuala Terengganu, Terengganu
35. Hospital Sungai Buloh, Selangor
36. Hospital Taiping, Perak
37. Hospital Teluk Intan, Perak
38. Hospital Tengku Ampuan Afzan, Kuantan, Pahang
39. Hospital Tengku Ampuan Rahimah, Klang, Selangor
40. Hospital Tuanku Ampuan Najihah, Kuala Pilah, Negeri Sembilan
41. Hospital Tuanku Fauziah, Kangar, Perlis
42. Hospital Tuanku Ja'afar, Seremban, Negeri Sembilan
43. Hospital Universiti Sains Malaysia, Kubang Kerian, Kelantan
44. Pusat Perubatan Universiti Malaya, Kuala Lumpur

**STEERING COMMITTEE 2017**

| | Member | Designation and Institution |
|---|---|---|
| 1 | Dr Chee Seok Chiong<br>(Chairperson) | Head of Neonatal Unit,<br>Paediatric Department, Hospital Selayang |
| 2 | Dr Irene Cheah Guat Sim | Head of Neonatal Unit,<br>Paediatric Institute,<br>Hospital Kuala Lumpur |
| 3 | Dr Ang Ee Lee | Consultant Paediatrician and Neonatologist,<br>Paediatric Department,<br>Hospital Tengku Ampuan Rahimah, Klang |
| 4 | Dr Pauline Choo | Neonatologist,<br>Paediatric Department,<br>Hospital Tuanku Jaa'far ,Seremban |
| 5 | Emeritus Professor Dr Boo Nem Yun | Senior Professor, Faculty of Medicine and Health Sciences, Universiti Tunku Abdul Rahman<br>&<br>Professor Emeritus, Universiti Kebangsaan Malaysia |
| 6 | Dr Neoh Siew Hong | Consultant Paediatrician and Neonatologist,<br>Paediatric Institute,<br>Hospital Kuala Lumpur |
| 7 | Dr Fazila Mohamed Kutty | Neonatologist,<br>Paediatric Department,<br>Hospital Serdang |
| 8 | Dr Wong Ann Cheng | Neonatologist,<br>Paediatric Department,<br>Hospital Umum Sarawak |
| 9 | Dr Azanna Ahmad Kamar | Senior Lecturer & Neonatologist,<br>Paediatric Department & Faculty of Medicine<br>Pusat Perubatan Universiti Malaya |

**LIST OF SITE COORDINATORS 2017**

| NORTHERN ZONE | | |
|---|---|---|
| **Institution** | **Head of Department** | **Coordinators** |
| Paediatric Department<br>Hospital Tuanku Fauziah,<br>Kangar, Perlis | Dr. Abdul Nasir Mohd Abdul Kadher | Dr. Siti Madihah Bt Abdul Halim<br>KUP Mastura Mahazir |
| Paediatric Department<br>Hospital Sultanah Bahiyah,<br>Alor Setar, Kedah | Dr Thiyagar Nadarajan | SN Firdaus Ahmad<br>SN Marina Mat Husain<br>SN Norsyamsinar Abdullah<br>SN Norfamiza Che Ros<br>SN Munirah Ismail |
| Paediatric Department<br>Hospital Sultan Abdul Halim,<br>Sungai Petani,<br>Kedah | Dr. Choo Chong Ming | KJ Gunawathy A/P Periasamy<br>SN Kok Sin Lee<br>SN Marhaini Salleh<br>SN Suhaili Bt Seman |
| Paediatric Department<br>Hospital Kulim,<br>Kedah | Dr. Zainab Ishak | Dr. Shafie Mohd Hamid<br>KJ Maizirozita Salleh<br>SN Nosiah Hamzah<br>SN Siti Noraini Ahmad<br>SN Siti Zaiton Hamzah |
| Paediatric Department<br>Hospital Pulau Pinang | Dr. Mehala Devi A/P Baskaran | KJ Zurina Bt Ahmad<br>SN Juliana Zulkifli<br>SN Yap Ruo Chiam<br>SN Siti Nirshafida bt Shaari |
| Paediatric Department<br>Hospital Seberang Jaya,<br>Pulau Pinang | Dr. Angeline Yeoh Aing Chiee | Dr. Lim Choo How<br>KUP Noralina Mat Ali<br>SN Rosliza Mukhtar<br>SN Juraidah Othman<br>SN Zulailawatie Khidir<br>SN Noramira Alias<br>SN Nida Azira Ishak |
| Paediatric Department<br>Hospital Raja Permaisuri Bainun,<br>Ipoh, Perak | Dato' Dr. HSS Amar Singh | Datin Dr. Noor Khatijah Nuraini<br>KJ Nur Aziah Bt. Abd Ghani<br>SN Nor Azizah Abdullah Thani |
| Paediatric Department<br>Hospital Seri Manjung,<br>Perak | Dr. Sheila Gopal Krishnan | Dr. Sheila Gopal Krishnan<br>KJ Azarita A. Rahim<br>KUP Teh Pei Nee<br>SN Nordiana Mazhan<br>SN Nor Afizan Ibrahim<br>SN Gayathiri A/P Rada Krishnan |
| Paediatric Department<br>Hospital Slim River,<br>Perak | Dr. Noor Hayati Bt Mohd Sharif | Dr. Noor Hayati Bt Mohd Sharif<br>Dr. Inderpreet Kaur<br>KUP Norhaslin Bt Mad Yusoff<br>SN Suriyati Bt Hamodan<br>SN Nurul Huda Bt Shuib<br>SN Norfahirah Bt Muhamad |

| | | |
|---|---|---|
| Paediatric Department<br>Hospital Taiping, Perak | Dr. Saiful Rijal Bin Muhammad | Dr. Saiful Rijal Bin Muhammad<br>SN Fadilah Bt Arsad<br>SN Norasmah Bt Mat Isa<br>SN Nafa Ani Bt Mat Isa<br>SN Shahizan Bt Abdul Razak<br>SN Noor Akmatul Akma<br>SN Noor Emylidiana Sharuddin |
| Paediatric Department<br>Hospital Teluk Intan,<br>Perak | Dr. Tan Hui Siu | Dr. Noor Asiah Md Saad<br>Dr. Arathi Kailasam<br>Dr. Siak Bee Leng<br>SN Nurul Huda |

| **CENTRAL ZONE** | | |
|---|---|---|
| **Institution** | **Head of Department** | **Coordinators** |
| Paediatric Institute<br>Hospital Kuala Lumpur | Dr. Hishamshah Mohd Ibrahim | Dr. Irene Cheah Guat Sim<br>Dr. Neoh Siew Hong<br>KJ Normy Shahira Bt Ab Rahman<br>SN Sharifah Norashikin<br>SN Mazlina |
| Paediatric Department<br>Hospital Putrajaya | Dr. Fuziah Bt Mohd Zain | Dr. Maslina Mohamed<br>Dr. Syazwani Rahim<br>Dr. Ahmad Syarafi Abdullah<br>KJ Rohaimi Jupri<br>KUP Norlia Mat Isa<br>KUP Yan Zuliana Basiron |
| Paediatric Department<br>Hospital Selayang,<br>Selangor | Dr. Wan Jazilah Wan Ismail | Dr. Chee Seok Chiong<br>KJ Hamidah Mat Selim<br>SN Masni Bt Mesri<br>SN Noraniza Bt Ibrahim<br>SN Norashidah Bt Ibrahim<br>SN Norsyazwani Bt Abu Bakar |
| Paediatric Department<br>Hospital Serdang,<br>Selangor | Dr. Rohaizah Borhan | Dr. Fazila Mohamed Kutty<br>KJ Naliza Bt Yusof<br>KUP Siti Faizah Mohammad<br>SN Fethi Warda Bt Samsuri |
| Paediatric Department<br>Hospital Sungai Buloh ,<br>Selangor | Dr. Jamaluddin Bin Haji Mohamad | Dr. See Kwee Ching<br>KUP Seribanon Bt Bohari<br>SN Fazilah Tahir<br>SN Tuty Haslina |
| Paediatric Department<br>Hospital Tengku Ampuan Rahimah, Klang<br>Selangor | Dr. Nachal Raman Nachiappan | Dr. Ang Ee Lee<br>KJ Umi Kalsom Kassan<br>SN Norma Bt Ismail<br>SN Siti Norakma Syatila |
| Paediatric Department<br>Hospital Ampang,<br>Selangor | Dato' Dr. Hjh Zuraidah Bt Abdul Latif | Dato' Dr. Hjh Zuraidah Bt Abdul Latif<br>Dr. Rahimah Ismail<br>KJ Fatimah Azzahra<br>SN Siti Zaleha Bt Haji Kori |

| | | |
|---|---|---|
| Paediatric Department<br>Hospital Kajang,<br>Selangor | Datin Dr. Baizura Bt Jamaluddin | Dr. Suhaida Bt Abdul Rahman<br>Dr. Zarina Rehana Bt Anuaruddin<br>KJ Kesuma bt Mohd Nor<br>SN Siti Nur Hanim bt Mohd Salleh<br>Sn Rosbaizura Bt Ismail<br>SN Shalina Bt Mohd Isa |
| Pediatric Department,<br>Pusat Perubatan Universiti<br>Malaya, Kuala Lumpur | Prof Lee Way Siah | Dr. Azanna Ahmad Kamar<br>Mr. Marwan |
| Pediatric Department,<br>Gleneagles Hospital,<br>Kuala Lumpur | Dr. Anand Dharmalingam | Sr Lim Seng Kiat<br>SN Siti Salina Rahman |

| **SOUTHERN ZONE** | | |
|---|---|---|
| **Institution** | **Head of Department** | **Coordinators** |
| Paediatric Department,<br>Hospital Tuanku Ampuan<br>Najihah, Kuala Pilah, N.S | Dr. Hasri Bin Hafidz | Dr. Tan Young Chie<br>SN Masnida Muhammad<br>SN Nur Humaira Bt Chan |
| Paediatric Department<br>Hospital Tuanku Ja'afar, N.S | Dr. Lee Ming Lee | Dr. Pauline Choo Poh Ling<br>SN Norhayati Sahak@Ishak<br>SN Raihana Hassan |
| Paediatric Department<br>Hospital Sultanah Aminah,<br>Johor Bahru, Johor | Dr. Mohd Nizam Mat Bah | SN Norfazilah Bt Azmi<br>SN Manisah Bt Sariman<br>SN Nik Hazrina<br>SN Siti Azah Bt Zainal |
| Paediatric Department<br>Hospital Melaka | Dr. Tan Pui Ying | Dr. Leow Poy Lee<br>KJ Lim Bee Eng<br>SN Zaleha Che Yusof<br>SN Hasmawati Hassan |
| Paediatric Department<br>Hospital Pakar Sultanah<br>Fatimah, Muar, Johor | Dr. Angeline Wan | KUP Siti Rabsah<br>KUP Siti Salwani Ahmad |
| Paediatric Department<br>Hospital Sultanah Nora Ismail,<br>Batu Pahat, Johor | Dr. Zainah Shaik Hedra | KUP Zubaidah Bt Ngah<br>KUP Ruzanaini Bt Rahmat<br>SN Nor hafizah bt Ramli |
| Paediatric Department<br>Hospital Kluang,<br>Johor | Dr. Suhaila Bt Ishak | KUP Hamidah Bt Hamid<br>SN Norhaniza bt Jamil |
| Paediatric Department<br>Hospital Segamat,<br>Johor | Dr. Intan Nor Chahaya Binti<br>Shukor | Dr. Afifah Bt Mokhtar<br>Dr. Muhammad Ishan Bin Roslan<br>KUP Rima Halina Bt Abd. Majid<br>KUP Norbahtiar Bt Hassan<br>SN Fauzi Bt Md Salleh<br>SN Noor Aisyah Bt Mahmud |

| | | |
|---|---|---|
| Paediatric Department<br>Hospital Sultan Ismail,<br>Johor | Dr. Susan Pee | Dr. Chia Lee Ser<br>KJ Norazliza Bt Maarof<br>Sn Fazilah Bt Shahrom |
| Pediatric Department,<br>KPJ Putri, Johor Bahru, Johor | Dr. Ismail Haron | SN Siti Nurliana Miskon |
| **EAST COST ZONE** | | |
| **Institution** | **Head of Department** | **Coordinators** |
| Paediatric Department<br>Hospital Raja Perempuan Zainab II, Kota Bharu, Kelantan | Dr. Nik Khairulddin Nik Yusuff | Dr. Hasmawati Hassan<br>SN Norhasmawati Hassan<br>SN Chan Soh Iyan |
| Paediatric Department<br>Hospital Sultan Haji Ahmad Shah, Temerloh, Pahang | Dr. Tan Hooi Kheng | Dr. Tan Hooi Kheng<br>SN Syarifah Bt Ali<br>SN Mardiana Mohd Mahyuddin<br>SN Safurah Nadzir<br>Sn Sulina Bt Mat Lia |
| Paediatric Department<br>Hospital Sultanah Nur Zahirah,<br>Kuala Terengganu,<br>Terengganu | Dr. Suryati Adnan | KJ Shaadah Embong<br>KUP Zawahir Abu Zahir |
| Paediatric Department<br>Hospital Tengku Ampuan Afzan,<br>Kuantan, Pahang | Dr. Chin Choy Nyok | Dr. Chin Choy Nyok<br>KJ Siti Meriam Marudin<br>SN Noorazlini Bt Mohd Nordin<br>SN Nurul Ziha Bt Abdul Aziz |
| Paediatric Department<br>Hospital Universiti Sains Malaysia, Kota Bharu, Kelantan | Prof. Dr. Hans Van Rostenberghe | SN Sakinah Mohamed |
| Paediatric Department,<br>Hospital Kuala Krai<br>Kota Bharu, Kelantan | Dr. Noraini Ab Rahman | Dr Nor Diyana Ismail<br>KUP Ruslina Daud |

| SABAH & SARAWAK | | |
|---|---|---|
| **Institution** | **Head of Department** | **Coordinators** |
| Paediatric Department<br>Hospital Umum Sarawak,<br>Kuching | Dr. Chan Lee Gaik | Dr. Chan Lee Gaik<br>KJ Hamsiah Bt Najidi<br>SN Estella Pagau |
| Paediatric Department<br>Hospital Umum Miri | Dr. Kiew Chiong Hung | Dr. Rebecca Ann Thomas<br>SN Helen Aping<br>SN Nur Ariena Bt Amit |
| Paediatric Department<br>Hospital Bintulu,<br>Sarawak | Dr. Anand Mohan a/l Mohana Lal | Dr. Richard Wong Siu Chiu<br>SN Lily Ho Ahmad Ho<br>SN Susie AK Jarup @ Jarop |
| Paediatric Department<br>Hospital Sibu,<br>Sarawak | Dr. Wong See Chang | Dr. Cheing Chae Hee<br>Dr Justina Lau Sie Wei<br>Dr. Chieng Chae Hee<br>KJ Ting Meng Ling |
| Paediatric Department<br>Hospital Wanita & Kanak –<br>Kanak, Kota Kinabalu, Sabah | Dr. Fong Siew Moy | Dr. Matthew Chong Hon Loon<br>KJ Veraline Joseph<br>SN Norhana Bt Lasami |
| Paediatric Department<br>Hospital Keningau, Sabah | Dr. Tee Pian Pian | Dr. Prakash Ruo Rama Rao<br>KJ Zarinah Mahmud<br>SN Carol David Juselly |
| Paediatric Department<br>Hospital Duchess Of Kent<br>Sandakan, Sabah | Dr. Jasminder Kaur A/P Amarjit Singh | Matron Erien Puing<br>KUT Evelyn Yong Su Li<br>SN Lina Agus<br>SN Masliza Reha Bt Ajuh |

**STAFF OF MALAYSIAN NATIONAL NEONATAL REGISTRY 2017**

| | |
|---|---|
| **Clinical Registry Manager** | : Thinisha A/P Mohan |
| **Clinical Registry Assistants** | : Nur Ain Bt Hamdan |

**CRC TECHNICAL SUPPORT STAFF**

| | |
|---|---|
| **Director** | **:** Dr Goh Pik Pin |
| **Database Administrator** | **:** Lim Jie Ying |
| **Web Application Programmer** | **:** Amy Porle |
| **Clinical Database Manager** | **:** Sebastian Thoo |
| **Desktop Publisher & Web Designer** | **:** Malik Abdul Tanjeng |

## CONTENTS

**SUMMARY**

The inclusion criteria for this study in 2017 were all preterm babies below 32 weeks gestational age, those of birth weight below or equal to 1500 g, all babies who required mechanical ventilation and/or nasal continuous positive airway pressure (nCPAP), all babies with hypoxic ischaemic encephalopathy (HIE), all babies with congenital heart disease and all neonatal deaths (babies < 28 days old who died in Neonatal Unit, Obstetric Department and other wards). Both inborn and outborn babies were included.

- In 2017, there were 44 participating hospitals with a total livebirths of 294393. A total of 16449 babies who were in level III NICUs met the study criteria, out of which 14765 (89.8%) were inborn while 1684 (10.2%) were outborn babies. (Figure 1 and Table 1)

- There were 3325 (20.2%) babies below 32 weeks gestational age. (Figure 2 and Table 2)

- There were 3764 (22.9%) babies with the birth weight of 1500g and below. (Figure 3 and Table 3)

- The survival rate of very preterm babies admitted to MNNR according to gestational age were 17.1% for 24 weeks, 34.8% for 25 weeks, 54.7% for 26 weeks, 73.6% for 27 weeks, 84.6% for 28 weeks, 88.7% for 29 weeks, 91.1% for 30 weeks and 92.8% for 31 weeks. (Figure 4 and Table 4)

- The survival rates of babies admitted to MNNR according to birth weight category were 5.6% for < 500 g, 55.2% for 501-1000 g, 91.4 % for 1001-1500 g, 92.8% for 1501-2500 g and 94.2% for >2500 g. For the category >1500 g birth weight, calculated survival rate does not include all live births in that category *(see inclusion criteria)*. (Figure 5 and Table 5)

- In 2017, 76.6% of mothers with babies less than 32 weeks gestation received antenatal corticosteroids. Antenatal corticosteroids were given to mothers of 80.5% inborn babies and 43.4% outborn babies below 32 weeks gestation. There were marked differences in the use of antenatal corticosteroids across the MNNR centres for inborn babies ranging from 36.6% to 100.0% . (Figure 6a & 6b and Table 6)

- There were 73.7% of mothers with babies weighing ≤1500g who received antenatal corticosteroids and 77.6% of these were given to mothers of inborn babies and 39.6% were babies who were born outside. (Figure 7a & 7b and Table 7)

- 1575 (55.2%) of inborn babies less than 32 weeks gestation were given early nCPAP at initial resuscitation.

- Only 608 (65.9% )of inborn babies weighing less than 1000 g were wrapped with plastic at birth.

- 13967 (95.7%) of all inborn babies required respiratory support in NICU. Out of these, 7955 (57%) had conventional ventilation and 1222 (8.7%) had high frequency ventilation. A total of 10,764 (77.1%) babies received nasal continuous positive airway pressure (nCPAP) and 2260 (16.2%) were given heated humidified high flow nasal cannula (HHHFNC) therapy. 2930 (89.8%) of babies with birth weight less than and equal to 1500 g and 2632 (92.6%) of babies less than 32 weeks gestation required respiratory support.

- Surfactant was given to a total of 3315 babies. 55.2%% (1801/3264) of babies with birth weight of 1500 g and below were treated with surfactant. 63.6% (1812/2851) of preterm babies below 32 weeks gestational age and 23.6% (1248/5294) between 32 and 36 weeks gestational age in the cohort had surfactant therapy.

- The incidence rate for ventilated meconium aspiration syndrome (MAS) in inborn babies ≥ 35 weeks gestation was 3.6/ 1000 term live births. A total of 1018 inborn babies and 117 outborn babies were ventilated for MAS. The overall mortality rate for ventilated MAS was 7.9%. The mortality rate for inborn and outborn babies ventilated for MAS was 8.4% and 3.4% respectively.

- The rates of chronic lung disease (oxygen dependency) for all inborn babies less than 32 weeks gestation surviving to day 28 and 36 weeks post-conception age were 81.0% and 68.4% respectively for babies between 22-24 weeks gestational age, 58.4.0% and 52.8% for babies between 25-27 weeks gestational age and 19.3% and 22.4 % for babies between 28-31 weeks gestation. (Figure 8 and Table 8)

- The rates of chronic lung disease for babies with birth weight <1500g who survived to Day 28 and 36 weeks post-conceptional age were 69.7% and 60.9% respectively for babies with birth weight < 750 g, 48.6% and 37.8% respectively for babies with birth weight 750-999g, 24.2% and 18.8% respectively for babies with birth weight 1000-1249 g and, 8.8% and 3.7% respectively for babies with birth weight 1250-1499 g. (Figure 9 and Table 9)

- Patent ductus arteriosus (PDA) was diagnosed in 808 (28.3%) inborn babies with gestational age <32 weeks admitted to the NICUs. Overall from the 808 babies, 26.2% and 37.3% were treated with indomethacin/ibuprofen and paracetamol whereas only 1.6% underwent PDA ligation. (Table 10)

- Patent ductus arteriosus (PDA) was diagnosed in 833 (28.3%) inborn babies weighing ≤1500g . 26.3% and 36.5% of the 833 babies were treated with indomethacin/ibuprofen and paracetamol, while only 1.8% underwent PDA ligation. (Table 11)

- A total of 665 babies ≥ 35 weeks gestation had persistent pulmonary hypertension of newborn (PPHN) with an overall mortality rate of 33.1%. Inhaled nitric oxide was given to 31.7% of the babies with PPHN.

