REPORT OF THE MALAYSIAN NATIONAL NEONATAL REGISTRY 2011

STUDY OF CRITICALLY ILL BABIES IN NEONATAL INTENSIVE CARE

Editor:
Irene Cheah Guat Sim

With contributions from:
Chee Seok Chiong, Jimmy Lee Kok Foo, Boo Nem Yun,
Soo Thian Lian, Neoh Siew Hong, Teh Siao Hean, Zuraidah Abdul Latif

CRC
MINISTRY OF HEALTH MALAYSIA
Research that matters to patients

Report of the

Malaysian National Neonatal Registry 2011

A STUDY OF CRITICALLY ILL BABIES IN

NEONATAL INTENSIVE CARE UNITS

Editor:
Irene Cheah Guat Sim

With contributions from:
Boo Nem Yun, Chee Seok Chiong, Chin Choy Nyok
Jimmy Lee Kok Foo, Neoh Siew Hong, Soo Thian Lian, Teh Siao Hean

Published by the:

Malaysian National Neonatal Registry (MNNR)
2-7, Medical Academies of Malaysia,
210, Jalan Tun Razak,
50400, Kuala Lumpur,
Malaysia.

Direct Line	:	(603)-4023 4505
Fax	:	(603)- 4023 4505
E-mail	:	mnnr@acrm.org.my
Website	:	http://www.acrm.org.my/mnnr

Important information

This report is copyrighted. Reproduction and dissemination of this report in part or in whole for research, educational or other non-commercial purposes not authorized without any prior written permission from the copyright holders unless the source fully acknowledged. **Suggested citation: Malaysian National Neonatal Registry and Clinical Research Centre, Ministry of Health Malaysia. Kuala Lumpur 2015.**

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.

January 2015

© Malaysian National Neonatal Registry, Malaysia

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 34 source data providers from the Government Hospitals which comprise of doctors and nurses working in the NICUs
- Clinical Research Centre, Ministry of Health, Malaysia
- CRC statisticians, En. Adam Bin Bujang, En .Tengku Mohd Ikhwan, En. Shahrul Aiman and En. Muhammad Firdaus
- Puan 'Aisyah Binti Ruslan, Registry Manager, MNNR
- Ms. Thinisha a/p Mohan, 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 2011

1. Hospital Ampang
2. Hospital Batu Pahat, Johor
3. Hospital Bintulu, Sarawak
4. Hospital Raja Permaisuri Bainun, Ipoh, Perak
5. Hospital Kajang, Selangor
6. Hospital Keningau, Sabah
7. Hospital Kuala Lumpur
8. Hospital Likas, Kota Kinabalu, Sabah
9. Hospital Melaka, Melaka
10. Hospital Umum Miri, Sarawak
11. Hospital Pulau Pinang, Pulau Pinang
12. Hospital Putrajaya
13. Hospital Raja Perempuan Zainab II, Kota Bharu, Kelantan
14. Hospital Umum Sarawak, Kuching, Sarawak
15. Hospital Seberang Jaya, Pulau Pinang
16. Hospital Selayang, Selangor
17. Hospital Serdang, Selangor
18. Hospital Seri Manjung, Perak
19. Hospital Sibu, Sarawak
20. Hospital Sultan Abdul Halim, Sg. Petani, Kedah
21. Hospital Sultan Haji Ahmad Shah, Temerloh, Pahang
22. Hospital Sultanah Aminah, Johor Bharu, Johor
23. Hospital Sultanah Bahiyah, Alor Setar, Kedah
24. Hospital Pakar Sultanah Fatimah, Muar, Johor
25. Hospital Sultanah Nur Zahirah, Kuala Terengganu, Terengganu
26. Hospital Sungai Buloh, Selangor
27. Hospital Taiping, Perak
28. Hospital Teluk Intan, Perak
29. Hospital Tengku Ampuan Afzan, Kuantan, Pahang
30. Hospital Tengku Ampuan Rahimah, Klang, Selangor
31. Hospital Tuanku Ampuan Najihah, Kuala Pilah, N.S
32. Hospital Tuanku Fauziah, Kangar, Perlis
33. Hospital Tuanku Ja'afar, Seremban, N.S
34. Hospital Universiti Sains Malaysia, Kelantan

STEERING COMMITTEE 2011

	Member	Designation and Institution
1	Dr Irene Cheah Guat Sim (Chairperson 2010)	Head of Neonatal Unit, Paediatric Institute, Hospital Kuala Lumpur
2	Dr Chee Seok Chiong (Co-Chairperson)	Head of Neonatal Unit, Paediatric Department, Hospital Selayang
3	Dato' Dr Jimmy Lee Kok Foo	Head of Paediatric Department, Hospital Sultanah Nur Zahirah, Kuala Terengganu
4	Dato Dr Soo Thian Lian	Head of Paediatric Department, Hospital Likas, Kota Kinabalu
5	Dr Noraida Ramli	Consultant Paediatrician and Lecturer, Hospital Universiti Sains Malaysia, Kota Bharu, Kelantan
6	Prof Dr Thong Meow Keong	Professor of Paediatrics and Consultant Geneticist , University Malaya Medical Centre Kuala Lumpur University Malaya Medical Centre (UMMC)
7	Dr Neoh Siew Hong	Consultant Paediatrician and Neonatologist, Paediatric Institute, Hospital Kuala Lumpur
8	Dr Zuraidah Abdul Latiff	Head of Paediatric Department, Hospital Ampang
9	Prof Dr Boo Nem Yun	Professor of Paediatrics and Consultant Neonatologist, School of Medicine, International Medical University (IMU)

LIST OF SITE COORDINATORS 2011

NORTHERN ZONE		
Institution	**Head of Department**	**Coordinators**
Paediatric Department Hospital Sultanah Bahiyah, Alor Setar	Dato' Dr. Teh Keng Hwang	Dato' Dr. Teh Keng Hwang KJ Noraini Bt Suhud
Paediatric Department Hospital Raja Perempuan Bainun, Ipoh	Dato' Dr. HSS Amar Singh	Dr. Noor Khatijah Nuraini Dr. Khoo Kim Khea KUP Tan Hai Hon
Paediatric Department Hospital Pulau Pinang	Dr. Revathi Nallusamy	SN Zurina Bt Ahmad
Paediatric Department Hospital Seberang Jaya	Dr. Angeline Yeoh Aing Chee	Dr. Angeline Yeoh Aing Chee Dr. Lim Choo How KUP Zaiton Mohd Salleh SN Zanariah Zakaria SN Noralina Mat Ali SN Rosliza Mukhtar SN Zuhailawatie Khidir
Paediatric Department Hospital Seri Manjung	Datin Dr. Chow Sow Keng	Dr. Nga Shih Hang SN Teh Pei Nee SN Rosliza Abdullah
Paediatric Department Hospital Sultan Abdul Halim, Sungai Petani	Dr. Choo Chong Ming	Dr. Parvinder Gernam Kaur Dr. Tan Ying Beih KJ Neelavathy Manickam SN Marhaini Salleh
Paediatric Department Hospital Taiping	Dr. Saiful Rijal Bin Muhammad	Dr. Saiful Rijal Bin Muhammad Dr. Mazlina Bt Mohammed SN Norizah Mohamed SN Norasmah Bt Mat Isa
Paediatric Department Hospital Teluk Intan	Dr. Kogilavani	Dr. Harminder Kaur KJ Gabrina Darson SN Azuwa bt Soaib
Paediatric Department Hospital Tuanku Fauziah, Kangar	Dr. Jamaluddin Bin Mohamad	Dr. Tina Azreen Norazman SN Mastura Mahazir
CENTRAL ZONE		
Institution	**Head of Department**	**Coordinators**
Paediatric Department Hospital Ampang	Dr. Zuraidah Latif	Dr. Rahimah Ismail Dr. Arfa Adura Arshad SN Noormazlin Bt Badron
Paediatric Department Hospital Kajang	Dr. Baizura Jamaluddin	Dr. Baizura Jamaluddin KJ Siti Aminah Othman SN Azliza Abu Bakar