- Among the 1899 inborn babies with gestational age < 32 weeks who underwent ROP screening before discharge, 1578 (83.1%) did not have ROP, 252 (13.3%) had ROP Stage 1&2, 42(2.2%) had ROP stage 3 and none had ROP stage 4&5. The incidence rates of ROP Stage 3 in this cohort were 14.3%, 6.9% and 1.0% in babies with gestational age of 22-24 weeks, 25-27 weeks and 28-31 weeks respectively. A total of 30 babies had laser therapy and 1 baby had cryotherapy. (Figure 12 and Table 12)

- A total of 2063 (79.4%) inborn babies with birth weight ≤1500g were screened for ROP before discharge. 1746 (85.0%) of those screened did not have ROP. 265 (12.9%) had ROP Stage 1 & 2, 42 (2.0%) had ROP Stage 3 and 4 while none had ROP Stage 4&5. The incidence rates of ROP Stage 3 in this cohort were 12.0%, 4.1%, 1.4% and 0.4% in babies with birth weight <750g, 750-999g, 1000-1249g and 1250-1499g respectively. A total of 31 babies underwent laser therapy and 1 baby had cryotherapy. (Figure 13 and Table 13)

- There were 2630 inborn babies with gestational age < 32 weeks who underwent cranial ultrasound examination. 1630 (62.0%) did not have intraventricular haemorrhage, 798 (30.3%) had Grade 1 or 2 intraventricular haemorrhage (IVH), 127 (4.8%) had Grade 3 IVH and 75 (2.9%) had Grade 4 IVH. The incidence rates of Grade 3 IVH were 10.1%, 9.4% and 3.3% in babies with gestational age of 22-24 weeks, 25-27 weeks and 28-31 weeks respectively. The incidence rates of Grade 4 IVH were 10.1%, 7.7% and 1.2% in babies with gestational age of 22-24 weeks, 25-27 weeks and 28-31 weeks respectively. (Figure 14 and Table 14)

- 2893 (92.5%) of inborn babies with birth weight ≤ 1500 g had cranial ultrasound examination. Among those screened, 1840 (63.6%) did not have intraventricular haemorrhage (IVH). The incidence rates of Grade 3 IVH were 10.6%, 7.7%, 5.0% and 1.7% in babies with birth weight <750 g, 750-999 g, 1000-1249 g and 1250-1499 g respectively. The incidence rates of Grade 4 IVH were 8.2%, 6.0%, 1.9% and 0.7% in babies with birth weight <750 g, 750-999 g, 1000-1249 g and 1250-1499 g respectively. (Figure 15 and Table 15)

- 125 (4.4%) of the inborn babies with gestational age <32 weeks developed necrotizing enterocolitis (NEC) whereby 20.8% of them required surgery. The incidence rates of NEC were 3.8%, 5.7% and 4.1% for babies with gestational age of 22-24 weeks, 25-27 weeks and 28-31 weeks respectively. (Figure 16 and Table 16)

- The incidence rates of NEC among inborn babies with birth weight ≤ 1500g were 5.5%, 7.3%, 4.6% and 2.6% in the <750 g, 750-999 g, 1000-1249 g and 1250-1499 g categories respectively. (Figure 17 and Table 17)

- The incidence of blood culture positive early onset sepsis among inborn babies with gestational age < 32 weeks was 1.8%. The incidence rates for early onset sepsis were 2.5%, 2.6% and 1.5% in babies with gesational age 22-24 weeks, 25-27 weeks and 28-31 weeks respectively. (Figure 18 and Table 18)

- The incidence of blood culture positive late onset sepsis correlated inversely with gestational age and birth weight groups 154 (6.7%) of inborn babies with gestational age < 32 weeks who survived more than 3 days had one or more episodes of blood culture positive late onset sepsis. The late onset sepsis rates were 38.1%, 14.3% and 5.0% in the 22-24 weeks, 25-27 weeks and 28-31 weeks gestational age categories respectively. (Figure 19 and Table 19)

- The incidence rates for blood culture postive late onset sepsis by birth weight categories were 22.8%, 12.4%, 5.7% and 3.5% for <750g, 750-999g, 1000-1249g and 1250-1499g respectively. (Figure 20 and Table 20)

- The overall incidence of hypoxic ischemic encephalopathy (HIE) in babies ≥ 35 weeks gestation was 2.2 / 1000 term live births. A total of 617 inborn babies and 88 outborn babies ≥ 35 weeks gestation were diagnosed with HIE. For all inborn babies with HIE, the rate of cooling was 87.0% and 75.6% for moderate and severe HIE . The mortality rate for all babies with moderate HIE was 5.3% and severe HIE was 51.0%.

- The number of major morbidities (PDA requiring surgical ligation, stage 3/4/5 ROP, oxygen dependency at 36 weeks or discharge, confirmed sepsis, NEC) among survivors were analysed. Among survivors with gestational age of 22-24 weeks, 27.3% had 1 morbidity, 31.8% had 2 morbidities and 9.1% had 3 morbidities. No babies had more than 3 morbidities. 31.8% of survivors did not have any of these 5 morbidities.

- Among survivors with gestational age of 25-27 weeks, 33.4% had 1 morbidity, 12.5% had 2 morbidities, 3.3% had 3 morbidities and none had more than 3 morbidities. 50.7% did not have any of these 5 morbidities.

- Among survivors with gestational age of 28-31 weeks, 15.7% had 1 morbidity, 2.9% had 2 morbidities, 0.3% had 3 morbidities, 0.1% had 4 morbidities and none had 5 morbidities. 81.1% did not have any of these 5 morbidities. (Table 21a)

- Among survivors with birth weight < 750g, 36.6% had 1 morbidity, 19.4% had 2 morbidities, 7.5% had 3 morbidities and no survivor had more than 3 morbidities. 36.6% did not have any of the 5 morbidities.

- Among survivors with birth weight 750-999g, 29.7% had 1 morbidity, 13.7% had 2 morbidities, 0.7% had 3 morbidities and none had 4 or 5 morbidities. , 55.9% did not have any of the 5 morbidities.

- Among survivors with birth weight 1000-1249g, 21.0% had 1 morbidity, 2.4% had 2 morbidities, 0.2% had 3 morbidities and 0.1% had 4 morbidities. , 76.2% did not have any of the 5 morbidities.

- Among survivors with birth weight 1250-1499g, 8.6% had 1 morbidity, 0.7% had 2 morbidities, 0.2% had 3 morbidities and none had 4 or 5 morbidities. 90.5% did not have any of the 5 morbidities. (Table 21b).

Study recommendations include collaboration with Obstetrics and Primary Healthcare staff:

- To enhance the use of antenatal steroids and continue with in-utero transfer of high-risk pregnancies.
- To reduce the number of post term deliveries and to reduce the risk of thick meconium stained liquor.
- To review preventable causes of HIE.
- To enhance antenatal detection of congenital abnormalities and to provide counselling to parents.

And in the NICUs:

- To continue to promote the use of nasal continuous positive airway pressure as early as possible after birth to reduce the need for mechanical ventilation for the spontaneously breathing preterm babies.
- To reduce the risk of pneumothorax.
- To enhance infection control in the NICUs.
- To increase availability of nitric oxide in state hospitals to reduce mortality from PPHN.
- To increase ROP screening before or soon after discharge

**Report of the Malaysian National Neonatal Registry (MNNR) 2017**

## 1. Organization of the MNNR

### 1.1 Objectives

The Malaysian National Neonatal Registry was set up in 2002 to study the outcome of sick babies admitted to Neonatal Intensive Care Units (NICUs) in the country. A minimum data set and a data collection system at a national level are important to monitor mortality and morbidity of babies admitted to NICUs.

**The Malaysian NNR aims:**

1. To determine the frequency and distribution of critically ill neonates in Malaysia. These are useful measures of the health burden of neonatal critical illnesses and its care in the country.
2. To study the mortality and some morbidity outcomes of babies admitted to NICUs in participating hospitals.
3. To calculate the perinatal, neonatal, and stillbirth mortality rates of inborn babies.
4. To compare the outcomes between various centres.
5. To develop indicators for standard of care in various areas e.g. acceptable septicaemic rates in NICUs.
6. To study, in further detail, the outcome of very low birth weight babies.
7. To stimulate and facilitate research on neonatal critical illness and its management.

### 1.2 Structure

The MNNR consists of a Governance Board, Steering Committee and administrative staff. The Governance Board is to monitor and to direct the functions of MNNR and it meets at least once a year.

The Steering Committee consists of nine elected members. This committee is responsible for the general running and decision-making of the Registry and for approving the use of its data.

A Registry Manager assisted by a clinical research assistant heads the administrative staff at the Neonatal Registry Unit (NRU). Statistical support was provided by the CRC.

### 1.3 Funding

Funding was provided via Perinatal Society of Malaysia & sponsors from industry.

**2. Data Set**

**2.1 Participating Centres in 2017:**

1. Hospital Ampang
2. Hospital Batu Pahat, Johor
3. Hospital Bintulu, Sarawak
4. Hospital Gleneagles, Kuala Lumpur
5. Hospital Raja Permaisuri Bainun, Ipoh, Perak
6. Hospital Kajang, Selangor
7. Hospital Keningau, Sabah
8. Hospital Kluang, Johor
9. Hospital Kuala Krai, Kelantan
10. Hospital Kuala Lumpur
11. Hospital Kulim, Kedah
12. Hospital Likas, Kota Kinabalu, Sabah
13. Hospital Melaka, Melaka
14. Hospital Umum Miri, Sarawak
15. Hospital Pulau Pinang, Pulau Pinang
16. Hospital Putrajaya
17. Hospital Raja Perempuan Zainab II, Kota Bharu, Kelantan
18. Hospital Umum Sarawak, Kuching, Sarawak
19. Hospital Sandakan, Sabah
20. Hospital Seberang Jaya, Pulau Pinang
21. Hospital Segamat, Johor
22. Hospital Selayang, Selangor
23. Hospital Serdang, Selangor
24. Hospital Seri Manjung, Perak
25. Hospital Sibu, Sarawak
26. Hospital Sultan Abdul Halim, Sg. Petani, Kedah
27. Hospital Sultan Haji Ahmad Shah, Temerloh, Pahang
28. Hospital Sultan Ismail, Johor Bahru, Johor
29. Hospital Sultanah Aminah, Johor Bahru, Johor
30. Hospital Sultanah Bahiyah, Alor Setar, Kedah
31. Hospital Pakar KPJ Putri, Johor Bahru, Johor
32. Hospital Pakar Sultanah Fatimah, Muar, Johor
33. Hospital Slim River, Perak
34. Hospital Sultanah Nur Zahirah, Kuala Terengganu, Terengganu
35. Hospital Sungai Buloh, Selangor
36. Hospital Taiping, Perak
37. Hospital Teluk Intan, Perak
38. Hospital Tengku Ampuan Afzan, Kuantan, Pahang
39. Hospital Tengku Ampuan Rahimah, Klang, Selangor
40. Hospital Tuanku Ampuan Najihah, Kuala Pilah, Negeri Sembilan
41. Hospital Tuanku Fauziah, Kangar, Perlis
42. Hospital Tuanku Ja'afar, Seremban, Negeri Sembilan
43. Hospital Universiti Sains Malaysia, Kubang Kerian, Kelantan
44. Pusat Perubatan Universiti Malaya, Kuala Lumpur

Centre numbers allocated to centers were different from the numbers above.

**2.2 Registration criteria**

The MNNR audit of critically ill babies admitted to Neonatal Units (NNUs) included

A. All babies admitted to a Neonatal Unit who have any of the following criteria:
   1. Had a gestation of <32 weeks i.e. up to 31 weeks + 6 days
   2. Had a birth weight of 1500 g and below.
   3. Required respiratory support (ventilated or required CPAP)
   4. Had hypoxic ischaemic encephalopathy (HIE) with or without requirement of ventilatory support.
   5. With confirmed sepsis i.e positive blood cultures

B. All neonatal deaths (i.e. newborn babies (<28days) who die in the NNU, delivery room i.e. operating theatre, labour room, and in other wards)

- Both inborn and outborn babies were included.
- Outborn babies who died before arrival were excluded. Babies who were admitted to the NNU at a corrected gestation of > 44/52 were not considered neonatal cases and hence were omitted from the study.

**2.3 Data Collection**

The CRF consisted of four sheets (of forms).

- Babies discharged or transferred out to non-paediatric wards (e.g. paediatric surgical wards) in the same hospital or to other hospitals would have only one set of CRF completed and readmission of the same babies into the NNU would require a new set of CRF.
- A baby who was transferred between neonatal and paediatric wards under the same department was considered to be the same admission and the discharge CRF was completed after complete discharge from the hospital. Hardcopy CRFs were used and data from completed CRFs were entered via the MNNR website by the respective SDPs or sent to MNNR secretariat after a defined period for data entry.

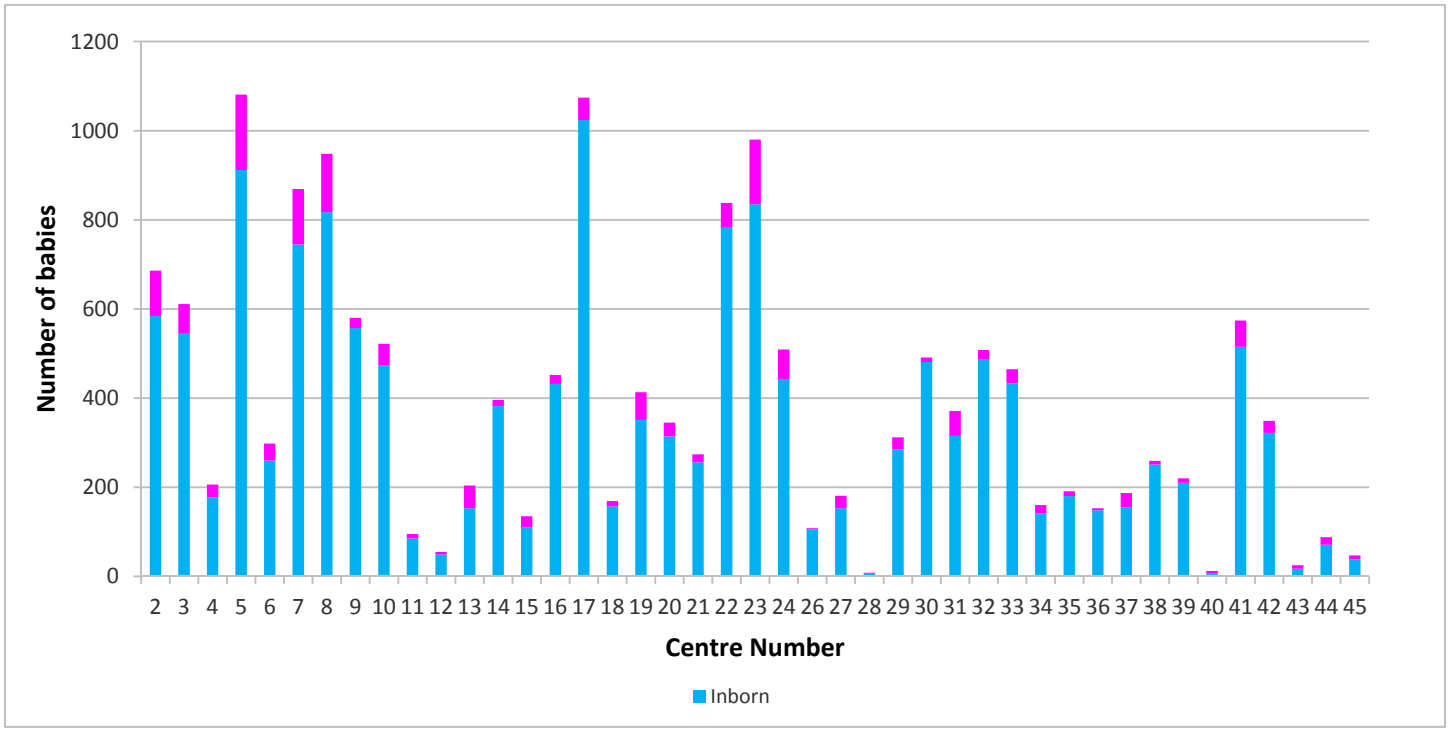
**2.4 Data Verification**

Missing or anomalous data was identified by manual check and then clarified with the respective centre. Further data verification was made on data entry onto the main database. Quantification of errors and the implementation of practices via website data entry to minimize errors are continually refined.

# RESULTS

**Figure 1**

**Number of babies according to place of birth**




*COMMENT: There were 14765 inborn babies and 1684 outborn babies in the MNNR.*

**Table 1: Number of babies according to place of birth**

| Hospitals | | Place of Birth | | Total |
|---|---|---|---|---|
| | | Inborn | Outborn | |
| 2 | n | 584 | 102 | 686 |
| | (%) | (85.1) | (14.9) | (100) |
| 3 | n | 546 | 65 | 611 |
| | (%) | (89.4) | (10.6) | (100) |
| 4 | n | 177 | 29 | 206 |
| | (%) | (85.9) | (14.1) | (100) |
| 5 | n | 912 | 169 | 1081 |
| | (%) | (84.4) | (15.6) | (100) |
| 6 | n | 260 | 38 | 298 |
| | (%) | (87.2) | (12.8) | (100) |
| 7 | n | 745 | 124 | 869 |
| | (%) | (85.7) | (14.3) | (100) |
| 8 | n | 817 | 131 | 948 |
| | (%) | (86.2) | (13.8) | (100) |
| 9 | n | 557 | 23 | 580 |
| | (%) | (96.0) | (4.0) | (100) |
| 10 | n | 474 | 48 | 522 |
| | (%) | (90.8) | (9.2) | (100) |
| 11 | n | 85 | 10 | 95 |
| | (%) | (89.5) | (10.5) | (100) |
| 12 | n | 49 | 6 | 55 |
| | (%) | (89.1) | (10.9) | (100) |
| 13 | n | 153 | 51 | 204 |
| | (%) | (75.0) | (25.0) | (100) |
| 14 | n | 382 | 14 | 396 |
| | (%) | (96.5) | (3.5) | (100) |
| 15 | n | 110 | 25 | 135 |
| | (%) | (81.5) | (18.5) | (100) |
| 16 | n | 432 | 20 | 452 |
| | (%) | (95.6) | (4.4) | (100) |
| 17 | n | 1024 | 50 | 1074 |
| | (%) | (95.3) | (4.7) | (100) |

Table 1: Number of babies according to place of birth (continued)

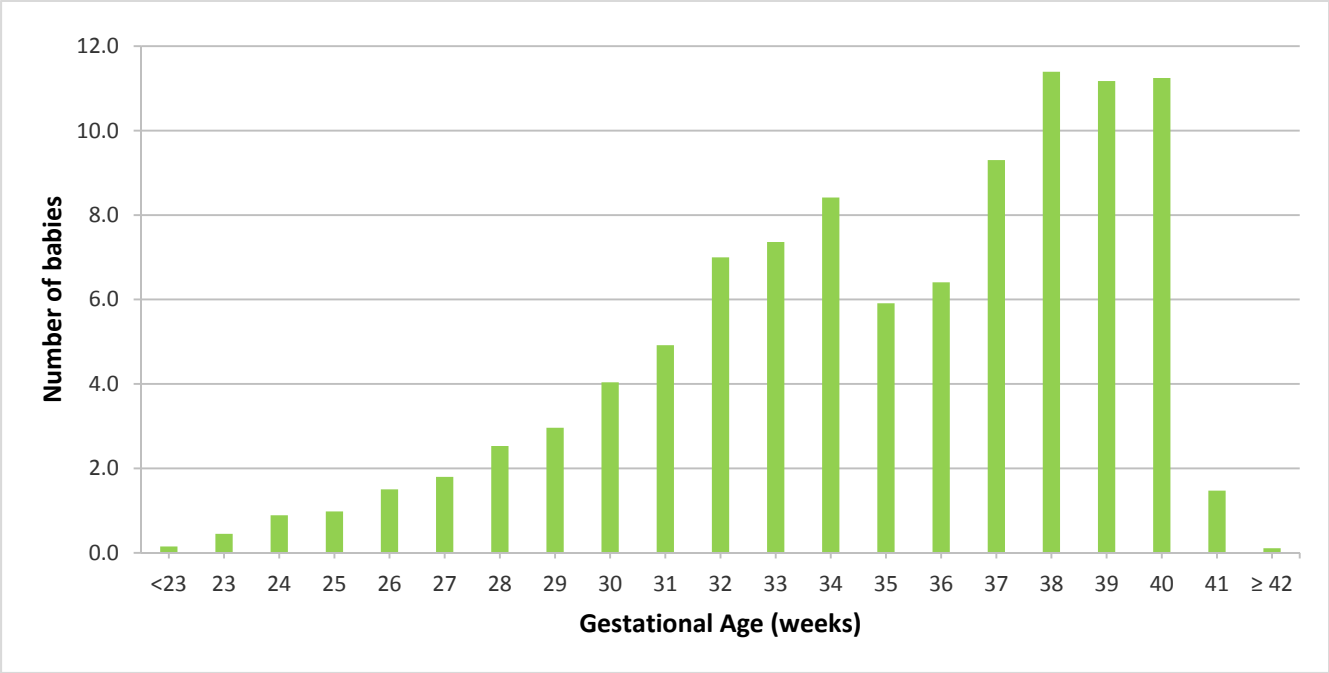
| Hospitals | | Place of Birth | | Total |
|---|---|---|---|---|
| | | Inborn | Outborn | |
| 18 | n | 157 | 12 | 169 |
| | (%) | (92.9) | (7.1) | (100) |
| 19 | n | 351 | 62 | 413 |
| | (%) | (85.0) | (15.0) | (100) |
| 20 | n | 314 | 31 | 345 |
| | (%) | (91.0) | (9.0) | (100) |
| 21 | n | 256 | 18 | 274 |
| | (%) | (93.4) | (6.6) | (100) |
| 22 | n | 784 | 54 | 838 |
| | (%) | (93.6) | (6.4) | (100) |
| 23 | n | 835 | 145 | 980 |
| | (%) | (85.2) | (14.8) | (100) |
| 24 | n | 443 | 66 | 509 |
| | (%) | (87.0) | (13.0) | (100) |
| 26 | n | 105 | 3 | 108 |
| | (%) | (97.2) | (2.8) | (100) |
| 27 | n | 153 | 28 | 181 |
| | (%) | (84.5) | (15.5) | (100) |
| 29 | n | 6 | 2 | 8 |
| | (%) | (75.0) | (25.0) | (100) |
| 30 | n | 285 | 27 | 312 |
| | (%) | (91.3) | (8.7) | (100) |
| 31 | n | 481 | 10 | 491 |
| | (%) | (98.0) | (2.0) | (100) |
| 32 | n | 315 | 56 | 371 |
| | (%) | (84.9) | (15.1) | (100) |
| 33 | n | 486 | 22 | 508 |
| | (%) | (95.7) | (4.3) | (100) |
| 34 | n | 433 | 32 | 465 |
| | (%) | (93.1) | (6.9) | (100) |
| 35 | n | 141 | 19 | 160 |
| | (%) | (88.1) | (11.9) | (100) |
| 36 | n | 180 | 11 | 191 |
| | (%) | (94.2) | (5.8) | (100) |

Table 1: Number of babies according to place of birth (continued)

| Hospitals | | Place of Birth | | Total |
|---|---|---|---|---|
| | | Inborn | Outborn | |
| 37 | n | 155 | 32 | 187 |
| | (%) | (82.9) | (17.1) | (100) |
| 38 | n | 251 | 8 | 259 |
| | (%) | (96.9) | (3.1) | (100) |
| 39 | n | 210 | 10 | 220 |
| | (%) | (95.5) | (4.5) | (100) |
| 40 | n | 6 | 6 | 12 |
| | (%) | (50.0) | (50.0) | (100) |
| 41 | n | 515 | 59 | 574 |
| | (%) | (89.7) | (10.3) | (100) |
| 42 | n | 322 | 27 | 349 |
| | (%) | (92.3) | (7.7) | (100) |
| 43 | n | 17 | 8 | 25 |
| | (%) | (68.0) | (32.0) | (100) |
| 44 | n | 71 | 17 | 88 |
| | (%) | (80.7) | (19.3) | (100) |
| 45 | n | 38 | 9 | 47 |
| | (%) | (80.9) | (19.1) | (100) |
| **TOTAL** | **n** | **14765** | **1684** | **16449** |
| | **(%)** | **(89.8)** | **(10.2)** | **(100)** |

**Figure 2**

**Frequency distribution of all babies in MNNR according to according to gestational age**




*COMMENT: For the categories ≥ 32 weeks, the case distribution does not include all livebirths in that respective gestational age group (See inclusion criteria).*

**Table 2 :**
**Frequency distribution of all babies in MNNR according to gestational age**

| Gestational age in completed weeks at birth | Frequency (n) | Percent (%) |
|---|---|---|
| < 23 | 25 | 0.2 |
| 23 | 74 | 0.4 |
| 24 | 146 | 0.9 |
| 25 | 161 | 1.0 |
| 26 | 247 | 1.5 |
| 27 | 296 | 1.8 |
| 28 | 416 | 2.5 |
| 29 | 487 | 3.0 |
| 30 | 664 | 4.0 |
| 31 | 809 | 4.9 |
| 32 | 1151 | 7.0 |
| 33 | 1211 | 7.4 |
| 34 | 1384 | 8.4 |
| 35 | 972 | 5.9 |
| 36 | 1054 | 6.4 |
| 37 | 1530 | 9.3 |
| 38 | 1874 | 11.4 |
| 39 | 1838 | 11.2 |
| 40 | 1850 | 11.2 |
| 41 | 242 | 1.5 |
| ≥ 42 | 18 | 0.1 |
| Total included | 16449 | 100 |
| Total no. of babies with missing gestational age | 0 | |
| Total no. of babies | 16449 | |