Paediatric Institute Hospital Kuala Lumpur	Dato' Dr. Hussain Imam Bin Hj Muhammad Ismail	Dr. Irene Cheah Guat Sim Dr. Neoh Siew Hong SN Normy Shahira Bt Ab Rahman
Paediatric Department Hospital Putrajaya	Dr. Fuziah Bt Mohd Zain	Dr. Vidya Natthondan Dr. Clarence Kavetha SN Norlia Mat Isa
Paediatric Department Hospital Selayang	Dr. Wan Jazilah Wan Ismail	Dr. Chee Seok Cheong SN Norleey Awang
Paediatric Department Hospital Serdang	Dr. Rohaizah Borhan	KJ Zalimah Tukimin SN Wan Marizai SN Siti Faizah Mohamad SN Munira Saad
Paediatric Department Hospital Sungai Buloh	Dr. Foo Lai sin	Dr. See Kwee Ching KJ Wirdawati Basar SN Zaizurina
Paediatric Department Hospital Tengku Ampuan Rahimah, Klang	Dr. Yogeswery Sithamparanathan	Dr. Yogeswery Sithamparanathan KJ Sharifah Hanim Syed Hamzah
SOUTHERN ZONE		
Institution	**Head of Department**	**Coordinators**
Paediatric Department Hospital Batu Pahat	Dr. Zainah Shaikh Hendra	Dr. Zainah Shaikh Hendra KJ Lee Soon Ai SN Norizah Mesdi
Paediatric Department Hospital Melaka	Dr. Tam Pui Ying	Dr. Leow Poy Lee Dr. Tae Sok Kun Dr. Ho Lai Jade Dr. Lee Von Yen KJ Lim Bee Eng KJ Fadillah Tamby SN Zaini Yahya
Paediatric Department Hospital Sultanah Aminah, Johor Bahru	Dr. Mohd Nizam Mat Bah	Dr. Unnikrishnan Gopi SN Fouziyah Enas
Paediatric Department Hospital Pakar Sultanah Fatimah, Muar	Dr. Angeline Wan Seng Lian	SN Siti Salwani Ahmad
Paediatric Department, Hospital Tuanku Ampuan Najihah,Kuala Pilah	Dr. Hasri Hafidz	SN Tengku Rohana Tengku Sulaiman
Paediatric Department Hospital Tuanku Ja'afar, Seremban	Dr. Tan Kah Kee	Dr. Umathevi Paramasivam Dr. Pauline Choo SN Siti Hajar Mohd Yunus

EAST COAST REGION		
Institution	**Head of Department**	**Coordinators**
Paediatric Department Hospital Raja Perempuan Zainab II, Kota Bharu, Kelantan	Dr. Nik Khairulddin Nik Yusoff	Dr. Hasmawati Hassan SN Norhasmawati Bt Ismail SN Chan Soh Iyan
Paediatric Department Hospital Sultan Haji Ahmad Shah, Temerloh	Dr. Rohani Abdul Jalil	Dr. Rohani Abdul Jalil KJ Rosmawani Ismail
Paediatric Department Hospital Sultanah Nur Zahirah, Kuala Terengganu	Dato' Dr Jimmy Lee Kok Foo	Dato' Dr Jimmy Lee Kok Foo Dr. Sharifah Huda bt Engku Alwi SN Zawahir Abu Zarin
Paediatric Department Hospital Tengku Ampuan Afzan, Kuantan	Dr. Chin Choy Nyok	Dr. Chin Choy Nyok SN Siti Meriam
Paediatric Department Hospital Universiti Sains Malaysia, Kelantan	Prof Dr. Hans van Rostenberghe	Dr. Noraida Ramli SN Way Siew Eng
SABAH & SARAWAK		
Institution	**Head of Department**	**Coordinators**
Paediatric Department Hospital Bintulu	Dr. Anand Mohana Lal	KJ Florence Sammy
Paediatric Department Hospital Keningau	Dr. Ubaya Kumar	Dr. Ubaya Kumar Sr Tiarapa Basiran Sr Mary Majikon
Paediatric Department Hospital Likas	Dato' Dr. Soo Thian Lian	Dato' Dr. Soo Thian Lian Dr. Maneet Kaur KJ Helen Lajewin JT Maria Tamaid
Paediatric Department Hospital Umum Miri	Dr. Teh Siao Hean	Dr. Teh Siao Hean SN Helen Aping SN Rapeah Mohamad Zin
Paediatric Department Hospital Umum Sarawak, Kuching	Dr. Chan Lee Gaik	Dr. Chan Lee Gaik SN Sabariah Bt Kiflie SN Juwita Bt Hashim
Paediatric Department Hospital Sibu	Dr. Wong See Chang	Dr. Wong See Chang KJ Ting Meng Ling JM Terusa AK Genie

STAFF OF MALAYSIAN NATIONAL NEONATAL REGISTRY 2011

Clinical Registry Manager	: Puan 'Aisyah Binti Ruslan
Clinical Registry Assistants	: Cik Manimegalai Ramakasinan

CRC TECHNICAL SUPPORT STAFF

Director	**:** Dr Goh Pik Pin
Epidemiologist	**:** Dr Jamaiyah Haniff
Head of ICT Unit	**:** Celine Tsai Pao Chien
Database Administrator	**:** Lim Jie Ying
Web Application Programmer	**:** Amy Porle
Clinical Database Manager	**:** Sebastian Thoo
Assistant Network Administrator	**:** Adlan Ab Rahman
Statisticians	**:** Adam Bin Bujang : Tengku Mohd Ikhwan : Shahrul Aiman : Muhammad Firdaus
Desktop Publisher & Web Designer	**:** Abdul Malik Tanjeng

CONTENTS

FOREWORD

This is the seventh printed edition for the annual report of the Malaysian National Neonatal Registry for the study year 2011. The registry in the year 2011 comprised 34 out of 40 NICUs in government hospitals, and one from a university hospital.