**Figure 3**

**Frequency distribution of all babies in MNNR according to birth weight categories**

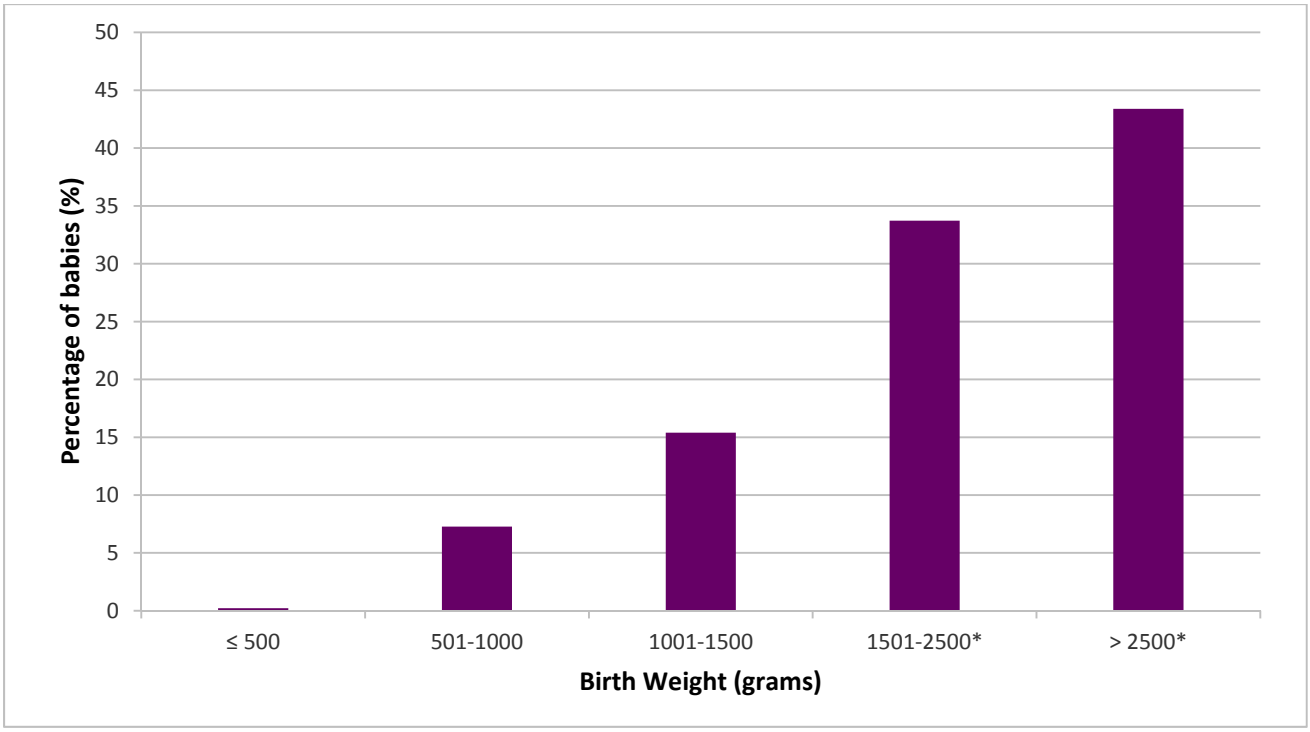



**Table 3 :**
**Frequency distribution of all babies in MNNR according to birth weight (BW) categories**

| Birth weight (grams) | Frequency (n) | Percent (%) |
|---|---|---|
| ≤ 500 | 36 | 0.2 |
| 501-1000 | 1196 | 7.3 |
| 1001-1500 | 2532 | 15.4 |
| 1501-2500* | 5547 | 33.7 |
| < 2500 | 7138 | 43.4 |
| Total included | 16449 | 100.0 |
| Total no. of babies with missing birth weight | 0 | |
| Total no. of babies | 16449 | |

*COMMENT: * For the category > 1500 gram birth weight, calculated percentage does not include all live births in that category (see inclusion criteria).*

**Figure 4**

**Survival to discharge of all live births admitted to MNNR hospitals according to gestational age**

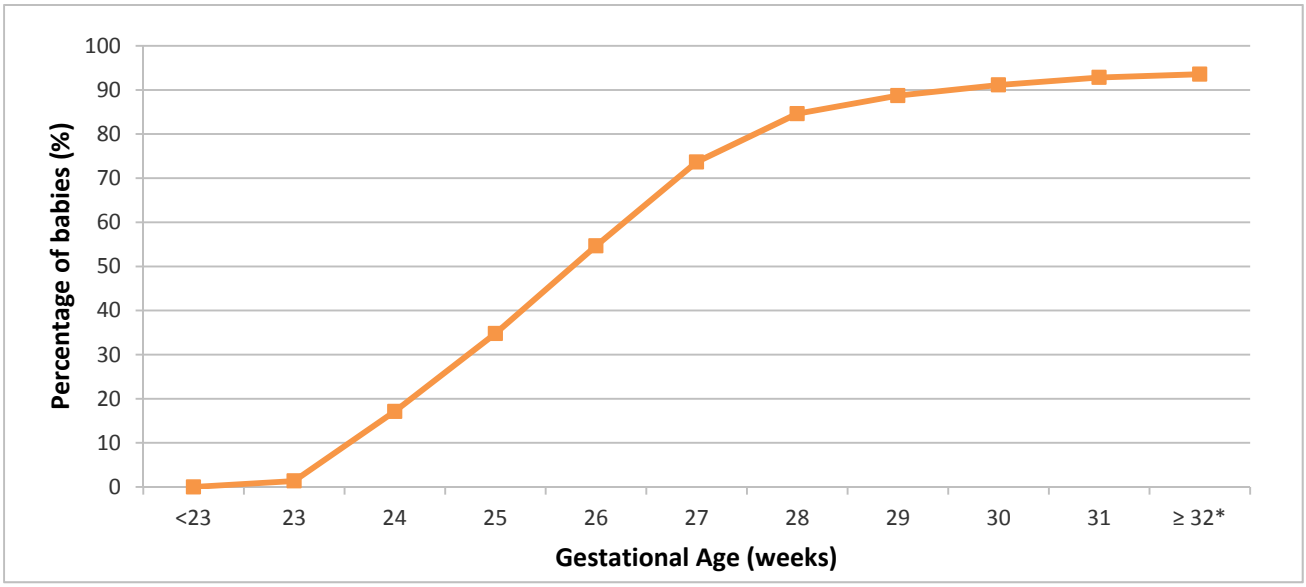



**Table 4 :**
**Survival to discharge of all live births admitted to MNNR hospitals according to gestational age**

| Gestational age (completed weeks) | Total number of inborn & outborn babies | Number of survivors | % survival |
|---|---|---|---|
| <23 | 25 | 0 | 0.0 |
| 23 | 74 | 1 | 1.4 |
| 24 | 146 | 25 | 17.1 |
| 25 | 161 | 56 | 34.8 |
| 26 | 247 | 135 | 54.7 |
| 27 | 296 | 218 | 73.6 |
| 28 | 416 | 352 | 84.6 |
| 29 | 487 | 432 | 88.7 |
| 30 | 664 | 605 | 91.1 |
| 31 | 809 | 751 | 92.8 |
| ≥32* | 13124 | 12276 | 93.5 |
| Total included | 16449 | 14851 | 90.3 |
| Total no. of missing (GA) | 0 | | |
| Total babies | 16449 | | |

*COMMENT: * For the category ≥ 32 weeks gestation, calculated survival rate does not include all live births in that category (see inclusion criteria).*

**Figure 5**

**Survival to discharge of all babies admitted to MNNR hospitals according to birth weight categories**

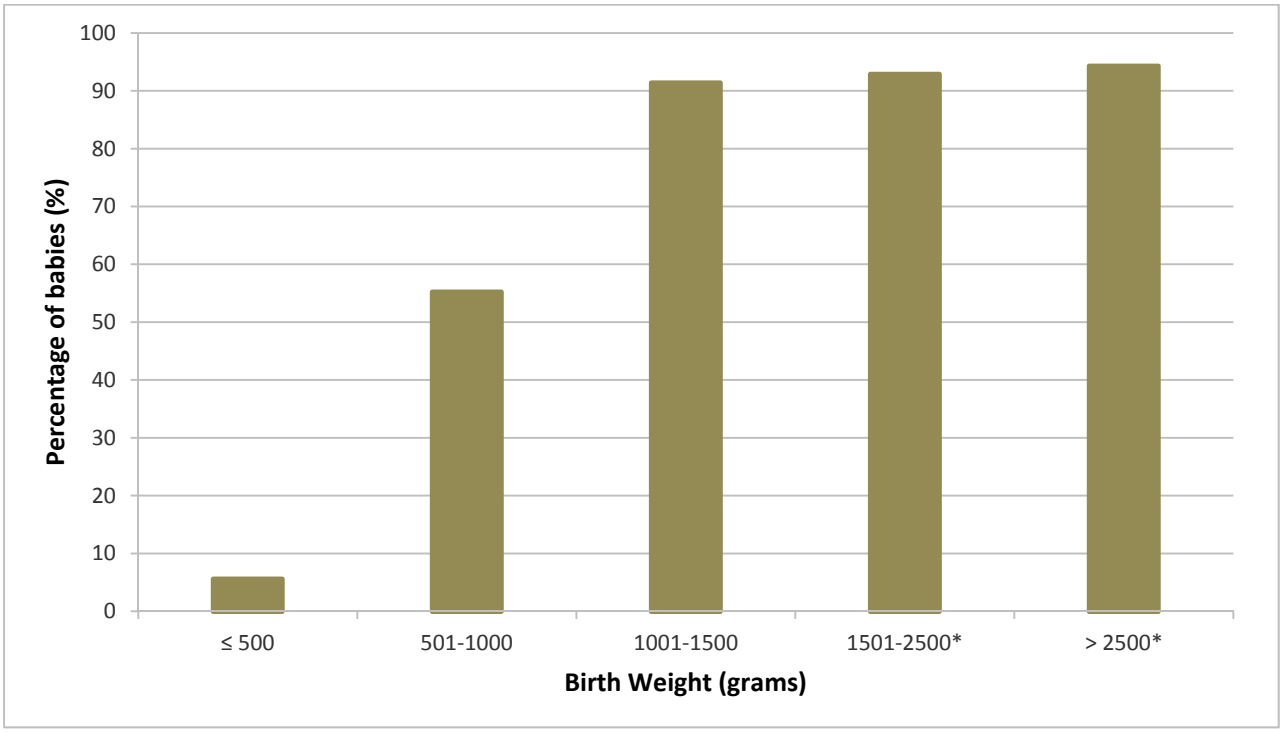



**Table 5 :**
**Survival to discharge of all babies admitted to MNNR hospitals according to birth weight categories**

| Birth weight (grams) | Total number of inborn & outborn babies | Number of survivors | % survivors |
|---|---|---|---|
| ≤500 | 36 | 2 | 5.6 |
| 501-1000 | 1196 | 660 | 55.2 |
| 1001-1500 | 2532 | 2,313 | 91.4 |
| 1501-2500* | 5547 | 5,149 | 92.8 |
| >2500* | 7138 | 6,727 | 94.2 |
| Total included | 16449 | 14,851 | 90.3 |
| Total no. of missing (BW) | 0 | | |
| Overall Total babies | 16449 | | |

*COMMENT: * For the category > 1500 gram birth weight, calculated survival rate does not include all live births in that category (see inclusion criteria).*

**Figure 6a**

**Antenatal corticosteroid for all inborn babies born at < 32 weeks gestational according to centres**

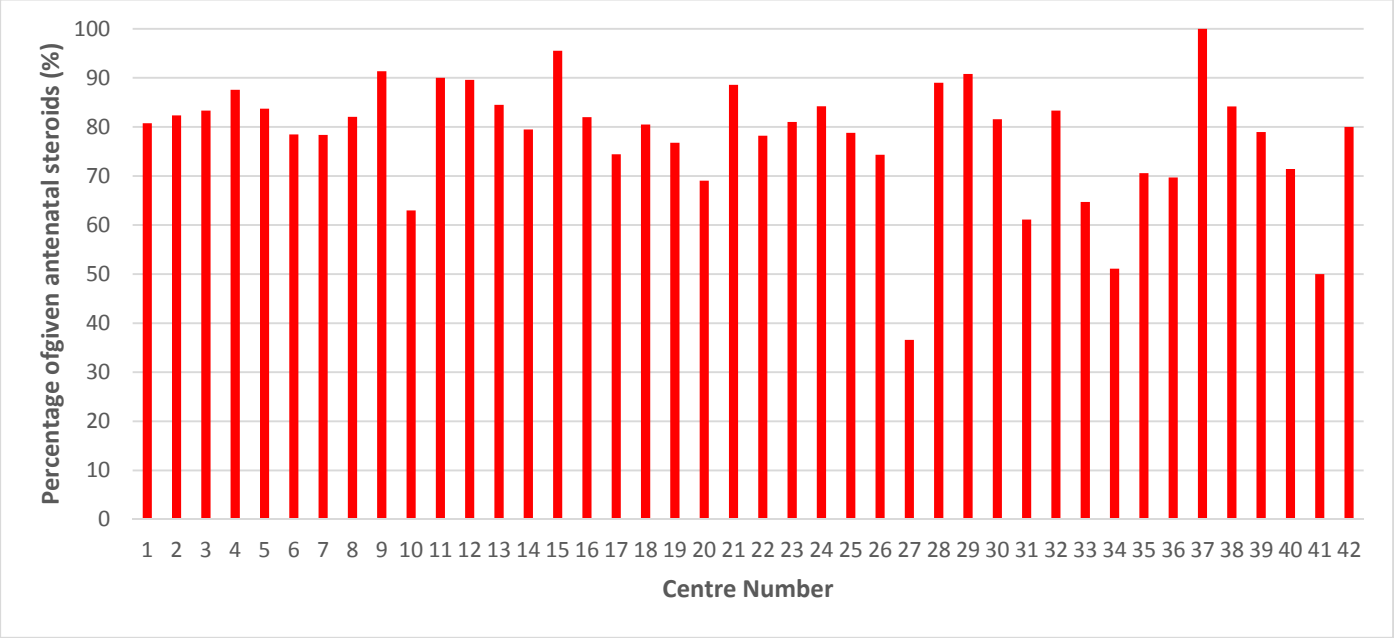



**Figure 6b**

**Antenatal corticosteroid for all outborn babies born at < 32 weeks gestational according to centres**

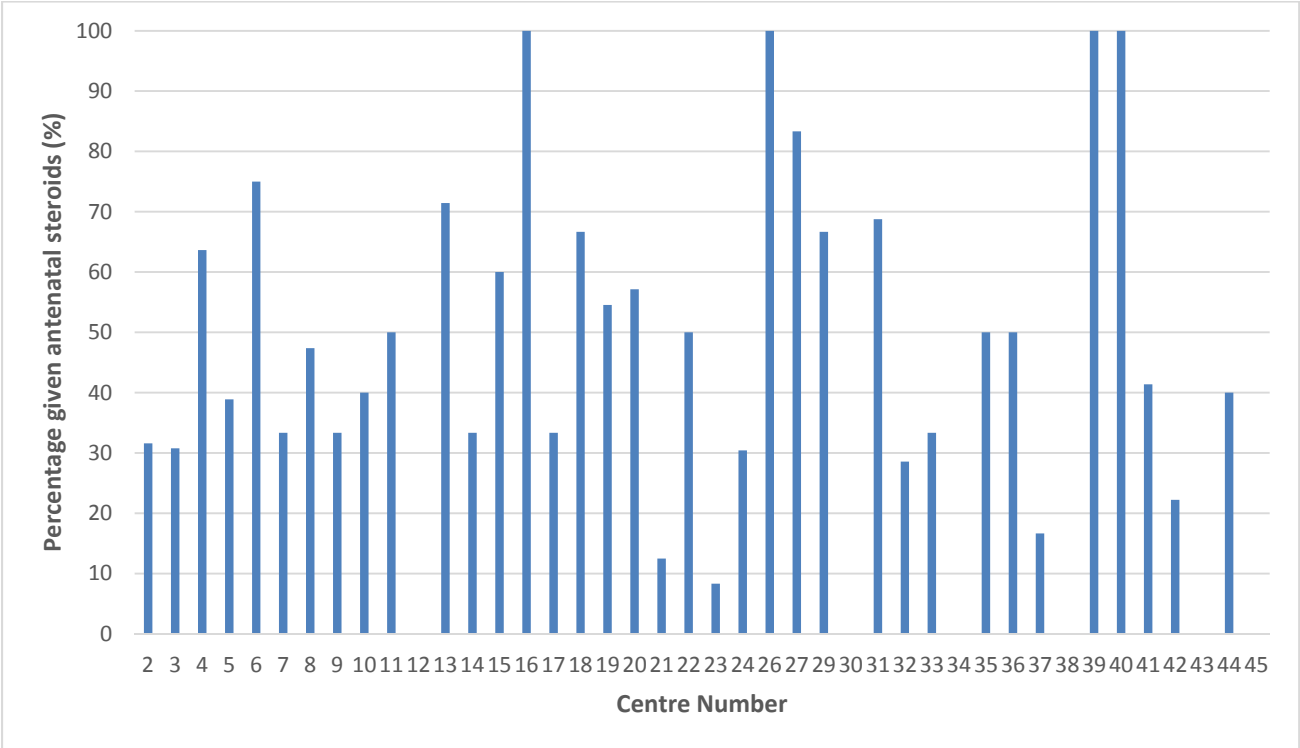


**Table 6:**
**Antenatal corticosteroid for all babies born at < 32 weeks gestational age according to centre**

| Hospitals | Inborn | | | Outborn | | |
|---|---|---|---|---|---|---|
| | Total no of babies | Given Antenatal Steroids | | Total No of Babies | Given Antenatal Steroids | |
| | n | N | % | n | N | % |
| | **2850** | **2295** | **80.5** | **334** | **145** | **43.4** |
| 2 | 135 | 109 | 80.7 | 19 | 6 | 31.6 |
| 3 | 136 | 112 | 82.4 | 13 | 4 | 30.8 |
| 4 | 48 | 40 | 83.3 | 11 | 7 | 63.6 |
| 5 | 161 | 141 | 87.6 | 18 | 7 | 38.9 |
| 6 | 43 | 36 | 83.7 | 4 | 3 | 75.0 |
| 7 | 195 | 153 | 78.5 | 18 | 6 | 33.3 |
| 8 | 148 | 116 | 78.4 | 19 | 9 | 47.4 |
| 9 | 78 | 64 | 82.1 | 3 | 1 | 33.3 |
| 10 | 81 | 74 | 91.4 | 10 | 4 | 40.0 |
| 11 | 27 | 17 | 63.0 | 2 | 1 | 50.0 |
| 12 | 10 | 9 | 90.0 | 0 | 0 | 0.0 |
| 13 | 48 | 43 | 89.6 | 14 | 10 | 71.4 |
| 14 | 58 | 49 | 84.5 | 3 | 1 | 33.3 |
| 15 | 39 | 31 | 79.5 | 5 | 3 | 60.0 |
| 16 | 89 | 85 | 95.5 | 1 | 1 | 100.0 |
| 17 | 100 | 82 | 82.0 | 6 | 2 | 33.3 |
| 18 | 43 | 32 | 74.4 | 3 | 2 | 66.7 |
| 19 | 82 | 66 | 80.5 | 11 | 6 | 54.5 |

**Table 6 (continued):**
**Antenatal corticosteroid for all babies born at < 32 weeks gestational age according to centres**

| Hospitals | Inborn | | | Outborn | | |
|---|---|---|---|---|---|---|
| | Total no of babies | Given Antenatal Steroids | | Total No of Babies | Given Antenatal Steroids | |
| | n | N | % | n | N | % |
| 20 | 56 | 43 | 76.8 | 7 | 4 | 57.1 |
| 21 | 42 | 29 | 69.0 | 8 | 1 | 12.5 |
| 22 | 105 | 93 | 88.6 | 6 | 3 | 50.0 |
| 23 | 156 | 122 | 78.2 | 12 | 1 | 8.3 |
| 24 | 137 | 111 | 81.0 | 23 | 7 | 30.4 |
| 26 | 19 | 16 | 84.2 | 2 | 2 | 100.0 |
| 27 | 33 | 26 | 78.8 | 12 | 10 | 83.3 |
| 29 | 74 | 55 | 74.3 | 9 | 6 | 66.7 |
| 30 | 41 | 15 | 36.6 | 1 | 1 | 0.0 |
| 31 | 100 | 89 | 89.0 | 16 | 11 | 68.8 |
| 32 | 87 | 79 | 90.8 | 7 | 2 | 28.6 |
| 33 | 76 | 62 | 81.6 | 9 | 3 | 33.3 |
| 34 | 18 | 11 | 61.1 | 5 | 0 | 0.0 |
| 35 | 30 | 25 | 83.3 | 2 | 1 | 50.0 |
| 36 | 34 | 22 | 64.7 | 2 | 1 | 50.0 |
| 37 | 45 | 23 | 51.1 | 6 | 1 | 16.7 |
| 38 | 17 | 12 | 70.6 | 0 | 0 | 0.0 |
| 39 | 33 | 23 | 69.7 | 1 | 1 | 100.0 |

**Table 6 (continued):**
**Antenatal corticosteroid for all babies born at < 32 weeks gestational age according to centres**

| Hospitals | Inborn | | | Outborn | | |
|---|---|---|---|---|---|---|
| | Total no of babies | Given Antenatal Steroids | | Total No of Babies | Given Antenatal Steroids | |
| | n | N | % | n | N | % |
| 40 | 2 | 2 | 100.0 | 1 | 1 | 100.0 |
| 41 | 120 | 101 | 84.2 | 29 | 12 | 41.4 |
| 42 | 76 | 60 | 78.9 | 9 | 2 | 22.2 |
| 43 | 7 | 5 | 71.4 | 1 | 0 | 0.0 |
| 44 | 16 | 8 | 50.0 | 5 | 2 | 40.0 |
| 45 | 5 | 4 | 80.0 | 1 | 0 | 0.0 |

**Figure 7a**

**Antenatal corticosteroid for all inborn babies born at ≤ 1500g birth weight according to centres**

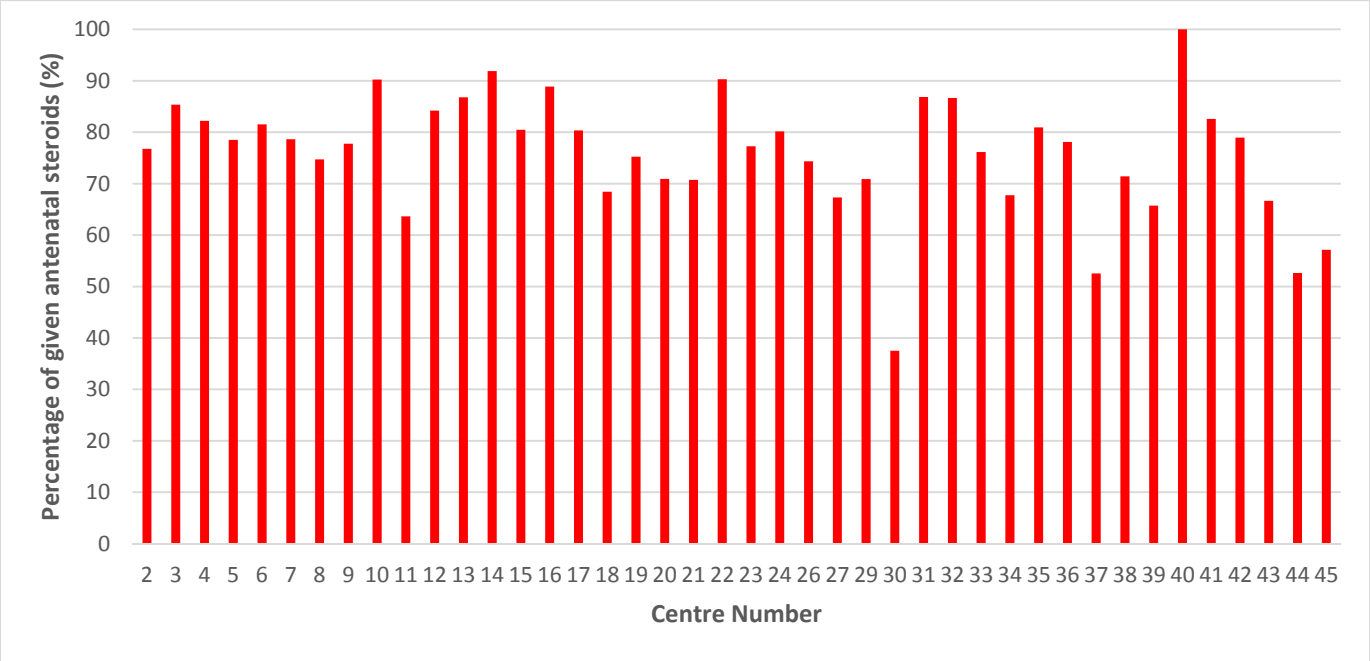



**Figure 7b**

**Antenatal corticosteroid for all outborn babies born at ≤ 1500g birth weight according to centres**

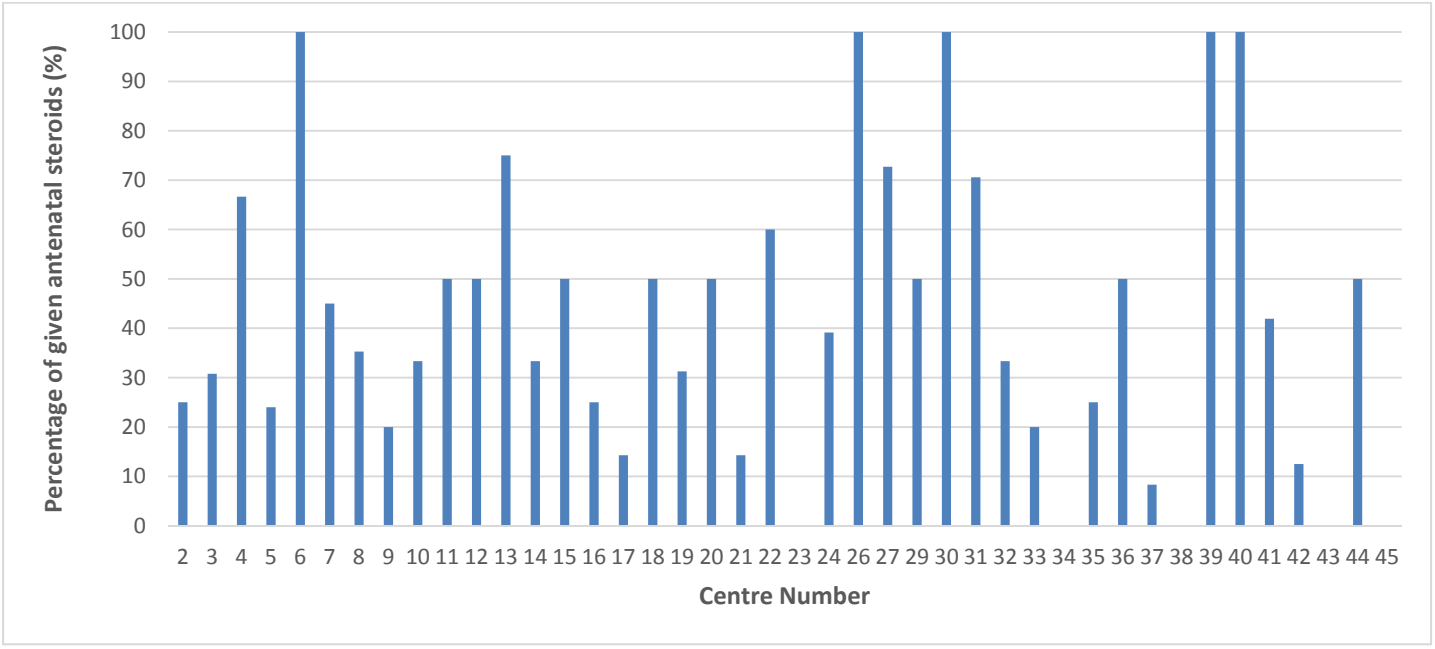


**Table 7 :**
**Antenatal corticosteroid for all babies born at ≤ 1500 grams birth weight according to centres**

| Hospitals | Inborn | | | Outborn | | |
|---|---|---|---|---|---|---|
| | Total no of babies | Given Antenatal Steroids | | Total No of Babies | Given Antenatal Steroids | |
| | n | N | % | n | N | n |
| | **3358** | **2637** | **78.5** | **362** | **137** | **37.8** |
| 2 | 142 | 109 | 76.8 | 20 | 5 | 25.0 |
| 3 | 157 | 134 | 85.4 | 13 | 4 | 30.8 |
| 4 | 45 | 37 | 82.2 | 12 | 8 | 66.7 |
| 5 | 214 | 168 | 78.5 | 25 | 6 | 24.0 |
| 6 | 65 | 53 | 81.5 | 3 | 3 | 100.0 |
| 7 | 234 | 184 | 78.6 | 20 | 9 | 45.0 |
| 8 | 174 | 130 | 74.7 | 17 | 6 | 35.3 |
| 9 | 90 | 70 | 77.8 | 5 | 1 | 20.0 |
| 10 | 123 | 111 | 90.2 | 12 | 4 | 33.3 |
| 11 | 33 | 21 | 63.6 | 2 | 1 | 50.0 |
| 12 | 19 | 16 | 84.2 | 2 | 1 | 50.0 |
| 13 | 53 | 46 | 86.8 | 12 | 9 | 75.0 |
| 14 | 74 | 68 | 91.9 | 3 | 1 | 33.3 |
| 15 | 41 | 33 | 80.5 | 4 | 2 | 50.0 |
| 16 | 99 | 88 | 88.9 | 4 | 1 | 25.0 |
| 17 | 117 | 94 | 80.3 | 7 | 1 | 14.3 |
| 18 | 57 | 39 | 68.4 | 2 | 1 | 50.0 |
| 19 | 101 | 76 | 75.2 | 16 | 5 | 31.3 |

**Table 7 (continued):**
**Antenatal corticosteroid for all babies born at ≤ 1500 grams birth weight according to centres**

| Hospitals | Inborn | | | Outborn | | |
|---|---|---|---|---|---|---|
| | Total no of babies | Given Antenatal Steroids | | Total No of Babies | Given Antenatal Steroids | |
| | n | N | % | n | N | % |
| 20 | 55 | 39 | 70.9 | 4 | 2 | 50.0 |
| 21 | 41 | 29 | 70.7 | 7 | 1 | 14.3 |
| 22 | 124 | 112 | 90.3 | 5 | 3 | 60.0 |
| 23 | 176 | 136 | 77.3 | 17 | 0 | 0.0 |
| 24 | 121 | 97 | 80.2 | 23 | 9 | 39.1 |
| 26 | 39 | 29 | 74.4 | 2 | 2 | 100.0 |
| 27 | 52 | 35 | 67.3 | 11 | 8 | 72.7 |
| 29 | 79 | 56 | 70.9 | 10 | 5 | 50.0 |
| 30 | 48 | 18 | 37.5 | 1 | 1 | 100.0 |
| 31 | 114 | 99 | 86.8 | 17 | 12 | 70.6 |
| 32 | 120 | 104 | 86.7 | 6 | 2 | 33.3 |
| 33 | 88 | 67 | 76.1 | 10 | 2 | 20.0 |
| 34 | 31 | 21 | 67.7 | 5 | 0 | 0.0 |
| 35 | 42 | 34 | 81.0 | 4 | 1 | 25.0 |
| 36 | 32 | 25 | 78.1 | 2 | 1 | 50.0 |
| 37 | 59 | 31 | 52.5 | 12 | 1 | 8.3 |
| 38 | 21 | 15 | 71.4 | 1 | 0 | 0.0 |
| 39 | 35 | 23 | 65.7 | 2 | 2 | 100.0 |

**Table 7 (continued):**
**Antenatal corticosteroid for all babies born at ≤ 1500 grams birth weight according to centres**

| Hospitals | Inborn | | | Outborn | | |
|---|---|---|---|---|---|---|
| | Total no of babies | Given Antenatal Steroids | | Total No of Babies | Given Antenatal Steroids | |
| | n | N | % | n | N | % |
| 40 | 3 | 3 | 100.0 | 1 | 1 | 100.0 |
| 41 | 132 | 109 | 82.6 | 31 | 13 | 41.9 |
| 42 | 76 | 60 | 78.9 | 8 | 1 | 12.5 |
| 43 | 6 | 4 | 66.7 | 0 | 0 | 0.0 |
| 44 | 19 | 10 | 52.6 | 4 | 2 | 50.0 |
| 45 | 7 | 4 | 57.1 | 0 | 0 | 0.0 |

**Figure 8**

**Incidence of oxygen dependency among admitted inborn babies with gestational age < 32 weeks**

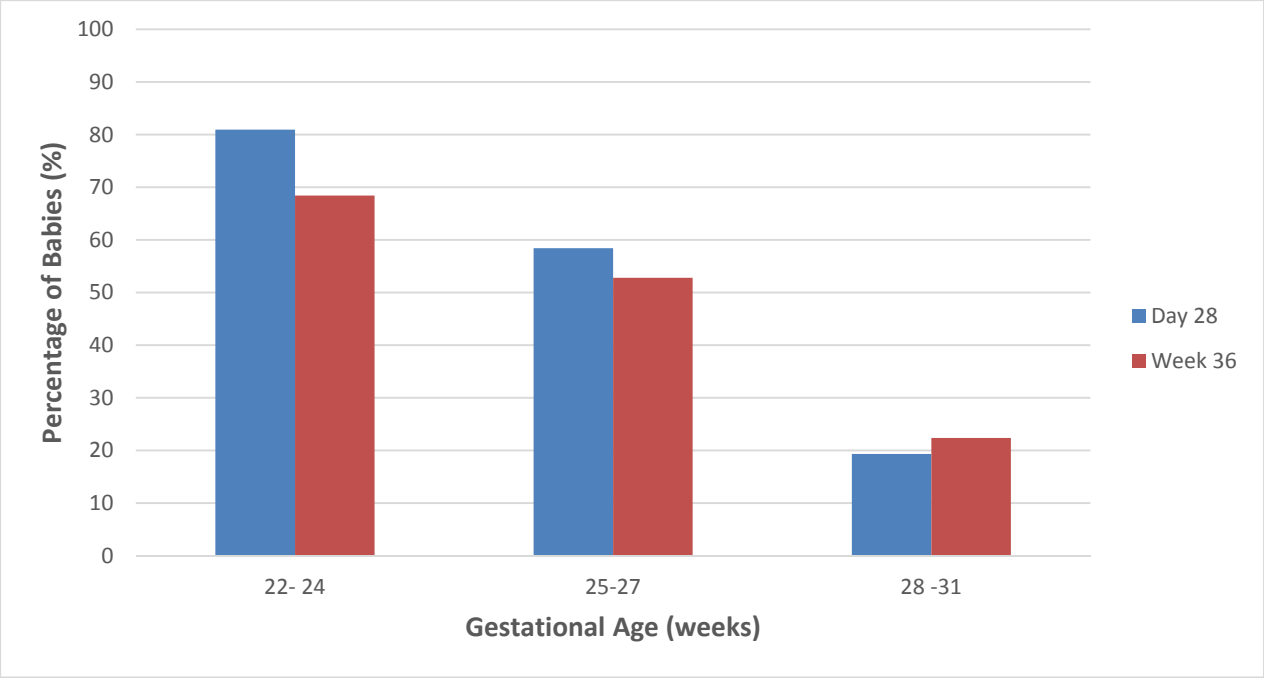



**Table 8 :**
**Incidence of oxygen dependency among admitted inborn babies with gestational age < 32 weeks**

| Gestational age at birth (weeks) | | Total no of admitted inborn babies | Babies alive at day 28 | Babies with oxygen dependency beyond day 28 among survivors | Babies alive at 36 weeks postmenstrual age | Babies with oxygen dependency beyond 36 weeks among survivors |
|---|---|---|---|---|---|---|
| 22-24 | *n* | 157 | 21 | 17 | 19 | 13 |
| | % | 5.5 | 13.4 | 81.0 | 12.1 | 68.4 |
| 25-27 | *n* | 579 | 344 | 201 | 267 | 141 |
| | % | 20.3 | 59.4 | 58.4 | 46.1 | 52.8 |
| 28-31 | *n* | 2115 | 1615 | 312 | 1015 | 227 |
| | % | 74.2 | 76.4 | 19.3 | 48.0 | 22.4 |
| Total included | *n* | 2851 | 1980 | 530 | 1301 | 381 |
| | % | 100 | 69.4 | 26.8 | 45.6 | 29.3 |
| Total babies | | 2851 | | | | |

**Figure 9**

**Incidence of oxygen dependency among admitted inborn babies with birth weight ≤ 1500 grams**

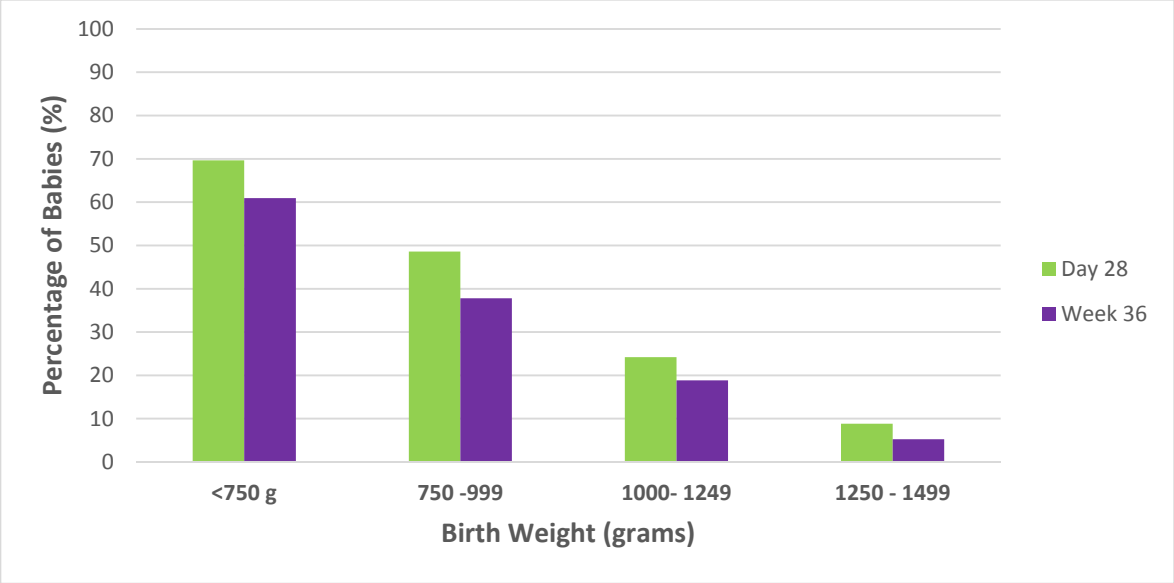



**Table 9:**
**Incidence of oxygen dependency among admitted inborn babies with birth weight ≤ 1500 grams**

| Birth Weight (grams) | | Total no of admitted inborn babies | Babies alive at 28 | Babies with oxygen dependency beyond day 28 among survivors | Babies alive at 36 weeks postmenstrual age | Babies with oxygen dependency beyond 36 weeks among survivors |
|---|---|---|---|---|---|---|
| < 750 | *n* | 329 | 89 | 62 | 87 | 53 |
| | % | 10.5 | 27.1 | 69.7 | 26.4 | 60.9 |
| 750-999 | *n* | 593 | 422 | 205 | 381 | 144 |
| | % | 19.0 | 71.2 | 48.6 | 64.2 | 37.8 |
| 1000 – 1249 | *n* | 920 | 785 | 190 | 626 | 118 |
| | % | 29.4 | 85.3 | 24.2 | 68.0 | 18.8 |
| 1250 - 1499 | *n* | 1286 | 961 | 85 | 817 | 43 |
| | % | 41.1 | 74.7 | 8.8 | 63.5 | 5.3 |
| Total Included | *n* | 3128 | 2257 | 542 | 1911 | 358 |
| | *%* | 100 | 72.2 | 24.0 | 61.1 | 18.7 |
| Total babies | | 3128 | | | | |

**Table 10**

**Treatment of patent ductus arteriosus (PDA) in admitted inborn babies in the MNNR by gestational age categories**

| Gestation (weeks) | Total Inborn | PDA Diagnosed | | Confirmed by ECHO | | Treatment | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Indocid/Brufen | | PCM | | Ligation | |
| | n | n | % | n | % | n | % | n | % | n | % |
| 22-24 | 157 | 27 | 17.2 | 23 | 14.6 | 5 | 18.5 | 9 | 33.3 | 0 | 0.0 |
| 25 - 27 | 579 | 262 | 45.3 | 248 | 42.8 | 87 | 33.2 | 112 | 42.7 | 7 | 2.7 |
| 28 -31 | 2115 | 519 | 24.5 | 495 | 23.4 | 120 | 23.1 | 180 | 34.7 | 6 | 1.2 |
| Total | 2851 | 808 | 28.3 | 766 | 26.9 | 212 | 26.2 | 301 | 37.3 | 13 | 1.6 |

**Table 11**

**Treatment of patent ductus arteriosus (PDA) in admitted inborn babies by birth weight categories**

| Birth Weight (grams) | Total Inborn | PDA Diagnosed | | Confirmed by ECHO | | Treatment | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Indocid/Brufen | | PCM | | Ligation | |
| | n | n | % | n | % | n | % | n | % | n | % |
| < 750 | 329 | 82 | 24.9 | 74 | 22.5 | 17 | 20.7 | 25 | 30.5 | 0 | 0.0 |
| 750 - 999 | 593 | 246 | 41.5 | 232 | 39.1 | 75 | 30.5 | 107 | 43.5 | 7 | 2.8 |
| 1000-1249 | 920 | 286 | 31.1 | 269 | 29.2 | 78 | 27.3 | 106 | 37.1 | 4 | 1.4 |
| 1250 - 1499 | 1286 | 219 | 17.0 | 213 | 16.6 | 49 | 22.4 | 66 | 30.1 | 4 | 1.8 |
| Total | 3128 | 833 | 26.6 | 788 | 94.6 | 219 | 26.3 | 304 | 36.5 | 15 | 1.8 |

**Figure 12**

**Incidence of retinopathy of prematurity (ROP) in admitted inborn babies by gestational age categories**

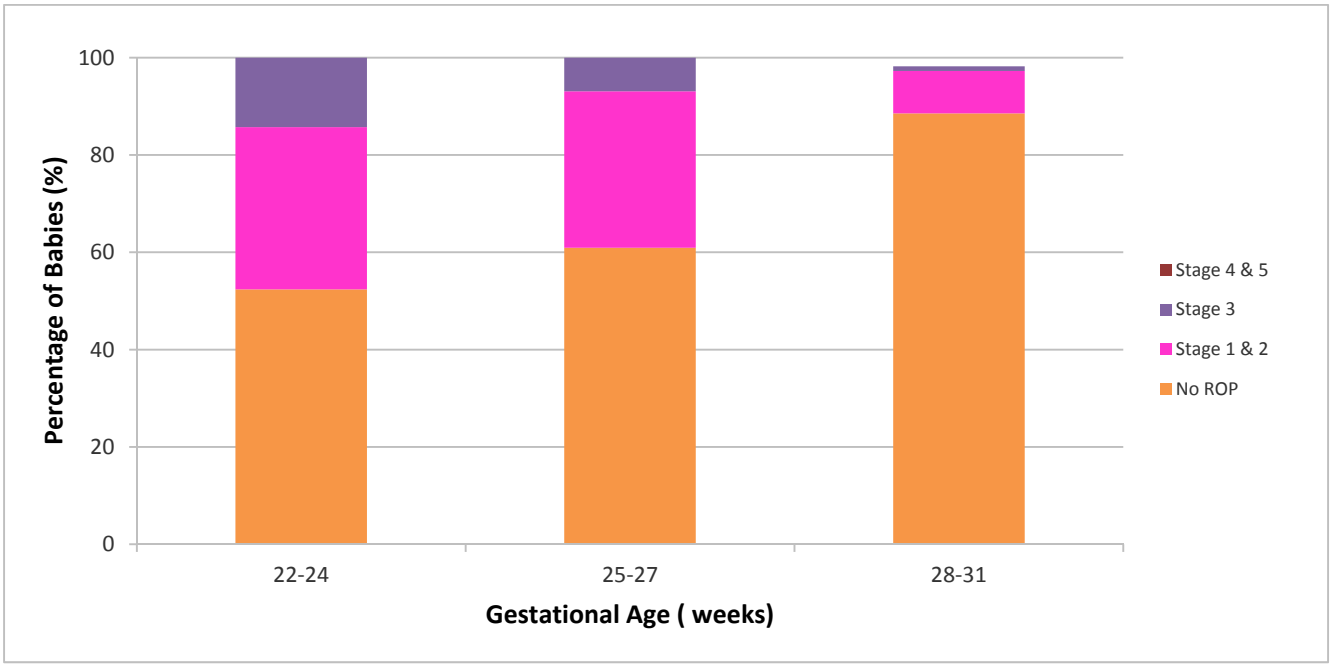



**Table 12:**
**Incidence of retinopathy of prematurity (ROP) in admitted inborn babies in the MNNR by gestational age categories**

| Gestational age at birth (weeks) | Total number of admitted inborn babies | No. of babies alive at 6 weeks | No. of babies with eye examination | | Retinopathy of prematurity | | | | | | | | Therapy | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | No ROP | | ROP Stage 1 & 2 | | ROP Stage 3 | | ROP Stage 4 & 5 | | Cryo | Laser |
| | *n* | *n* | *n* | % | *n* | % | *n* | % | *n* | % | *n* | % | | |
| 22-24 | 157 | 23 | 21 | 91.3 | 11 | 52.4 | 7 | 33.3 | 3 | 14.3 | - | 0.0 | - | 3 |
| 25-27 | 579 | 382 | 348 | 91.1 | 212 | 60.9 | 112 | 32.2 | 24 | 6.9 | - | 0.0 | 1 | 16 |
| 28-31 | 2115 | 1943 | 1530 | 78.7 | 1355 | 88.6 | 133 | 8.7 | 15 | 1.0 | - | 0.0 | - | 11 |
| Total Included | 2851 | 2348 | 1899 | 80.9 | 1578 | 83.1 | 252 | 13.3 | 42 | 2.2 | - | 0.0 | 1 | 30 |

*Comment: Screening refers to those screened during the ward admission*

**Figure 13**

**Incidence of retinopathy of prematurity (ROP) in admitted inborn babies by birth weight categories**

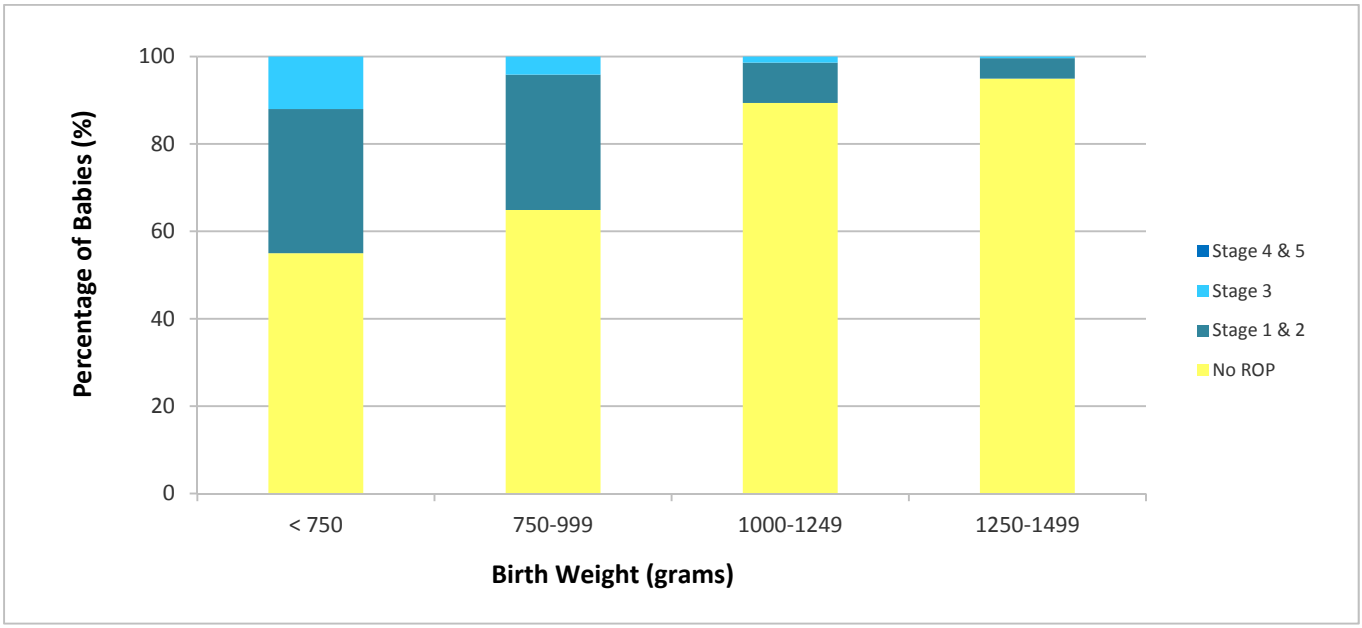



**Table 13 :**
**Incidence of retinopathy of prematurity (ROP) in admitted inborn babies in the MNNR by birth weight categories**

| Birth weight (grams) | Total no of admitted inborn babies | No. of babies alive at 6 weeks | No. of babies with eye examination | | Retinopathy of prematurity | | | | | | | | Therapy | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | No ROP | | ROP Stage 1 & 2 | | ROP Stage 3 | | ROP Stage 4 & 5 | | Cryo | Laser |
| | *n* | *n* | *n* | % | *n* | % | *n* | % | *n* | % | *n* | % | | |
| < 750 | 329 | 106 | 100 | 94.3 | 55 | 55.0 | 33 | 33.0 | 12 | 12.0 | - | 0.0 | 1 | 10 |
| 750-999 | 593 | 444 | 410 | 92.3 | 266 | 64.9 | 127 | 31.0 | 17 | 4.1 | - | 0.0 | - | 11 |
| 1000-1249 | 920 | 828 | 725 | 88.6 | 639 | 88.1 | 66 | 9.1 | 10 | 1.4 | - | 0.0 | - | 8 |
| 1250-1499 | 1286 | 1219 | 828 | 67.9 | 786 | 94.9 | 39 | 4.7 | 3 | 0.4 | - | 0.0 | - | 2 |
| Total included | 3128 | 2597 | 2063 | 79.4 | 1746 | 85.0 | 265 | 12.9 | 42 | 2.0 | - | 0.0 | 1 | 31 |

*Comment: Screening refers to those screened during the ward admission*

**Figure 14**

**Incidence of intraventricular haemorrhage (IVH) in admitted inborn babies < 32 weeks gestational age**

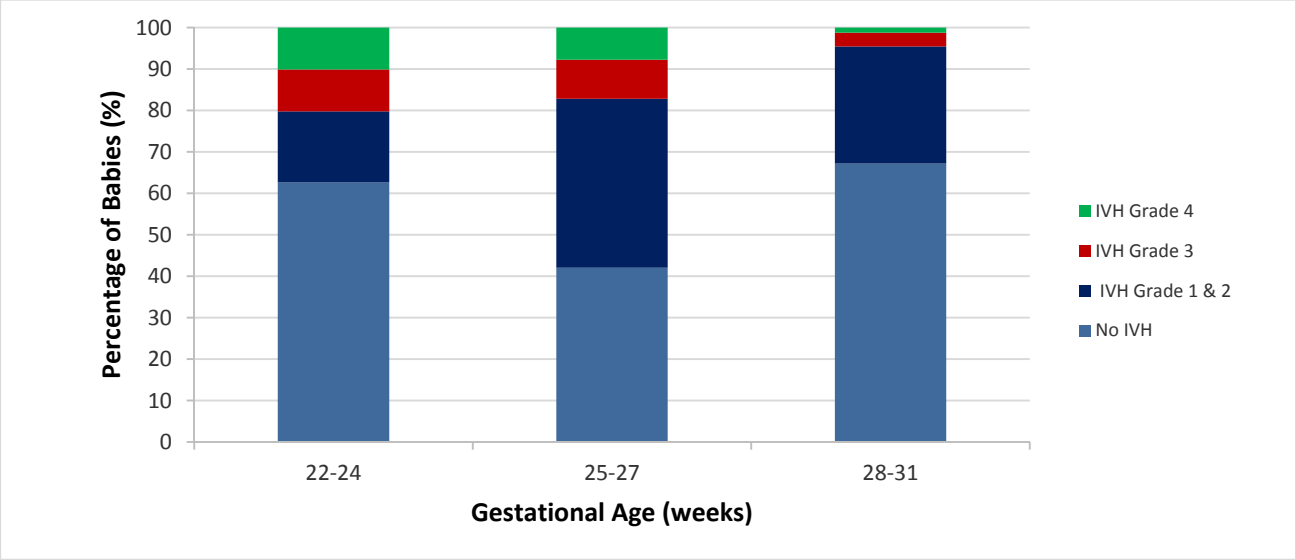



**Table 14 :**
**Incidence of intraventricular haemorrhage (IVH) in admitted inborn babies < 32 weeks gestational age**

| Gestational age (completed weeks) | | Total no. of admitted inborn babies | Babies with CUS | NO IVH | IVH Grade 1 & Grade 2 | IVH Grade 3 | IVH Grade 4 |
|---|---|---|---|---|---|---|---|
| 22-24 | **n** | 157 | 99 | 62 | 17 | 10 | 10 |
| | **%** | 5.5 | 65.1 | 62.6 | 17.2 | 10.1 | 10.1 |
| 25-27 | **n** | 579 | 530 | 223 | 216 | 50 | 41 |
| | **%** | 20.3 | 94.1 | 42.1 | 40.8 | 9.4 | 7.7 |
| 28-31 | **n** | 2115 | 2001 | 1345 | 565 | 67 | 24 |
| | **%** | 74.2 | 96.7 | 67.2 | 28.2 | 3.3 | 1.2 |
| Total included | **n** | 2851 | 2630 | 1630 | 798 | 127 | 75 |
| | **%** | 100 | 94.8 | 62.0 | 30.3 | 4.8 | 2.9 |
| Total babies | 2851 | | | | | | |

**CUS – cranial untrasound**

**Figure 15**

**Incidence of intraventricular haemorrhage (IVH) in admitted inborn babies ≤ 1500 grams birth weight**

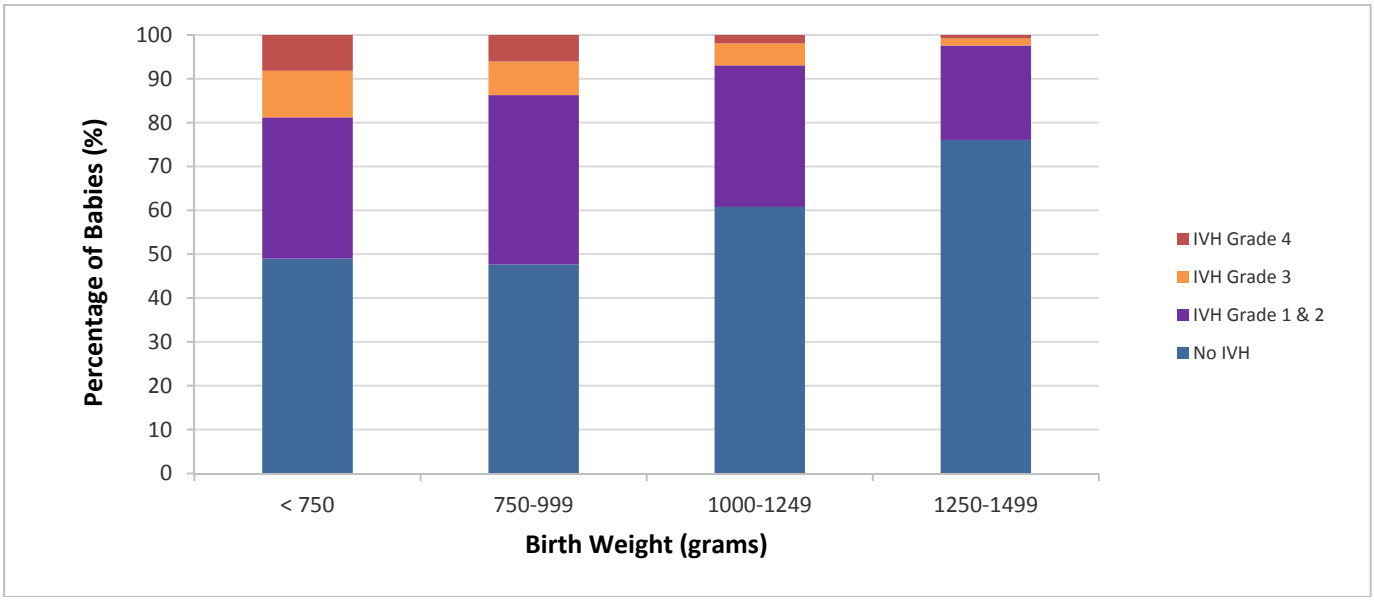



**Table 15 :**
**Incidence of intraventricular haemorrhage (IVH) in admitted inborn babies ≤ 1500 grams birth weight**

| Birth weight (grams) | | Total no. of admitted inborn babies | Babies with CUS | NO IVH | IVH Grade 1 & Grade 2 | IVH Grade 3 | IVH Grade 4 |
|---|---|---|---|---|---|---|---|
| < 750 | **n** | 329 | 245 | 120 | 79 | 26 | 20 |
| | **%** | 10.5 | 74.5 | 49.0 | 32.2 | 10.6 | 8.2 |
| 750-999 | **n** | 593 | 562 | 268 | 217 | 43 | 34 |
| | **%** | 19.0 | 94.8 | 47.7 | 38.6 | 7.7 | 6.0 |
| 1000-1249 | **n** | 920 | 882 | 536 | 285 | 44 | 17 |
| | **%** | 29.4 | 95.9 | 60.8 | 32.3 | 5.0 | 1.9 |
| 1250-1499 | **n** | 1286 | 1204 | 916 | 259 | 20 | 9 |
| | **%** | 41.1 | 93.6 | 76.1 | 21.5 | 1.7 | 0.7 |
| Total included | **n** | 3128 | 2893 | 1840 | 840 | 133 | 80 |
| | **%** | 100 | 92.5 | 63.6 | 29.0 | 4.6 | 2.8 |
| Total babies | 3128 | | | | | | |

**CUS – cranial untrasound**

**Figure 16**

**Incidence of necrotizing enterocolitis (NEC) in admitted inborn babies according to gestational age categories**


**Table 16 :**
**Incidence and treatment of necrotizing enterocolitis (NEC) in admitted inborn babies according to gestational age categories**

| Gestational age (weeks) | Total number of admitted inborn babies | Babies with NEC | | With Surgical treatment | |
|---|---|---|---|---|---|
| | *n* | *n* | *%* | *n* | *%* |
| 22-24 | 157 | 6 | 3.8 | 1 | 16.7 |
| 25-27 | 579 | 33 | 5.7 | 11 | 33.3 |
| 28-31 | 2115 | 86 | 4.1 | 14 | 16.3 |
| Total included | 2851 | 125 | 4.4 | 26 | 20.8 |
| Total no. of missing (GA) | 0 | | | | |
| Overall Total babies | 2851 | | | | |

*Comment: NEC refers to those with at least Stage 2 modified Bell's criteria*

**Figure 17**

**Incidence of necrotizing enterocolitis (NEC) in admitted inborn babies according to birth weight categories**

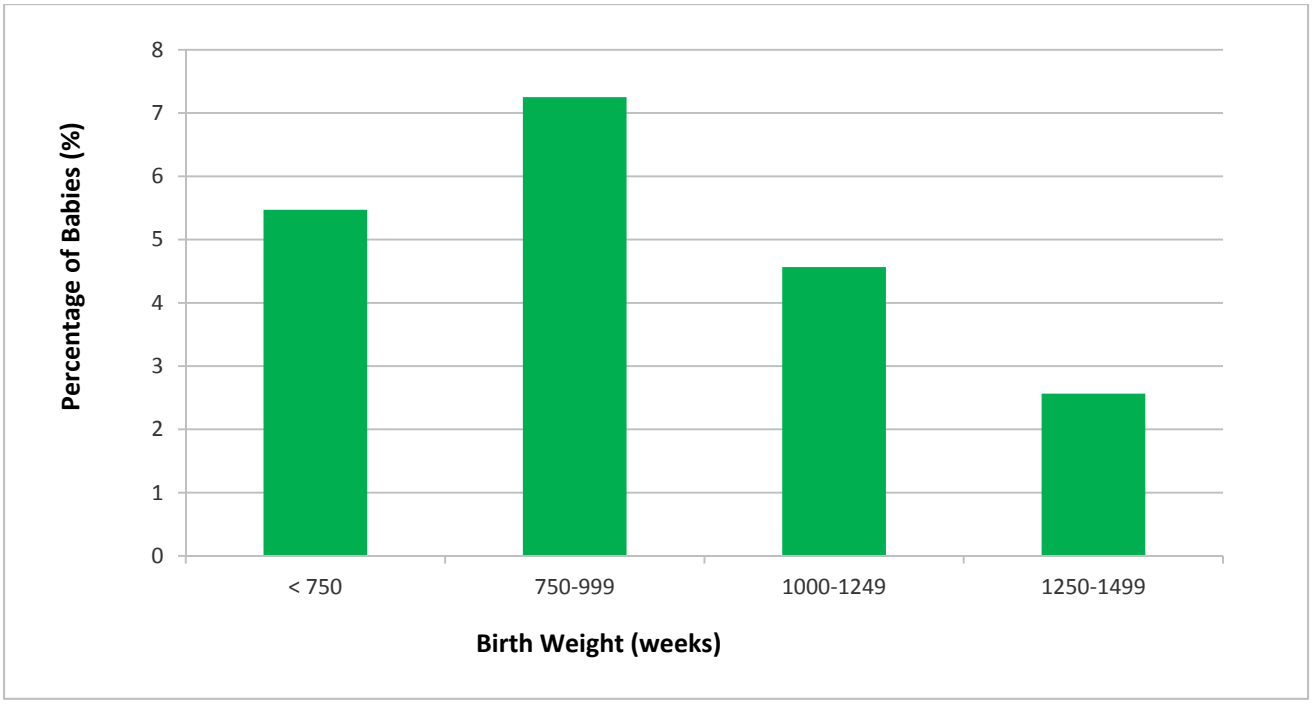



**Table 17 :**
**Incidence and treatment of necrotizing enterocolitis (NEC) in admitted inborn babies according to birth weight categories**

| Birth weight (grams) | Total number admitted of inborn babies | Babies with NEC | | With Surgical treatment | |
|---|---|---|---|---|---|
| | *n* | *n* | *%* | *n* | *%* |
| < 750 | 329 | 18 | 5.5 | 4 | 22.2 |
| 750-999 | 593 | 43 | 7.3 | 10 | 23.3 |
| 1000-1249 | 920 | 42 | 4.6 | 7 | 16.7 |
| 1250 - 1499 | 1286 | 33 | 2.6 | 3 | 9.1 |
| Total included | 3128 | 136 | 4.3 | 24 | 17.6 |
| Total no. of missing (BW) | 0 | | | | |
| Overall total babies | 3128 | | | | |

*Comment: NEC refers to those with at least Stage 2 modified Bell's criteria*

**Figure 18**

**Incidence of blood culture positive early onset sepsis in admitted inborn babies by gestational age categories**

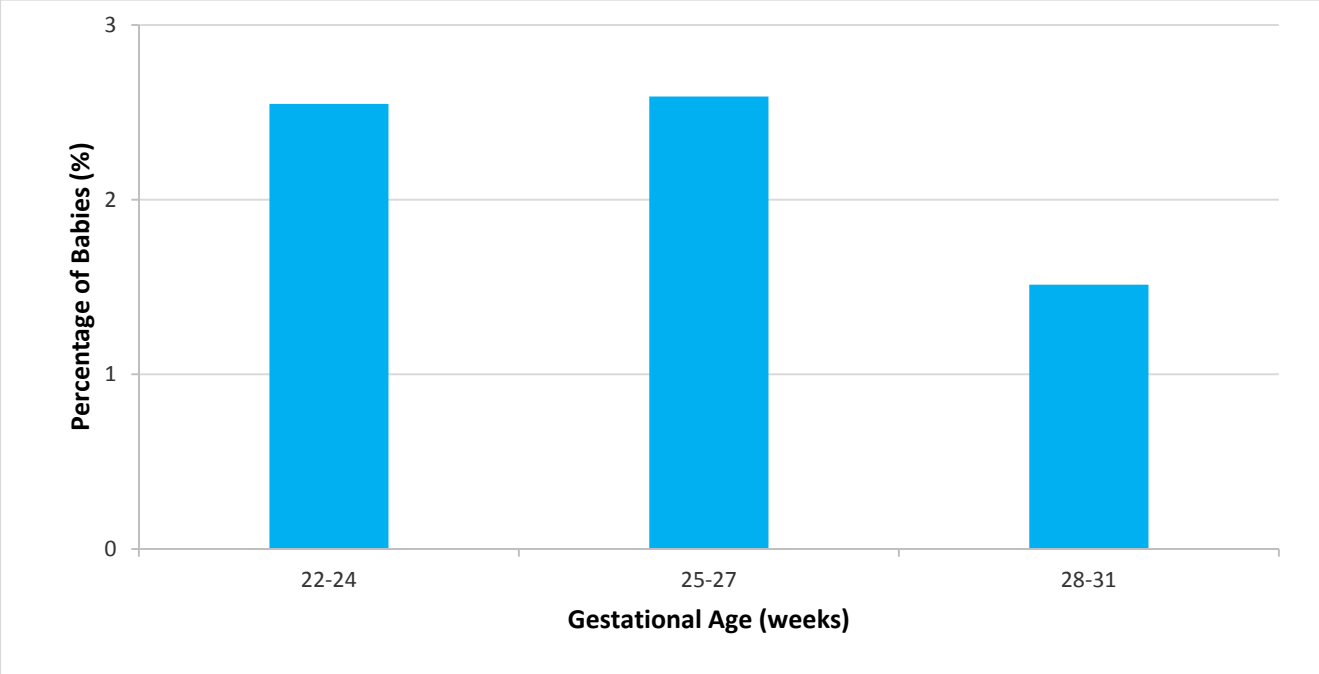



**Table 18 :**
**Incidence of blood culture positive early onset sepsis in admitted inborn babies by gestational age categories**

| Gestational age at birth (completed weeks) | Total number of admitted inborn babies | No. of babies with early infection | |
|---|---|---|---|
| | *n* | *n* | % |
| 22-24 | 157 | 4 | 2.5 |
| 25-27 | 579 | 15 | 2.6 |
| 28-31 | 2115 | 32 | 1.5 |
| Total included | 2851 | 51 | 1.8 |
| Total no. of missing (GA) | 0 | | |
| Total babies | 2851 | | |

**Figure 19**

**Incidence of blood culture positive late onset sepsis in admitted inborn babies by gestational age categories**

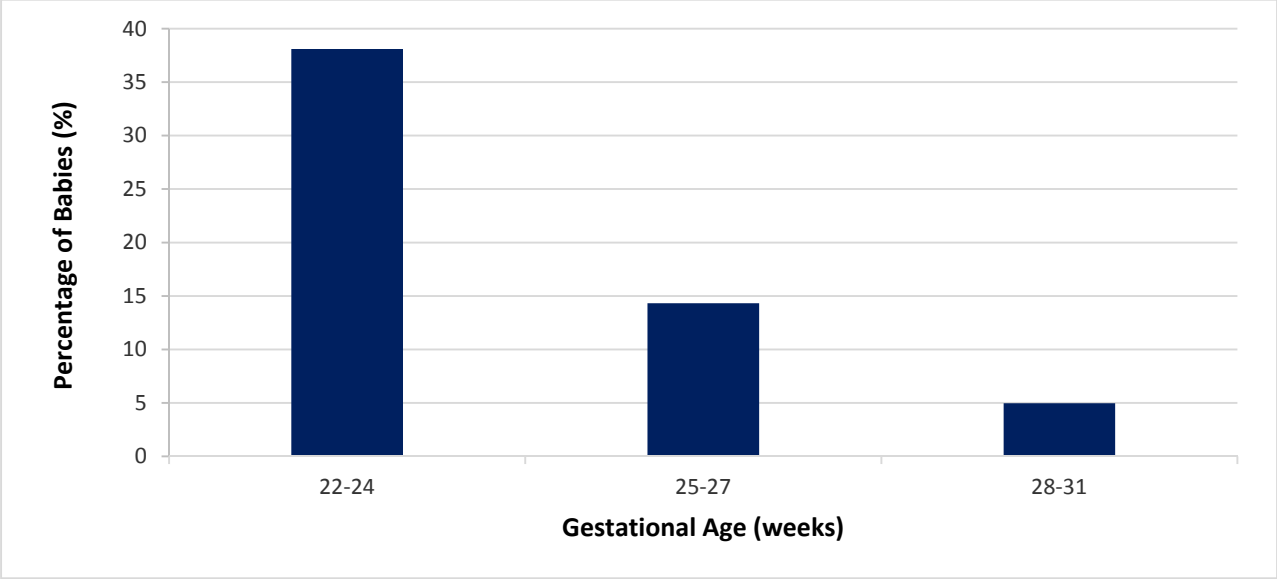



**Table 19 :**
**Incidence of blood culture positive late onset sepsis in admitted inborn babies by gestational age categories**

| Gestational age (weeks) | Total number of admitted inborn babies | No. of babies who survived beyond day 3 after birth | No. of babies with at least one episode of late onset sepsis | |
|---|---|---|---|---|
| | *n* | *n* | n | % |
| 22-24 | 157 | 21 | 8 | 38.1 |
| 25-27 | 579 | 356 | 51 | 14.3 |
| 28-31 | 2115 | 1913 | 95 | 5.0 |
| Total included | 2851 | 2290 | 154 | 6.7 |
| Total no. of missing (GA) | 0 | | | |
| Total babies | 2851 | | | |

**Figure 20**

**Incidence of blood culture positive late onset sepsis in admitted inborn babies by birth weight categories**

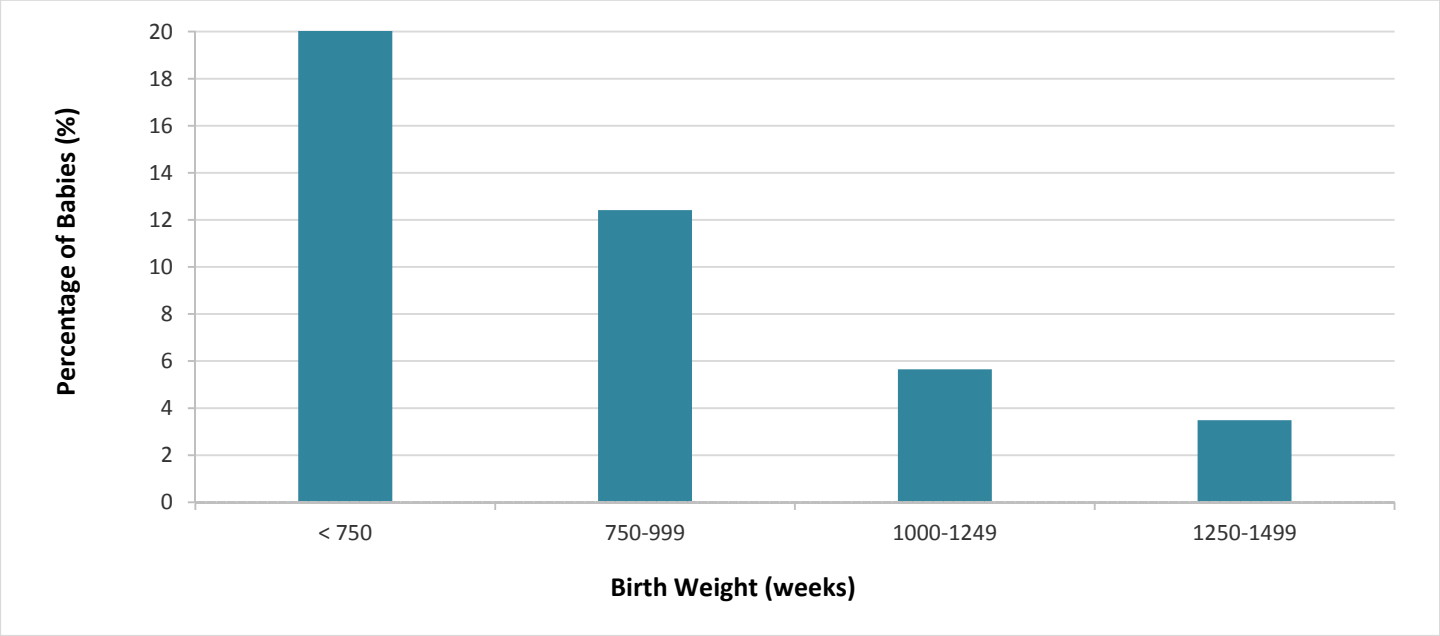



**Table 20 :**
**Incidence of blood culture positive late onset sepsis in admitted inborn babies by birth weight categories**

| Birth weight (grams) | Total number of admitted inborn babies | No. of babies who survived beyond day 3 after birth | No. of babies with at least one episode of late onset sepsis | |
|---|---|---|---|---|
| | *n* | *n* | n | % |
| < 750 | 329 | 92 | 21 | 22.8 |
| 750-999 | 593 | 427 | 53 | 12.4 |
| 1000-1249 | 920 | 814 | 46 | 5.7 |
| 1250 - 1499 | 1286 | 1205 | 42 | 3.5 |
| Total included | 3128 | 2538 | 162 | 6.4 |
| Total no. of missing (BW) | 0 | | | |
| Overall total babies | 3128 | | | |

**Table 21a**

**Gestational age specific mortality or significant morbidity in admitted inborn babies (five morbidities)**

| Gestational age at birth (weeks) | | Total no. of admitt-ed inborn babies | Numb er Surviv ed | No. with any one morbiditi es prior to discharge among survivors | No. with any two morbiditi es prior to discharge among survivors | No. with any three morbiditi es prior to discharge among survivors | No. with any four morbiditi es prior to discharge among survivors | No. with any five morbiditi es prior to discharge among survivors | No. without any five morbiditi es prior to discharge among survivors |
|---|---|---|---|---|---|---|---|---|---|
| 22-24 | n | 157 | 22 | 6 | 7 | 2 | 0 | 0 | 7 |
| | % | 5.5 | 14.0 | 27.3 | 31.8 | 9.1 | 0.0 | 0.0 | 31.8 |
| 25-27 | n | 579 | 359 | 120 | 45 | 12 | 0 | 0 | 182 |
| | % | 20.3 | 62.0 | 33.4 | 12.5 | 3.3 | 0.0 | 0.0 | 50.7 |
| 28-31 | n | 2115 | 1927 | 303 | 55 | 5 | 1 | 0 | 1563 |
| | % | 74.2 | 91.1 | 15.7 | 2.9 | 0.3 | 0.1 | 0.0 | 81.1 |
| Total Included | n | 2851 | 2308 | 429 | 107 | 19 | 1 | 0 | 1752 |
| | % | 100 | 81.0 | 18.6 | 4.6 | 0.8 | 0.0 | 0.0 | 75.9 |
| Total no. of missing (GA) | - | | | | | | | | |
| Total babies | 2851 | | | | | | | | |

i. PDA requiring surgical ligation
ii. Stage 3 / 4 or 5 ROP
iii. Oxygen dependency at 36 weeks or discharge
iv. Confirmed sepsis
v. NEC

**Table 21b**

**Birth weight specific mortality or significant morbidity in admitted inborn babies (five morbidities)**

| Gestational age at birth (weeks) | | Total no. of admitt-ed inborn babies | Numb er Surviv ed | No. with any one morbiditi es prior to discharge among survivors | No. with any two morbiditi es prior to discharge among survivors | No. with any three morbiditi es prior to discharge among survivors | No. with any four morbiditi es prior to discharge among survivors | No. with any five morbiditi es prior to discharge among survivors | No. without any five morbiditi es prior to discharge among survivors |
|---|---|---|---|---|---|---|---|---|---|
| < 750 | n | 329 | 93 | 34 | 18 | 7 | 0 | 0 | 34 |
| | % | 10.5 | 28.3 | 36.6 | 19.4 | 7.5 | 0.0 | 0.0 | 36.6 |
| 750 - 999 | n | 593 | 431 | 128 | 59 | 3 | 0 | 0 | 241 |
| | % | 19.0 | 72.7 | 29.7 | 13.7 | 0.7 | 0.0 | 0.0 | 55.9 |
| 1000 - 1249 | n | 920 | 819 | 172 | 20 | 2 | 1 | 0 | 624 |
| | % | 29.4 | 89.0 | 21.0 | 2.4 | 0.2 | 0.1 | 0.0 | 76.2 |
| 1250 - 1499 | n | 1286 | 1212 | 104 | 8 | 3 | 0 | 0 | 1097 |
| | % | 41.1 | 94.2 | 8.6 | 0.7 | 0.2 | 0.0 | 0.0 | 90.5 |
| Total Included | n | 3128 | 2555 | 438 | 105 | 15 | 0 | 0 | 1996 |
| | % | 100 | 81.7 | 17.1 | 4.1 | 0.6 | 0.0 | 0.0 | 78.1 |
| Total no. of missing (GA) | - | | | | | | | | |
| Total babies | 3128 | | | | | | | | |

i. PDA requiring surgical ligation

ii. Stage 3 / 4 or 5 ROP

iii. Oxygen dependency at 36 weeks or discharge

iv. Confirmed sepsis

v. NEC

# APPENDICES

# Appendix 1 Level of Neonatal Care

*(Adapted from Committee on Foetus and Newborn, Levels of Neonatal Care, Paediatrics, Vol. 114 no. 5, November 2004, p.1345)*

Level I Neonatal Care (Basic), well- newborn nursery: has the capability to:

- Provide neonatal resuscitation at every delivery
- Evaluate and provide postnatal care to healthy newborn infants
- Stabilise and provide care for infants born at 35 to 37 weeks gestation who remain physiologically stable
- Stabilise newborn infants who are ill and those born at <35 weeks gestation, until transfer to a hospital that can provide the appropriate level of neonatal care

Level II Neonatal Care (Specialty), Special care nursery: Level II units are subdivided into two categories on the basis of their ability to provide assisted ventilation including continuous positive airway pressure

1. ***Level II A*** *has the capability to:*
   - Resuscitate and stabilise preterm and/or ill infants before transfer to a facility at which newborn intensive care is provided
   - Provide care for infants born at >32 weeks gestation and weighing ≥1500 g (1) who have physiologic(al) immaturity such as apnoea of prematurity, inability to maintain body temperature, or inability to take oral feeding or (2) who are moderately ill with problems that are anticipated to resolve rapidly and are not anticipated to need subspecialty service on an urgent basis
   - Provide Care for infants who are convalescing after intensive care

2. ***Level II B*** *has the capabilities* of a Level IIA nursery and the additional capability to provide mechanical ventilation for brief durations (<24 hours) or continuous positive airway pressure

Level III (Subspecialty) Neonatal Intensive Care Unit (NICU): Level III units subdivided into three categories:

3. ***Level III A NICU*** has the capability to
   - Provide comprehensive care for infants born at >28 weeks gestation and weighing >1000 g
   - Provide sustained life support limited to conventional mechanical ventilation
   - Perform minor surgical procedures such as placement of central venous catheters or inguinal hernia repair

4. ***Level III B NICU*** has the capability to provide
   - Comprehensive care for extremely low birth weight infants (≤1000 g and ≤28 weeks gestation)
   - Advanced respiratory support such as high-frequency ventilation and inhaled nitric oxide
   - Prompt and on-site access to a full range of paediatric medical subspecialties
   - Advanced imaging, with interpretation on an urgent basis, including computed tomography, magnetic resonance imaging, and echocardiography Paediatric surgical specialists and paediatric anaesthesiologists on- site or at a closely related institution to perform major surgeries such as ligation of patent ductus arteriosus and repair of abdominal wall defects, necrotising enterocolitis with bowel perforation, trachea-oesophageal fistula and/or oesophageal atresia and myelomeningocele

5. ***Level III C NICU*** has the capabilities of a Level III B NICU and which is located within an institution that has the capability to provide extracorporeal membrane oxygenation (ECMO) and surgical repair of complex congenital cardiac malformation that requires cardiopulmonary bypass.

# Appendix 2 Data Definitions

**DATA DEFINITIONS AND CRITERIA**

***Centre Name****:* Name of participating hospital

***Date of Admission (dd/mm/yy*)**: Date of first admission to the participating site

State if it is a new case, or a readmission and to specify the referring centre (*Referral from :*) if relevant.

**Case Status:**

***'New case':*** First time admission to the NNU concerned will be considered as a new case.

***'Readmission':*** Subsequent admission of the same baby to the same NNU within 44 weeks postconceptional age.

***'Previously admitted to another SDP':*** Case transferred from SDP hospital to another SDP hospital for first time.

State if it is admitted to neonatal ward/ admitted to neonatal ward as an abandoned baby.

## SECTION 1: Patient Particulars

1. ***Name of mother***: Name as in hospital record
2. ***Name of baby (optional)***: Name as in hospital record, if relevant
3. ***RN of baby****:* Registration Number at participating hospital. If the baby dies in Labour room and has no RN, then use the mother's RN.
4. ***a) Mother's I/C Number****:* MyKad number or Other ID document no. If "Other" please specify type of document.
   ***b) Baby's MyKid number:*** add number if available
5. ***a) Date of Birth****:* dd/mm/yy ***b) Time of Birth*****:** To state 24-hour format (mandatory for death cases) Estimate time of death if patient died at home and time accurately not known as in home delivery
6. ***Ethnic group***: Malay / Chinese / Indian / Orang Asli / Bumiputra Sabah / Bumiputra Sarawak / Other Malaysian (e.g. Punjabi, Eurasian or Serani) / Non-citizen (specific country). If Bumiputra Sabah or Bumiputra Sarawak, please specify the indigenous group.
7. ***Maternal Age****:* Age in completed years.
8. ***GPA***: Gravida, Para, Abortion (of current pregnancy before delivery of this child). To state number of ectopic pregnancies (Ectopic pregnancy also considered as an abortion).
9. ***Maternal Diabetes:*** State 'yes' or 'no' if mother had diabetes (regardless of whether it is gestational or pre-gestational) State 'unknown' if so
10. ***Maternal Hypertension:*** State 'yes' or 'no' if mother had hypertension (regardless of whether it is chronic or pregnancy induced) State 'unknown' if so

11. ***Maternal Chorioamnionitis:*** State 'yes' or 'no' if mother had chorioamnionitis. State 'unknown' if so.
12. ***Maternal Eclampsia:*** State 'yes' or 'no'. State 'unknown' if so.
13. ***Maternal Anaemia:*** State 'yes', 'no' or 'unknown'. Mother's Hb level < 11 g/dL or noted to have anaemia of pregnancy by O&G.
14. ***Maternal abruptio placenta:*** State 'yes' or 'no'.
15. ***Maternal bleeding placenta praevia:*** State 'yes' or 'no'.
16. ***Cord prolapse:*** State 'yes' or 'no'.

## SECTION 2: Birth History

17. ***Antenatal steroids****:* Corticosteroids given antenatal via any route to the mother at a time likely to enhance fetal lung maturation. Excludes steroids given for other reasons. State 'yes' if this has been given (regardless of number of doses or when it was given) or 'no' if this has not been given. If yes, state whether ONE or TWO doses given. State 'unknown' if so

18. ***Intrapartum antibiotics****:* Antibiotic treatment is provided to the mother within the period mother is in labour, with the intent of preventing infection of the fetus. This includes the prophylactic use of parenteral penicillin or ampicillin. State 'Yes' if systematic antibiotics (enteral or parenteral) were given to mothers in the 24 hours prior to delivery. State 'unknown' if so

19. ***Birth weight (grams)****:* The weight of the baby immediately following delivery recorded in grams to the nearest gram and measured within the first hour of life.

20. **a)** ***Gestation (weeks)****:* Best estimate of gestational age at birth given in full weeks. Preferences among estimates should be:

    1) obstetric estimate according to delivering obstetrician. (Ultrasound date selected if done earlier than 25 weeks and there is a discrepancy with the Last Menstrual Period (LMP) dates. Otherwise, use LMP dates.

    2) New expanded Ballard scoring. If there is no definite estimate but baby referred to as term baby, enter 40. Preferably insert the exact gestation for term infants – i.e. ranging from 37-41 weeks

    **b)** ***Gestational age based on:*** LMP, Ultrasound, Neonatal assessment or unknown – mandatory if patient died.

21. ***Growth status****:* based on Intrauterine Growth Curves (Composite Male / Female) chart. SGA <10$^{th}$ centile; AGA 10-90$^{th}$ centile; LGA >90$^{th}$ centile.

22. ***Gender***: Indicate Male, Female or Ambiguous/Indeterminate.

***23. Place of birth****:*

**Inborn** – born in the same hospital as the participating site. If born within the wards of participating hospital also considered as inborn. (unless in ambulance – born before arrival BBA as outborn)

**Outborn** – Born in another place (includes BBA) and transferred after birth to NNU of the participating site. Includes those born in hospital compound but not wards.

- Home
- Health Clinic
- Government Hospital with specialist – General/District
- Government Hospital without specialist
- University Hospital
- Private Hospital/maternity home<50 beds with/without specialist
- Private Hospital/maternity home>50 beds
- Alternative Birthing Centre (ABC) – Urban/Rural
- Enroute / During transport
- Others _ _(please specify)
- Unknown

***24. Multiplicity****:* To indicate as singleton, twins, triplets or others i.e. quadruplets, etc. If the baby is other than singleton, specify birth order e.g. if baby is twin 1 – fill in "01". For triplet three, fill "03". This together with mother's IC no. will act as unique identifier.

***25. Final Mode of Delivery****:* Tick as relevant. All caesarians are considered as such without differentiation into upper or lower segment. For breech presentation in caesarian sections, tick Caesarian only.
Tick as 'emergency' if there is a reason for the Caesarian section that has an emergency indication, not whether it is listed as 'semi emergency' or 'emergency' in the OT list.

***26. Apgar Score at 1 min and 5 min:*** A numerical score of the condition of newborn at 1 min and 5 min after birth based on heart rate, colour, respiratory effort, muscle tone and reflex irritability. Enter the Apgar score at 1 min and 5 min as noted in the labour and delivery record. Score even if baby was intubated by 5 minutes of life. Tick 'unknown' if so, not because it was not scored once baby intubated. Apgar score can be '0' at 1 minute & 5 minutes.

***27. Initial Resuscitation (for inborn babies only):*** Tick 'Yes' for all intervention that apply at birth for inborn cases only

a) Oxygen
b) CPAPA
c) Bag-mask ventilation
d) Endotracheal Tube Ventilation
e) Cardiac Compression
f) Adrenaline

***28. a) Plastic wrap at birth :*** Yes /No ( for < 1000 gm)
***b) If yes: was baby wrapped without drying at birth***: Yes /No

c) ***Admission Temperature:*** Indicate the first temperature (axillary) on admission to one decimal point in degree Celsius. Mandatory field for admission to Neonatal Ward. Does not include babies who die in delivery room.

## SECTION 3: Neonatal Events

29. ***Respiratory support***: Tick 'Yes' if any respiratory support was given

    a) CPAP – Continuous Positive Airway Pressure. Early CPAP – given during initial stabilization at birth

    b) High flow nasal cannula (HFNC)

    c) Conventional Ventilation – intermittent positive pressure ventilation through an endotracheal tube a conventional ventilator (IMV rate < 240/min) at any time after leaving the delivery room.

    d) HFJ/ HFOV – High frequency ventilation

    e) Nitric oxide – delivered as a gas via a ventilator at any time after leaving the delivery room.

30. ***Total number of days on ventilation support at your centre***: Total number of days on conventional ventilation and high frequency ventilation. Do not include days on CPAP of HFNC.

31. ***Surfactant***: A dose of any type of exogenous surfactant was used to treat the baby. Indicate whether exogenous surfactant given or not. If 'yes' indicate whether given at < 1 hour, 1 -2 hours or > 2 hours postnatal age.

32. ***Parenteral Nutrition***: Intravenous infusion of a nutrient solution consisting of a minimum of dextrose and protein but generally providing a complete nutrient infusion including electrolytes, calcium, phosphorus, zinc, trace elements, vitamins and fat. Nutrition given intravenously. Parenteral nutrition must include amino acids with or without fats, hence plain dextrose saline infusion in not parenteral nutrition.

## SECTION 4: Problems / Diagnoses

Mandatory fields are included for some diagnoses/procedures that are very important in the care of VLBW and sick infants. Definitions of these conditions are as shown below (AFTER SECTION 5). Other diagnoses or problems not given in the list can be referred to 'WHO 1992 ICD-10; Volume 1 document' and to be written in the space provided under '*Others'.*

**NA in the CRF means data is not applicable or not available. There should not be too many 'Not available' data**

## SECTION 5: Outcome

***47a. Date of discharge/transfer/death****:* Enter the exact date

***47b. Time of death:*** State as 24-hour format – used to auto calculate age at discharge. Mandatory for death cases – give best-estimated time if of death if exact time not known.

***48. Weight (grams) and growth status on discharge/ death:***

a) Weight in grams. For weight on death is the last weight taken when the baby was alive
b) Indicate growth status as per Intrauterine Growth Curves (Composite Male / Female)

***49. Exclusive breastfeeding at discharge : Tick yes/no***

***50. Total Duration of hospital stay (Neonatal/Paeds Care)***: State to next complete day i.e. < 24 hours is 1 day and 10 days 6 hours is 11 days.

***51. Outcome****:* Alive or Dead – Alive at discharge or died before discharge.

***If child alive, state Place of discharge to*****:** Home, Other Non-Paeds Ward, Social Welfare home 'Still hospitalised as of 1st birthday' or 'Transferred to other hospitals'. If transferred to other hospitals, specify the name of hospital transferred to.

If a case is transferred to another hospital in the MNNR network, complete the CRF up to current status and send photocopy of the form with the baby to assist the referral hospital in obtaining the patient particulars and birth history. The referring hospital still need to key in the original form into the system. The referral centre will open and complete a new CRF and this will be analysed together with the CRF of the referring hospital.

***Post- transfer disposition***: **If the case is transferred to another hospital out of the NNR network,** the referring unit **must get the final 'outcome' of the baby** from the unit that the case was referred to. Click "still in the ward" if patient is still hospitalized in the non-NNR hospital at close out. **ROP findings after discharge can also be updated in the ROP section.**

**If child died, tick 'Yes' or 'No' whether the infant died within 12 hours or less from the time of admission to the NICU.**

**Place of Death:** Labour Room/OT, In Transit Neonatal Unit or others, specify.

**SUPPLEMENTARY FORM**

**Filled whenever there is neonatal death in accordance to the Modified Wigglesworth Classification of Perinatal Mortality:**

An additional data to that collected in the main CRF for neonatal deaths.

1. ***Centre' Name:*** State name of reporting hospitals
2. ***Name:*** State mother's name
3. ***RN of baby:*** RN at participating hospital. If the baby dies in Labour Room and has no RN, use mother's RN.
4. ***Mother's new IC number or passport:*** whichever applicable

**Immediate Cause of Death (Modified Wigglesworth):**

**(Adapted *from Garis panduan Penggunaan Format PNM 1/97 (Pindaan 2000) bagi Melapor Kematian Perinatal*, Jun 2000, Bahagian Pembangunan Kesihatan Keluarga, Kementarian Kesihatan Malaysia)**

***a. Lethal Congenital Malformation (LCM)/defect***
Severe or lethal malformation that contribute to death. If 'Yes', tick specifically the cause of death.

***b.*** If no LCM, is baby preterm?

***c.*** Gestation < 37 weeks (Preterm death without LCM) due to: This includes only livebirths less than 37 weeks gestation after excluding LCM. Tick the immediate secondary cause of death e.g. severe IVH, pulmonary haemorrhage, acute intrapartum event ("asphyxia"). Tick "extreme prematurity" in the subcategory only for babies less than 28 weeks only who died and no immediate secondary cause of death eg. as in palliative care

Gestation ≥ 37 weeks (did the baby had an was there an Asphyxial condition? All term babies who die from birth asphyxia or meconium aspiration syndrome or PPHN.

***d. If term and no asphyxia conditions, was there Infection?***
This refers to term babies (> 37 weeks gestation) whose primary cause of death is an infection. Some examples include meningitis, group B streptococcal infection, intrauterine infections etc.

***e. If term and infection present, tick organism***

***f. If term and infection absent, are they any other specific causes of death?***
Specify any other cause of death not included in the above classification. This includes kernicterus, haemorrhagic shock /inborn error of metabolism/pneumothorax/ pulmonary haemorrhage. Use ICD 10 code

***g. Unknown***
Where cause of death is not known.

**DEFINITIONS OF CERTAIN SPECIFIED DIAGNOSES**

(Modified from ICD 10)

| Diagnosis | Definition |
|---|---|
| Respiratory | |
| Meconium aspiration syndrome | Tick 'yes' if all 5 criteria are satisfied:<br>a. Presence of meconium stained amniotic fluid at birth<br>b. Respiratory distress onset within 1 hour of birth. Respiratory distress defined as presence of one of the following signs: tachypnoea, grunting, nasal flaring, or intercostal retraction.<br>c. $PaO_2$ < 50 mmHg in room air, central cyanosis in room air or requirement for supplemental $O_2$ to maintain a $PaO_2$ > 50 mmHg<br>d. Abnormal CXR compatible with meconium aspiration: Findings may include coarse irregular or nodular pulmonary densities, areas of diminished aeration or consolidation alternating with area of hyperinflation, or generalized hyperinflation.<br>e. Absence of culture proven early onset bacterial sepsis or pneumonia (i.e. negative blood culture within 72 hours of birth). |
| Pulmonary haemorrhage | Originating in the perinatal period (as diagnosed clinically by pink or red frothy liquid draining from mouth or arising from the trachea between the vocal cord or suctioned through the endotracheal tube. (Diagnosis may also be made on autopsy finding of haemorrhage in the lungs). |
| Congenital Pneumonia | Infection of the lungs acquired prepartum, intrapartum, at birth or after birth. (Diagnosed with / without cultures). Diagnosis made clinically and supported by CXR findings. |
| Nosocomial pneumonia | Infection of the lungs acquired after admission to the ward. |
| Community acquired pneumonia | Infection of the lungs acquired after discharge home |

| | |
|---|---|
| Transient Tachypnoea of Newborn | Benign disease of near-term, term or large premature infants with respiratory distress shortly after delivery resolving within 3 days. |
| Pulmonary Interstitial Emphysema | Dissection of air into the perivascular tissues of lung from alveolar overdistention or overdistention of smaller airways evident on CXR as linear or cast like lucencies with a history of requiring increasing ventilatory support. |
| Respiratory distress syndrome (RDS). | Defined as: within the first 24 hours of life,<br>A. $PaO_2$ < 50mmHg in room air, central cyanosis in room air, or a requirement for supplemental $O_2$ to maintain a $PaO_2$ > 50mmHg<br>AND<br>B. A chest radiograph consistent with RDS (low lung volumes and reticulogranular appearance to lung fields, with or without air bronchograms) |
| Pneumothorax | Presence of extrapleural air diagnosed by chest radiograph or needle aspiration (thoracocentesis).<br><br>For infants who had thoracic surgery and a chest tube placed at the time of surgery OR if free air was only present on a CXR taken immediately after thoracic surgery and was not treated with a chest tube, tick **'No'**.<br><br>For infants who had thoracic surgery and then later developed extra pleural air diagnosed by CXR or needle thoracocentesis, tick **'Yes'**.<br><br>**Indicate whether pneumothorax developed during CPAP, Conventional ventilation or HFV.** |
| Supplemental oxygen & BPD<br><br>Tick "yes" if the baby received continuous oxygen concentration > 21% for at least 28 continuous days (note not "till 28 days of life"). Otherwise tick "no".<br><br>For babies < 32 weeks – state if $O_2$ / any form of CPAP or ventilatory support required at 36 weeks corrected gestation.<br><br>For babies ≥ 32 weeks - state if $O_2$ / any form of CPAP or ventilatory support required at Day 56. | Receipt of continuous enriched oxygen concentration > 21% by oxyhood, nasal cannula, nasal catheter, facemask or still requiring nCPAP or other forms of respiratory support by Day 28 and 36 weeks or day 56.<br><br>'Continuous' means that the patient is receiving oxygen throughout the time period and not just in brief episodes as needed i.e. during feeds. 'Blow-by' oxygen dose not counted unless it is the mode of oxygen administration used in a transport situation. Do not score oxygen given as part of a hyperoxia test. |

| | |
|---|---|
| Cardiovascular<br>a. Persistent Pulmonary Hypertension (PPHN)<br><br><br><br>b. Heart failure | Definitive diagnosis of PPHN is made by echocardiography. In the absence of echo confirmation, pre and postductal pulse oxymetry difference of > 10% can be used. Preductal pulse oxymetry done on the right hand and post ductal pulse oxymetry done on lower limbs.<br><br>Failure of the heart to pump characterized by tachypnea, tachycardia, feeding difficulties, hepatic enlargement, and cardiomegaly. |
| Patent ductus arteriosus (PDA) | Clinical evidence of left to right PDA shunt documented by continuous murmur, hyperdynamic precordium, bounding pulses, wide pulse pressure congestive heart failure, increased pulmonary vasculature or cardiomegaly by CXR, and/or increased $O_2$ requirement or ECHO evidence of PDA with documentation of left to right ductal shunting.<br><br>If ticked 'Yes', indicate whether ECHO was done and whether pharmacological closure (indomethacine/ibuprofen/paracetamol) or ligation was given or not. |
| Necrotising enterocolitis (NEC)<br>(Stage 2 and above)<br><br><br><br>If 'yes' and managed surgically, tick 'Surgical Treatment'<br><br>NEC present before admission to your centre? (applies to outborn babies) | ***Definition for NEC stage 2 and above :***<br>1 Diagnosis at surgery or post mortem, or<br>2 **Radiological diagnosis, a clinical history plus**<br>• pneumatosis intestinalis, or<br>• portal vein gas,<br>3 Clinical diagnosis, a clinical history plus abdominal wall cellulitis and palpable abdominal mass.<br><br>NEC according to Bell's criteria stage 2 or higher<br><br>**Stage 1:** Suspect (History of perinatal stress, systemic signs of ill health i.e. temperature instability, lethargy, apnoea, GIT manifestations i.e. poor feeding, increased volume of gastric aspirate, vomiting, mild abdominal distension, faecal occult blood with no anal fissure).<br><br>**Stage 2:** Confirmed (Any features of stage 1 plus persistent occult or gastrointestinal bleeding, marked abdominal distension, abdominal radiograph, intestinal distension, bowel wall oedema, unchanging bowel loops, pneumatosis intestinalis, portal vein gas).<br><br>**Stage 3:** Advanced (Any features of stages 1 or 2 plus: deterioration in vital signs, evidence of shock or severe sepsis, or marked gastrointestinal |

| | |
|---|---|
| | haemorrhage, or abdominal radiograph shows any features of stage 2 plus pneumoperitoneum). |
| Retinopathy of prematurity (ROP)<br><br>Maximum stage of ROP in left/right eye as defined by the International Committee on ROP (ICROP).<br>Score according to the grade of ROP assigned on an eye exam done by an ophthalmologist (e.g. threshold).<br><br>If there is no explicit grade listed, then score according to the descriptions given by the ICROP. (e.g. threshold).<br><br>Tick 'Yes' if a retinal exam was done.<br>State exact date of first screening and post conceptional age at screening.<br>Specify only the worst stage**. Also tick if PLUS disease present**<br><br>State if laser, cryotherapy, intravitreal anti VEGF or vitrectomy was done.<br><br>If screening was not done, state 'No' and indicates whether an appointment for retinal examination was given, if applicable.<br><br>State "date of appointment" or "date of first screening" section and postconceptional age will be autocalculated<br><br>ROP present prior to admission? (applies to outborn babies)<br><br>To trace back the outcome of ROP screening on first screening if done after<br><br>Tick "Not applicable" if does not fulfill criteria | Criteria for screening for ROP are for babies with birth weight < or equal 1500 grams OR gestational < 32 weeks, as well as all preterm babies whose clinical course places them at increased risk for ROP as determined by the attending doctor.<br>If an indirect ophthalmologic examination was performed at any time, enter the worst stage documented:<br><br>No ROP : No Evidence of ROP<br>Stage 1 : Demarcation Line<br>Prethreshold ROP ("Prethresh")<br>Threshold ROP ("Thresh")<br>Stage 4 : Partial Retinal Detachment<br>Stage 5 : Total retinal detachment<br><br>PLUS disease : dilated veins and tortuous arteries, papillary rigidity (must also include stages other than No ROP) |
| Intraventricular haemorrhage (IVH)<br><br>Tick 'Yes' if IVH is seen and enter the worst grade before or on 28 days of life.<br><br>State if VP shunt/reservoir was inserted | If ultrasound of brain done, enter the worst grade:<br><br>**Grade 1:** Subependymal germinal matrix (GM) haemorrhage only<br>**Grade 2:** IVH without ventricular dilation<br>**Grade 3:** IVH with ventricular dilation |

| | |
|---|---|
| Tick 'No; if no IVH before or day 28<br>Tick 'Not Applicable' for term infant<br>Tick "Ultrasound not done" if it was not done. | **Grade 4:** IVH with parenchymal involvement |
| Central venous line<br><br>a. Central line - yes or no<br>Date of insertion<br>Date of removal (autocalculate)<br><br><br><br><br><br><br>b. CLABSI | If more than one central line, use data of the central line with the longest duration<br><br>Central line defined as:<br>(1) Umbilical catheters.<br>(2) Percutaneously inserted central catheters.<br>(3) Surgically placed Broviac catheter that terminates at or close to the heart or in one of the great vessels. Aorta, superior vena cava, brachiocephalic veins, internal jugular veins, subclavian veins, inferior vena cava, external iliac veins and common femoral veins are considered great vessels for this study.<br><br>CLABSI defined as clinical sepsis with positive blood culture in patient with **ALL** of the following:<br>a. central line in place for at least 48 hours, or within 48 hours after removal<br>b. no other apparent source of infection<br>c. two positive cultures of the same organism from different sites if the organism is a common skin organism (to differentiate from skin contaminant) |
| Confirmed sepsis<br><br>Tick 'Yes'if there is evidence of confirmed sepsis.<br><br>Do not include presumed or clinical sepsis.<br><br>State whether the onset of first confirmed sepsis was On or before 72 hours of life OR after 72 hours of life.<br><br>State the organism cultured:<br>• Group B streptococcus<br>• MRSA<br>• CONS (see definition)<br>• Staphylococcus aureus<br>• Klebsiella | ***Confirmed sepsis***<br>Clinical evidence of sepsis plus blood culture-proven infection.<br><br>For CONS:<br>Place a tick if the infant has ALL 3 of the following:<br>1. CONS is recovered from a blood culture obtained from either a central line, or a peripheral blood sample AND<br><br>2. Signs of generalized infection (such as apnoea, temperature instability, feeding intolerance, worsening respiratory distress or haemodynamic instability) AND<br><br>3. Treatment with 5 or more days of IV antibiotics after the above cultures were obtained. If the patient died, was |

| | |
|---|---|
| • Pseudomonas<br>• Acinetobacter<br>• Fungal (see definition)<br>• Others, specify<br>• ESBL organisms | discharged, or transferred prior to completion of 5 days or more of IV antibiotics, this condition would still be met if the intention were to treat for 5 or more days.<br>Do not place a tick if any or all of the above are not true.<br><br><u>For FUNGAL infection</u>:<br>Place a tick only if a fungus recovered from a blood culture obtained from either a central line or peripheral blood sample after day 3 of life. |
| Neonatal meningitis<br><br>Tick 'yes' (if CSF biochem or cytology suggestive even if CSF C&S is negative) or 'no'<br><br>If yes, State if CSF Culture positive **- Yes / No**<br><br>State the organism cultured:<br>• Group B streptococcus<br>• MRSA<br>• CONS (see definition)<br>• Staphylococcus aureus<br>• Klebsiella<br>• Pseudomonas<br>• Acinetobacter<br>• Fungal (see definition)<br>• Others, specify<br>• ESBL organisms | Signs of clinical sepsis and evidence of meningeal infection as shown in cerebrospinal fluid findings (i.e. cytology, biochemistry or microbiologic findings). |
| Hypoxic ischaemic encephalopathy (HIE)<br><br>**Applies only to gestation ≥ 35 weeks** | HIE requires the presence of all 3 of the following criteria:<br><br>1. Presence of a clinically recognized encephalopathy within 72 hours of birth. Encephalopathy is defined as the presence of 3 or more of the following findings within 72 hours after birth: |

| | |
|---|---|
| | a. Abnormal level of consciousness: hyperalertness, lethargy, stupor or coma<br>b. Abnormal muscle tone: hypertonia, hypotonia or flaccidity<br>c. Abnormal deep tendon reflexes: increased, depressed or absent<br>d. Seizures: subtle, multifocal or focal clonic<br>e. Abnormal Moro reflex: exaggerated, incomplete or absent<br>f. Abnormal suck: weak or absent<br>g. Abnormal respiratory pattern: periodic, ataxic or apnoeic<br>h. Oculomotor or papillary abnormalities: skew deviation, absent or reduced Doll's eye or fixed unreactive pupils<br><br>**AND**<br><br>2. Three or more supporting findings from the following list:<br>a. Arterial cord pH<7.00<br>b. Apgar score at 5 minutes of 5 or less<br>c. Evidence of multi-organ system dysfunction – dysfunction of one or more of the following systems within 72 hours of birth<br>d. Evidence of foetal distress on antepartum monitoring: persistent late decelerations, reversal of end-diastolic flow on Doppler flow studies of the umbilical artery or a biophysical profile of 2 or less<br>e. Evidence of CT, MRI, technetium or ultrasound brain scan performed within 7 days of birth of diffuse or multifocal ischaemia or of cerebral oedema.<br>f. Abnormal EEG: low amplitude and frequency, periodic, paroxysmal or isoelectric.<br><br>**AND**<br><br>3. The absence of an infectious cause, a congenital malformation of the brain or an inborn error of metabolism, which could explain the encephalopathy. |

| | |
|---|---|
| HIE severity<br><br>If the infants diagnosed with HIE, record the worst stage observed during the first 7 days following birth based on the infant's level of consciousness and response to arousal maneuvers such as persistent gentle shaking, pinching, shining a light or ringing of a bell:<br><br>Tick "none" if there is no HIE<br><br>Tick '"Mild, Moderate, Severe " according to the definition<br><br>45a. Tick "none" if there is no HIE Tick '"Mild, Moderate, Severe " according to the definition<br><br>45b. Highest Thompson Score before 6 hours of life<br><br>45c. Cooling therapy<br><br>45d. Seizures in HIE cases | *HIE severity*<br><br>a. Mild (normal or hyperalert) – infants in this category are alert or hyperalert with either a normal or exaggerated response to arousal. No seizures (Sarnat Stage 1)<br>b. Moderate (lethargic or stupor) – infants in this category are arousable but have a diminished response to arousal maneuvers. Such babies frequently have seizures (Sarnat Stage 2)<br>c. Severe (deep stupor or coma) – infants in this category are not arousable in response to arousal maneuvers. (Sarnat Stage 3)<br><br>Insert highest score<br><br>Yes/ No if yes , completed 72 hours yes no If yes : cooling blanket or cap / passive cooling plus or minus gel pack / both<br><br>Yes / No |
| Major Congenital Abnormalities<br><br>Tick 'Yes ' if major congenital anomaly is present even if it is an isolated one (i.e. only one abnormality)<br><br>If Yes, state:<br>1. 'Known Syndrome',<br>2. 'Not a Recognised Syndrome'<br>3. 'Isolated major abnormality'<br><br>If the syndrome is known, tick the specify syndromes or specify it.<br><br>Types of Abnormalities:<br>**Tick all major abnormalities found for recognisable syndrome, non-recognisable ones or isolated major congenital abnormality** | A major congenital abnormality is defined as any abnormality of prenatal origin that if uncorrected or uncorrectable, significantly impairs normal physical or social function or reduce normal life expectancy<br><br>Any abnormalities of prenatal origin that are present at birth, and do not have surgical, medical or cosmetic importance at the time of examination during the newborn period is a minor congenital abnormality and NOT included in this registry. Examples include isolated findings such as 'low-set ears', sacral dimple or single transverse palmar crease".<br><br>For congenital heart disease,<br>Type Operation yes or no<br>Age of operation _____ (days) |

**Malaysian National Neonatal Registry**

2-7, Medical Academies of Malaysia
210 Jln Tun Razak
50400 Kuala Lumpur

Telephone: 016– 270 4505
03- 4023 4505
Fax : 03- 4023 4505

| | | | | | |
|---|---|---|---|---|---|
| i. Hospital: | | | | | |
| ii. Month: | | iii. Year: | | | |
| iv. Total Births: | | v. Live Births: | | vi. Still Births: | |

## SECTION 1: DELIVERIES VERSUS BIRTH WEIGHT

| Birth Weight (grams) | No. of Still Births | No. of Live Births | No. Admitted to Neonatal Unit | No. who died in delivery room |
|---|---|---|---|---|
| < 500 | | | | |
| 500 | | | | |
| 501 - 600 | | | | |
| 601 - 700 | | | | |
| 701 - 800 | | | | |
| 801 - 900 | | | | |
| 901 - 999 | | | | |
| 1000 | | | | |
| 1001 - 1250 | | | | |
| 1251 - 1499 | | | | |
| 1500 | | | | |
| 1501 - 2000 | | | | |
| 2001 - 2500 | | | | |
| > 2500 | | | | |
| TOTAL | | | | |

## SECTION 2: BIRTH VERSUS GESTATION WEEKS

| Gestation (weeks) | No. of Still Births | No. of Live Births | No. Admitted to Neonatal Unit | No. who died in delivery room |
|---|---|---|---|---|
| <22 | | | | |
| 22-24 | | | | |
| 25 | | | | |
| 26 | | | | |
| 27 | | | | |
| 28 | | | | |
| 29 | | | | |
| 30 | | | | |
| 31 | | | | |
| 32 | | | | |
| 33 | | | | |
| 34 | | | | |
| 35 | | | | |
| 36 | | | | |
| 37-40 | | | | |
| > 40 | | | | |
| TOTAL | | | | |

## SECTION 3: BIRTH VERSUS MODE OF DELIVERY

| Mode of Delivery | No. of Still Births | No. of Live Births | No. Admitted to Neonatal Unit | No. who died in delivery room |
|---|---|---|---|---|
| SVD | | | | |
| Breech | | | | |
| Forceps | | | | |
| Ventouse | | | | |
| LSCS Elective | | | | |
| LSCS Emergency | | | | |
| **TOTAL :** | | | | |

## SECTION 4: BIRTHS VERSUS ETHNIC GROUP

| Ethnic Group | No. of Still Births | No. of Live Births | No. Admitted to Neonatal Unit | No. who died in delivery room |
|---|---|---|---|---|
| Malay | | | | |
| Chinese | | | | |
| Indian | | | | |
| Orang Asli | | | | |
| Bumiputera Sabah specify ethnic group: _____ | | | | |
| Bumiputera Sarawak specify ethnic group: _____ | | | | |
| Foreigner | | | | |
| Other Malaysian: _____ | | | | |
| **TOTAL :** | | | | |

| | |
|---|---|
| **1. Remarks:** | |
| **2. Name of Site Coordinator:** | |
| **3. Chop:** | |
| **4. Date:** | ☐☐ / ☐☐ / ☐☐ |

*i. Birth census should be sent together with the tracking forms and the completed CRFs of discharges for the month by the end of the following month*

*ii. Sample of tracking form are as follows*

Copy For NNR

# MALAYSIAN NATIONAL NEONATAL REGISTRY (CRF 2017)

| | | |
|---|---|---|
| **Centre Name:** | ○ New Case<br>○ Readmission<br>○ Transfer from another SDP Hospital or IJN: | **MNNR No. (Office use):** ____ / ____<br>**Centre:** ____ |
| **Date of Admission:** ____ (dd/mm/yy) | | |

**Admitted to neonatal ward:** ○ Yes → (Proceed to complete ALL sections in this CRF) ○ No → (Proceed to complete Section 1, 2 [without No.28], 4[No.47 only] and 5)

☐ Abandoned baby → (if this box is ticked, item No. 1, No. 4a, No. 6 to No.16 are not mandatory)

***Instruction: Where check boxes ☐ are provided, ticked (√) one or more boxes. Where radio buttons ○ are provided, ticked (√) one box only.***

## SECTION 1 : PATIENT PARTICULARS & MATERNAL HISTORY

| | |
|---|---|
| ***1. Name of mother:** | |
| **2. Name of baby** (Optional): | |
| ***3. RN of baby:** | |
| ***4a. Mother's I/C number:** | MyKad: ____ - ____ - ____<br>Other ID document No: ____<br>Specify document type (if others): ○ Passport ○ Armed Force ID ○ Driver's License ○ Old IC ○ Hospital RN ○ Father's I/C ○ Work Permit number ○ Police ID Card ○ Immigration permit ○ Other, specify:..... |
| **4b. Baby's MyKid number:** | ____ - ____ - ____ |
| ***5a. Date of birth of baby:** (dd/mm/yy) | ____ / ____ / ____ **5b. Time of birth:** (24 hour format. Enter the best estimated time of birth if the exact time unknown) ____ |
| ***6. Ethnic group of Mother:** | ○ Malay ○ Indian ○ Bumiputra Sabah, specify:..... ○ Other, Malaysian<br>○ Chinese ○ Orang Asli ○ Bumiputra Sarawak, specify:..... ○ Non-citizen, specify country..... |
| ***7. Maternal age:** | ____ |
| ***8. GPA:** (current pregnancy before delivery of this child) | ***Gravida:** ____ ***Parity:** ____ ***Abortion:** ____ |
| ***9. Maternal diabetes (including gestational diabetes):** | ○ Yes ○ No ○ Unknown |
| ***10. Maternal hypertension, chronic pregnancy included:** | ○ Yes ○ No ○ Unknown |
| ***11. Maternal Eclampsia:** | ○ Yes ○ No ○ Unknown |
| ***12. Maternal Chorioamnionitis:** | ○ Yes ○ No ○ Unknown |
| ***13. Maternal Anaemia:** ( <11g/dL) | ○ Yes ○ No ○ Unknown |
| ***14. Maternal abruption placenta:** | ○ Yes ○ No ○ Unknown |
| ***15. Maternal bleeding placenta praevia:** | ○ Yes ○ No ○ Unknown |
| ***16. Cord prolapse:** | ○ Yes ○ No ○ Unknown |

## SECTION 2 : BIRTH HISTORY

| | |
|---|---|
| ***17. Antenatal steroid:** | ○ Yes → ○ 1 dose ○ 2 doses ○ No ○ Unknown |
| ***18. Intrapartum antibiotic:** | ○ Yes ○ No ○ Unknown |
| ***19. Birth weight:** | ____ (grams) |
| ***20a.Gestation:** | ____ ( weeks) ***20b.Gestational age based on: (if patient died)** ○ LMP ○ Ultrasound ○ Ballard Score ○ Unknown |
| ***21. Growth status:** | ○ SGA ○ AGA ○ LGA |
| ***22. Gender:** | ○ Male ○ Female ○ Ambiguous / Indeterminate |
| ***23. Place of birth:** | ○ Inborn<br>○ Outborn → ○ Home ○ Health Clinic ○ Private Hospital ○ Government hospital with specialist ○ District ○ General ○ Government hospital without specialist ○ University hospital ○ Enroute / during transport ○ Maternity home with specialist ○ Maternity home without specialist ○ Alternative Birthing centre (ABC) ○ Urban ○ Rural ○ Others / specify..... ○ Unknown |
| ***24. Multiplicity:** | ○ Singleton ○ Twin ○ Triplet ○ Other, specify: ..... Specify birth order if not a singleton: ____ |
| ***25. Final Mode of delivery:** | ○ Vaginal delivery → ○ SVD ○ Breech<br>○ Instrumental → ☐ Vacuum ☐ Forceps<br>○ Caesarean section → ○ Elective ○ Emergency<br>○ Others, specify:.....<br>○ Unknown |

## SECTION 2 : BIRTH HISTORY (continue)

| | | | | |
|---|---|---|---|---|
| *26. Apgar score at 1 min and 5 min ( 0-10) | a) Score at 1 min: | ☐ Unknown | b) Score at 5 min: (Please score even if the baby is intubated) | ☐ Unknown |
| 27. Initial resuscitation: (applicable for inborn only) | a) Oxygen: | ○ Yes ○ No | d) Endotracheal tube vent: | ○ Yes ○ No |
| | b) Early CPAP : | ○ Yes ○ No | e) Cardiac compression: | ○ Yes ○ No |
| | c) Bag and mask ventilation: | ○ Yes ○ No | f) Adrenaline: | ○ Yes ○ No |
| *28. Admission temperature: (mandatory if admitted to Neonatal ward) | ☐☐ . ☐ (°C) | | | |

## SECTION 3: NEONATAL EVENT

*29. Respiratory support:

If < 12 hours = state 0.5 days

If > 12 to 24 hours = state 1 day

If > 24 hours = state to next completed days

Complete entry a) to d) for each type of respiratory support given

○ Yes → ○ No

| | | |
|---|---|---|
| a) CPAP done? | ○ Yes ○ No → ii) Total duration of CPAP at your centre: | ☐☐ . ☐ Day (s) |
| b) High flow nasal cannula (HFNC): | ○ Yes ○ No → i) Total duration of HFNC at your centre: | ☐☐ . ☐ Day (s) |
| c) Conventional ventilation: | ○ Yes ○ No → i) Total duration of Conventional ventilation at your centre : | ☐☐ . ☐ Day (s) |
| d) HFJV/HFOV: | ○ Yes ○ No → i) Total duration of HFJV//HFOV at your centre: | ☐☐ . ☐ Day (s) |
| e) Nitric Oxide: | ○ Yes ○ No → i) Total duration of Nitric Oxide at your centre: | ☐☐ . ☐ Day (s) |

*30.Total number of days on ventilation support at your centre: ☐☐☐ . ☐ (autocalculate)

*31. Surfactant: ○ Yes → ○ < 1 hr ○ 1-2 hrs ○ > 2 hrs ; ○ No

*32. Parenteral nutrition: ○ Yes ○ No

## SECTION 4: PROBLEMS/ DIAGNOSES

33. Respiratory: ☐ Meconium aspiration syndrome ☐ Pulmonary haemorrhage ☐ Congenital pneumonia ☐ Community acquired pneumonia ☐ Transient tachypnoea of newborn ☐ Pulmonary interstitial emphysema ☐ Nosocomial pneumonia

*34. RDS: ○ Yes ○ No

*35. Pneumothorax: ○ Yes → Pneumothorax developed during: ○ Spontaneous ○ CPAP ○ CMV ○ HFV ; ○ No

*36. Supplemental oxygen and BPD:

a) Is baby on > 21% oxygen continuously for 28 days or more? ○ Yes ○ No

b) If Yes
- (i) for < 32 weeks GA, baby still on oxygen , CPAP or other forms of respiratory at 36 weeks ○ Yes ○ No
- (ii) for >= 32 weeks GA, baby still on oxygen , CPAP or other forms of respiratory support at at day 56 ○ Yes ○ No

*37. CVS : *37a. PPHN : ○ Yes ○ No *37b. Heart Failure : ○ Yes ○ No

*38. PDA: ○ Yes → ○ No

| | | |
|---|---|---|
| a) ECHO done: | ○ Yes ○ No | |
| b) Pharmacological closure | ○ Yes ○ No → If Yes then to choose | ☐ Indomethacin ☐ Ibuprofen ☐ Paracetamol |
| c) Ligation: | ○ Yes ○ No | |

*39. NEC (stage 2 and above): ○ Yes → ○ No

| | |
|---|---|
| a) surgical treatment: | ○ Yes ○ No |
| b) NEC present before admission to your centre: (for outborn baby only) | ○ Yes ○ No |

*40. ROP Retinal Exam Done

< 33 weeks OR ≤ 1500g - option 'Not Applicable' will be auto blocked

> 32 weeks AND >1500g: option 'Yes' & 'No' will be auto blocked

○ Yes → (If yes, worst stage of ROP):

| | |
|---|---|
| a) Date of first screening: | ☐☐ / ☐☐ / ☐☐ |
| b) Post conceptional age at 1st screening: | ☐☐ (autocalculate) |
| c) ○ No ROP ○ Stage 1 ○ Prethresh ○ Thresh ○ Stage 4 ○ Stage 5 ☐ PLUS disease | |
| d) Laser Therapy: | ○ Yes ○ No |
| e) Cryotherapy: | ○ Yes ○ No |
| f) Vitrectomy/AntiVEGF: | ○ Yes ○ No |
| g) ROP present prior to admission? (for outborn baby only) | ○ Yes ○ No |

○ No → ○ Not Applicable

| | |
|---|---|
| Appointment given: | ○ Yes ○ No |
| Date of appointment: | ☐☐ / ☐☐ / ☐☐ |

## SECTION 4: PROBLEMS/ DIAGNOSES (continue)

***41. IVH:**

○ Yes *If yes, worst grade:* → ○ Grade 1 ○ Grade 2 ○ Grade 3 ○ Grade 4

☐ VP shunt/ reservoir insertion

○ No
○ Not applicable (term infant)
○ Ultrasound not done

***42a. Central Venous Line** (applies to the catherer in situ for the longest duration)

i. ○ Yes ○ No

ii. Date of insertion: ☐☐ / ☐☐ / ☐☐

Date of removal: ☐☐ / ☐☐ / ☐☐

Duration of central line (autocalculate) : _____days

**42b. CLABSI**

○ Yes ○ No

***43. Confirmed sepsis:**

**(Blood culture positive only)**

○ Yes ○ No

☐ ≤ 72 hours of life

II) **Type of organism** (can tick more than one)

☐ Group B Steptococcus ☐ Staphylococcus aureus ☐ Acinetobacter ☐ ESBL organisms

☐ MRSA ☐ Klebsiella ☐ Fungal ☐ E.Coli

☐ CONS ☐ Pseudomonas ☐ Serratia ☐ Others, specify:.....

☐ ≥ 72 hours of life

II) **Type of organism** (can tick more than one)

☐ Group B Streptococcus ☐ Staphylococcus aureus ☐ Acinetobacter ☐ ESBL organisms

☐ MRSA ☐ Klebsiella ☐ Fungal ☐ E.Coli

☐ CONS ☐ Pseudomonas ☐ Serratia ☐ Others, specify: .....

***44. Neonatal meningitis:**

○ Yes ○ No

**CSF Culture positive :** ○ Yes ○ No

**II) If Yes, type of organism:** (can tick more than one)

☐ Group B Steptococcus ☐ Staphylococcus aureus ☐ Acinetobacter ☐ ESBL organisms

☐ MRSA ☐ Klebsiella ☐ Fungal ☐ E.Coli

☐ CONS ☐ Pseudomonas ☐ Others , specify :.....

*** 45. HIE :**
**(Only for ≥ 35 weeks GA)**

a ) HIE severity: ○ None ○ Mild ○ Moderate ○ Severe

b ) Highest Thompson: ☐☐

c ) Cooling therapy : ○ Yes ○ No

If yes ;then to choose
☐ Cooling blanket or cap
☐ Passive cooling ± gel pack
☐ Both

d) Seizures in HIE cases: ○ Yes ○ No

***46. Congenital anomalies:**

***46a. Major congenital anomalies :**

○ Yes ○ No

○ Syndrome (known)
- ☐ Down
- ☐ Edward
- ☐ Patau
- ☐ Others, specify
- ☐ (Refer to ICD 10):

○ Not a recognized syndrome

○ Isolated major abnormality

***46b. Types of abnormalities (check all that are present. Applies to all including 'known syndromes', 'not a recognized syndrome' or isolated major abnormality'**

☐ CNS →
- ○ Hydrocephalus
- ○ Hydrancephaly
- ○ Holoprosencephaly
- ○ Others (Refer to ICD 10) : _____

☐ Neural Tube Defect →
- ○ Spina bifida
- ○ Anencephaly
- ○ Encephalocoele
- ○ Others (Refer to ICD 10) : _____

☐ CVS → Please see (page 4)

☐ Skeletal dysplasia
☐ Respiratory
- ☐ CDH

☐ GIT
☐ Hydrops
☐ Renal
☐ Others , specify (Refer ICD10) :
☐ None of the above

## SECTION 4: PROBLEMS/ DIAGNOSES (continue)

**46b.**

☐ CVS

- ◯ Duct dependent lesion →
  - ☐ TGA
  - ☐ TOF or PA with VSD
  - ☐ Pulmonary atresia (PA) with Intact ventricular septum
  - ☐ Complex cyanotic heart with PA
  - ☐ Critical PS
  - ☐ Hypoplastic left heart syndrome
  - ☐ Interrupted aortic arch
  - ☐ Coarctation of aorta
  - ☐ Critical AS
- ◯ Severe congenital heart (needs early intervention) →
  - ☐ TAPVD
  - ☐ Others
- ◯ Other lesions →
  - ☐ ASD
  - ☐ VSD
  - ☐ AVSD
  - ☐ PDA
  - ☐ Others ,specify .....

Date of echo diagnosis : Date done: ____/____/____ auto calculate age (days)

Intervention →
- ◯ Nil done
- ◯ Surgery — Date done: ____/____/____ auto calculate age (days)
- ◯ Catheterization — Date done: ____/____/____ auto calculate age (days)

Name of procedure: _____

## SECTION 5: OUTCOME

| | | |
|---|---|---|
| ***47a. Date of discharge / transfer/ death:** (dd/mm/yy) | ☐☐ / ☐☐ / ☐☐ | **48b. Time of Death:** (24 hour format) (mandatory for death cases) ☐☐☐☐ (enter the best estimated time of death if the exact time is unknown) |
| ***48. Weight and growth status on discharge:** | **a) Weight:** ☐☐☐☐ (grams) | |
| | **b) Growth status:** ◯ SGA ◯ AGA ◯ LGA | |
| **49. Exclusive breastfeeding At discharge :** ( Tick yes if > 72 hour before discharge) | ◯ Yes ◯ No | |
| ***50. Total duration of hospital stay (neonatal/ peads care):** | ☐☐☐ ( in completed days) (auto calculate) | |
| ***51. Outcome:** | | |

◯ Alive →

**Place discharged to:**
- ◯ Home
- ◯ Social welfare home
- ◯ Other wards within hospital
- ◯ Still hospitalized as of 1st birthday
- ◯ Transfer to other hospitals →

| | |
|---|---|
| **a) Name of hospital:** | |
| **b) Reason for transfer:** | ◯ Growth/ stepdown care ◯ Acute medical/ diagnostic services ◯ Social/ Logistic reason<br>◯ Lack of NICU bed ◯ Other, specify: .....<br>◯ Chronic/ Palliative care ◯ Surgery |
| **c) Post transfer disposition:** (Please fill this section if place transferred is not part of the NNR Network) | ◯ Home ◯ Transferred again to another hospital<br>◯ Death ◯ Readmitted to your hospital<br>◯ Still in ward |

◯ Dead →

| | |
|---|---|
| **Place of death:** | ◯ Labour room/OT ◯ Neonatal unit<br>◯ In transit ◯ Others, specify: ..... |

**Name :** _____ **Signature:** _____ **Date:** ☐☐☐ **(dd/mm/yy)**

# MALAYSIAN NATIONAL NEONATAL REGISTRY

## Supplementary Form

*Instruction:*
*1) For term babies please fill in according to the most pertinent underlying cause of death.*
*2) For preterm babies please fill in according to the most immediate cause of death.*

| | | | | | |
|---|---|---|---|---|---|
| 1. Centre Name: | | | | Office use: Centre: | / |
| 2. Name: | | 3. RN: | | | |
| 4. Mother's I/C Number: | New IC: | | Passport: | | |

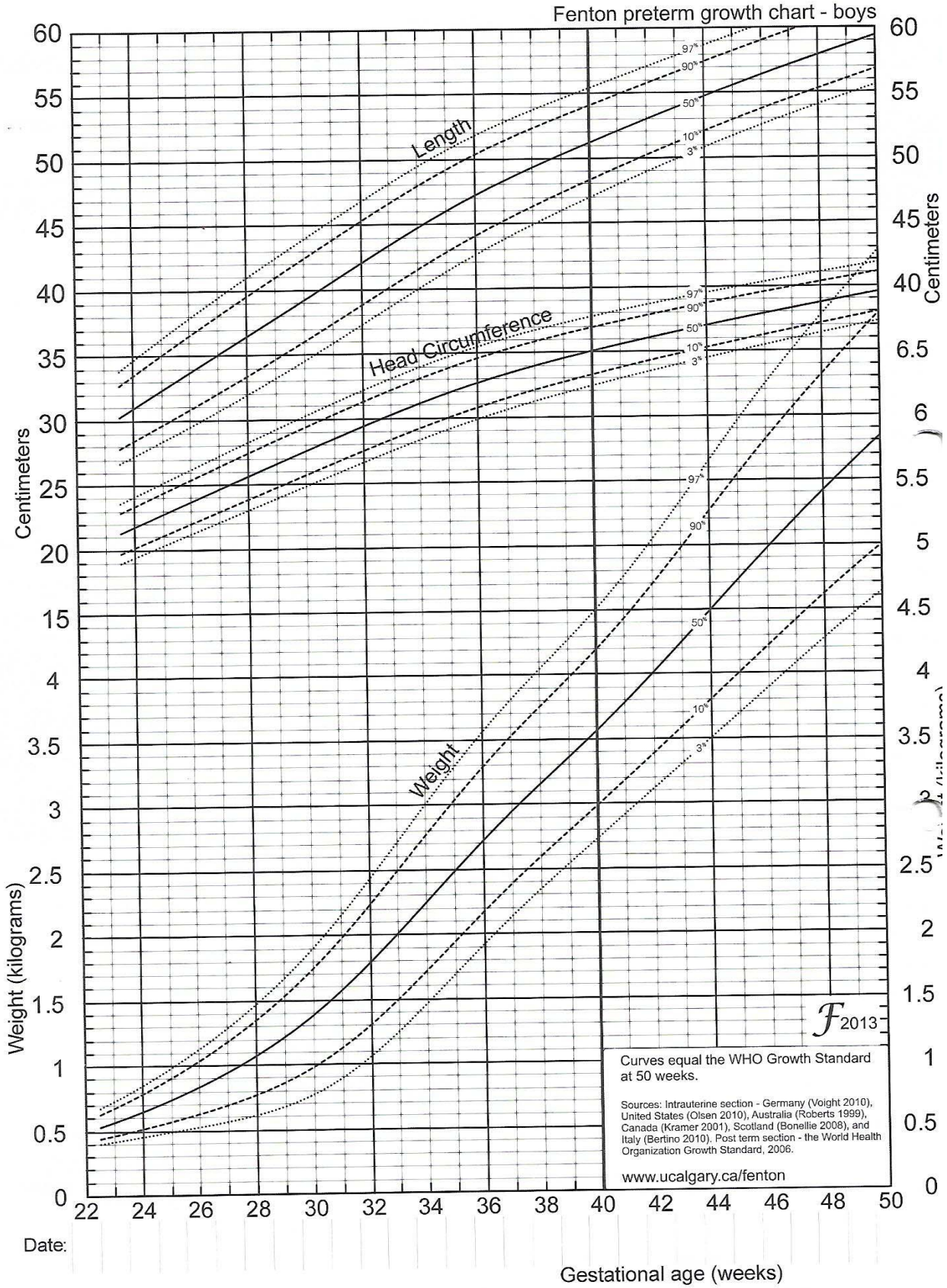
**Immediate cause of death (Modified Wigglesworth):** Tick relvevant button to reach correct classification

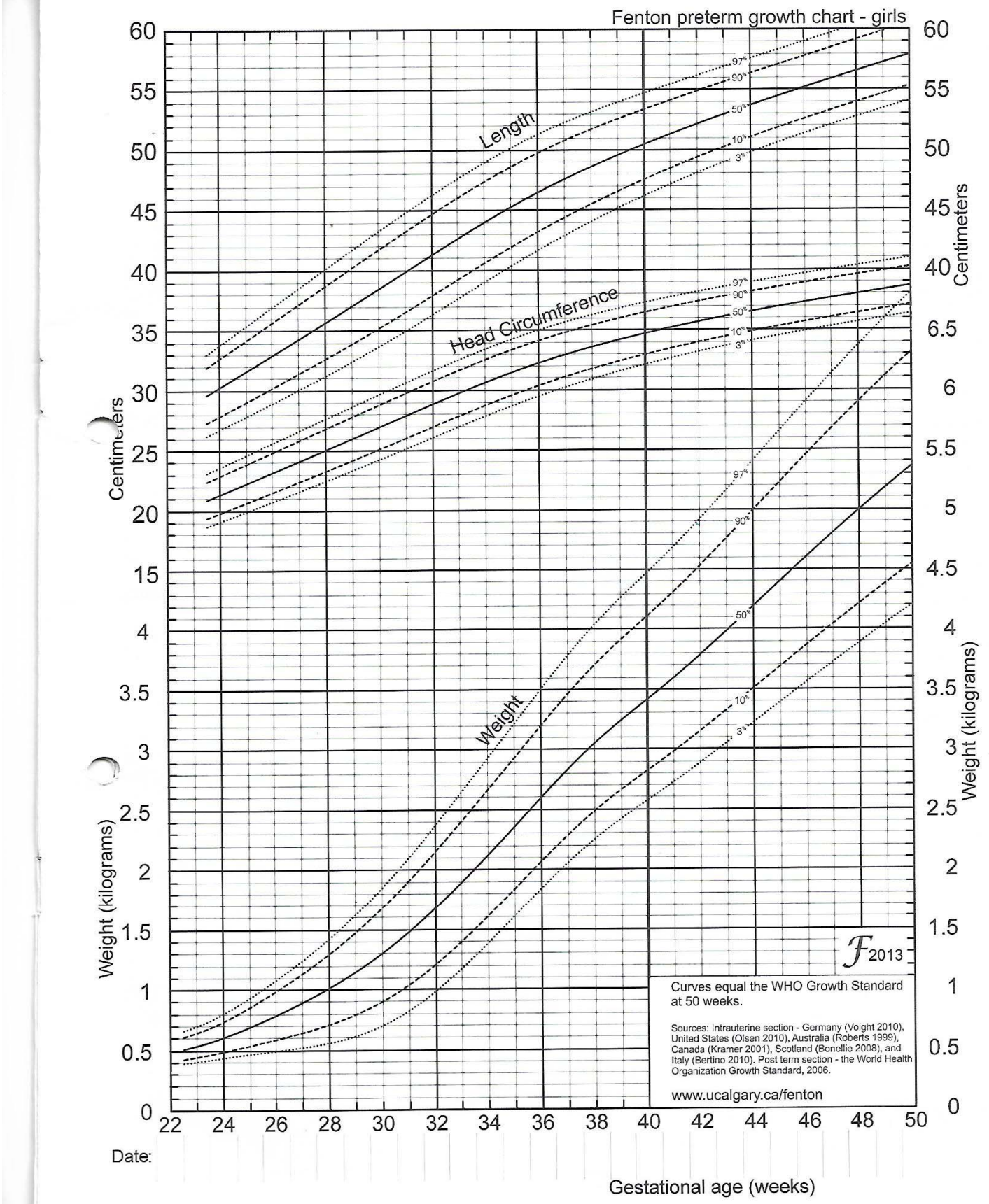
**NEONATAL DEATH**
**(Is there any LCM?)**

Note: LCM = Lethal Congenital Malformation

- LCM present
  - a) Lethal congenital malformation/defect, specify:
    - Neurak tube defects
      - Anencephaly
      - Encephalocoele
      - Others,specify ..... (Refer to ICD 10):
    - CVS
      - Complex Heart Disease
      - Acyanotic
    - CNS
      - Hydrancephaly
      - Holoprosencephaly
      - Others,specify ..... (Refer to ICD 10):
    - Recognisable syndrome
      - Edward
      - Patau
      - Others,specify ..... (Refer to ICD 10):
    - Not recognisable syndrome
    - Skeletal dysplasia
    - Respiratory (eg. lung hypoplasia)
    - GIT
    - Hydrops foetalis
    - Renal
    - Others, specify: .....
- LCM absent
  - b) (Is gestation <37 weeks ?)
    - Yes
      - c) Gestation <37 weeks (Preterm Death without LCM) due to:
        - IVH
        - Septicaemia
        - PDA in failure
        - Pulmonary hemorrhage
        - NEC
        - Pneumonia
        - PIE / BPD
        - Pneumothorax
        - Extreme prematurity
        - Acute intrapartum event
      - Severe RDS
      - Others (specify)
    - No
      - Gestation > 37 weeks (Did the baby have an asphyxial condition?)
        - d) Asphyxial condition absent (Did the baby die from infection?)
          - e) If term and infection present
            - Group B streptococcal septicaemia
            - Meningitis
            - Congenital pneumonia
            - Congenital infection
            - Others,specify .....
          - If term and infection absent (Are there any other specific causes of death?)
            - f) Other specific causes of death:
              - Kernicterus / severe neonatal jaundice
              - Haemorrhagic disease of newborn / Vitamin K deficiency
              - Intracranial bleed / SAH
              - Pneumothorax
              - Pulmonary hemorrhage
              - IEM
              - MAS
              - Surgical, specify: .....
              - Others, specify: .....
            - Unknown cause
        - Asphyxial condition present

Name : _____ Signature : _____ Date : ___ ___ ___ (dd/mm/yy)


Fenton preterm growth chart - boys
Length
Head Circumference
Weight
97th
90th
50th
10th
3rd
Centimeters
Weight (kilograms)
Gestational age (weeks)
Date:
Curves equal the WHO Growth Standard at 50 weeks.
Sources: Intrauterine section - Germany (Voight 2010), United States (Olsen 2010), Australia (Roberts 1999), Canada (Kramer 2001), Scotland (Bonellie 2008), and Italy (Bertino 2010). Post term section - the World Health Organization Growth Standard, 2006.
www.ucalgary.ca/fenton
F2013


Fenton preterm growth chart - girls
Length
Head Circumference
Weight
97th
90th
50th
10th
3rd
Centimeters
Weight (kilograms)
Gestational age (weeks)
Date:
Curves equal the WHO Growth Standard at 50 weeks.
Sources: Intrauterine section - Germany (Voight 2010), United States (Olsen 2010), Australia (Roberts 1999), Canada (Kramer 2001), Scotland (Bonellie 2008), and Italy (Bertino 2010). Post term section - the World Health Organization Growth Standard, 2006.
www.ucalgary.ca/fenton
F 2013

# Appendix 5 Presentations

**POSTER, ABSTRACT AND PAPER PRESENTIONS**

1. Neoh SH. *Survival of VLBW Neonates.*Presented at the MNNR SDP Meeting, PPUM, Kuala Lumpur, Malaysia, December 2018

2. Boo NY. *Admission hypothermia in VLBW neonates.* Presented at the MNNR SDP Meeting, PPUM, Kuala Lumpur, Malaysia, December 2018

3. Chee SC. *NEC in VLBW neonates.* Presented at the MNNR SDP Meeting, PPUM, Kuala Lumpur, Malaysia, December 2018

4. Cheah IGS. *Cardiac Anomalies.* Presented at the MNNR SDP Meeting, Selayang, PPUM , Kuala Lumpur, Malaysia, December 2018

5. Wong AC. *Central Line Associated Blood Stream Infection.* Presented at the MNNR SDP Meeting, PPUM, Kuala Lumpur, Malaysia, December 2018

6. Pauline Choo. *Retinopathy of Prematurity*. Presented at the MNNR SDP Meeting, PPUM, Kuala Lumpur, Malaysia, December 2018

7. Fazila MK. *Hypoxic Ischaemic Encephalopathy*. Presented at the MNNR SDP Meeting, Presented at the MNNR SDP Meeting, PPUM, Kuala Lumpur, Malaysia, December 2018

8. Ang EL. *Intraventricular haemorrhage*. Presented at the MNNR SDP Meeting, PPUM,Kuala Lumpur, Malaysia, December 2018

9. Azanna AH. *Broncho pulmonary dysplasia*. Presented at the MNNR SDP Meeting, PPUM, Kuala Lumpur, Malaysia, December 2018