The steering committee would like to thank the Director General of Health Datuk Dr. Norhisham Abdullah, the head of Pediatric Activity, Dato. Dr Hussain Imam and the head of Clinical Research Centre, Dr. Goh Pik Pin for their constant support. The commitment and hard work of the individual staff of the participating centres to key in the data on line and the MNNR secretariat are to be highly commended.

The MNNR has enabled the readily available data for epidemiology, workload and outcome to be readily accessible and having an online system data entry that been updated with data entry rules over the years has made data cleaning easier. Thus, it is hope that future reports will be timelier.

Several papers from MNNR data been published and quality intervention workshops have been held where improvement is required based on the registry findings. All the NICUs in this registry have access to their performance as compared to the benchmark and continue to strive to provide better care through audit and quality improvement.

Dr. Irene Cheah Guat Sim

Chairman,

Malaysian National Neonatal Registry

Report of the Malaysian National Neonatal Registry (MNNR) 2011

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 septicemic 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 members, eight of whom elected. The ninth member was appointed based on expertise and involvement in the development of the 'congenital anomalies' section of the registry. This committee is responsible for the general running and decision-making of the Registry and for approving the use of its data.

A Clinical Nurse Manager assisted by a clinical research officer and one clinical research assistants heads the administrative staff at the Neonatal Registry Unit (NRU). Statistical support provided by the CRC.

1.3 Funding

Funding was provided via Clinical Research Centre (CRC) of Ministry of Health, Malaysia, the Perinatal Society of Malaysia & sponsors from industry

2. Data Set

2.1 Participating Centres in 2011:

1. Hospital Ampang
2. Hospital Batu Pahat, Johor
3. Hospital Bintulu, Sarawak
4. Hospital Raja Permaisuri Bainun, Ipoh, Perak
5. Hospital Kajang, Selangor
6. Hospital Keningau, Sabah
7. Hospital Kuala Lumpur
8. Hospital Likas, Kota Kinabalu, Sabah
9. Hospital Melaka, Melaka
10. Hospital Umum Miri, Sarawak
11. Hospital Pulau Pinang, Pulau Pinang
12. Hospital Putrajaya
13. Hospital Raja Perempuan Zainab II, Kota Bharu, Kelantan
14. Hospital Umum Sarawak, Kuching, Sarawak
15. Hospital Seberang Jaya, Pulau Pinang
16. Hospital Selayang, Selangor
17. Hospital Serdang, Selangor
18. Hospital Seri Manjung, Perak
19. Hospital Sibu, Sarawak
20. Hospital Sultan Abdul Halim, Sg. Petani, Kedah
21. Hospital Sultan Haji Ahmad Shah, Temerloh, Pahang
22. Hospital Sultanah Aminah, Johor Bharu, Johor
23. Hospital Sultanah Bahiyah, Alor Setar, Kedah
24. Hospital Pakar Sultanah Fatimah, Muar, Johor
25. Hospital Sultanah Nur Zahirah, Kuala Terengganu, Terengganu
26. Hospital Sungai Buloh, Selangor
27. Hospital Taiping, Perak
28. Hospital Teluk Intan, Perak
29. Hospital Tengku Ampuan Afzan, Kuantan, Pahang
30. Hospital Tengku Ampuan Rahimah, Klang, Selangor
31. Hospital Tuanku Ampuan Najihah, Kuala Pilah, N.S
32. Hospital Tuanku Fauziah, Kangar, Perlis
33. Hospital Tuanku Ja'afar, Seremban, N.S
34. Hospital Universiti Sains Malaysia, Kelantan

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. 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)

.

B. All infants with major congenital anomaly/anomalies
C. All infants with hypoxic ischaemic encephalopathy

Both inborn and outborn babies will be included.

Outborn babies who die before arrival are excluded. Babies who admitted to the NNU at a corrected gestation of > 44/52 not considered a neonatal case and hence 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 will have only one set of CRF completed and readmission of the same babies into the NNU will 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 used and completed CRFs sent to MNNR secretariat after a defined period.

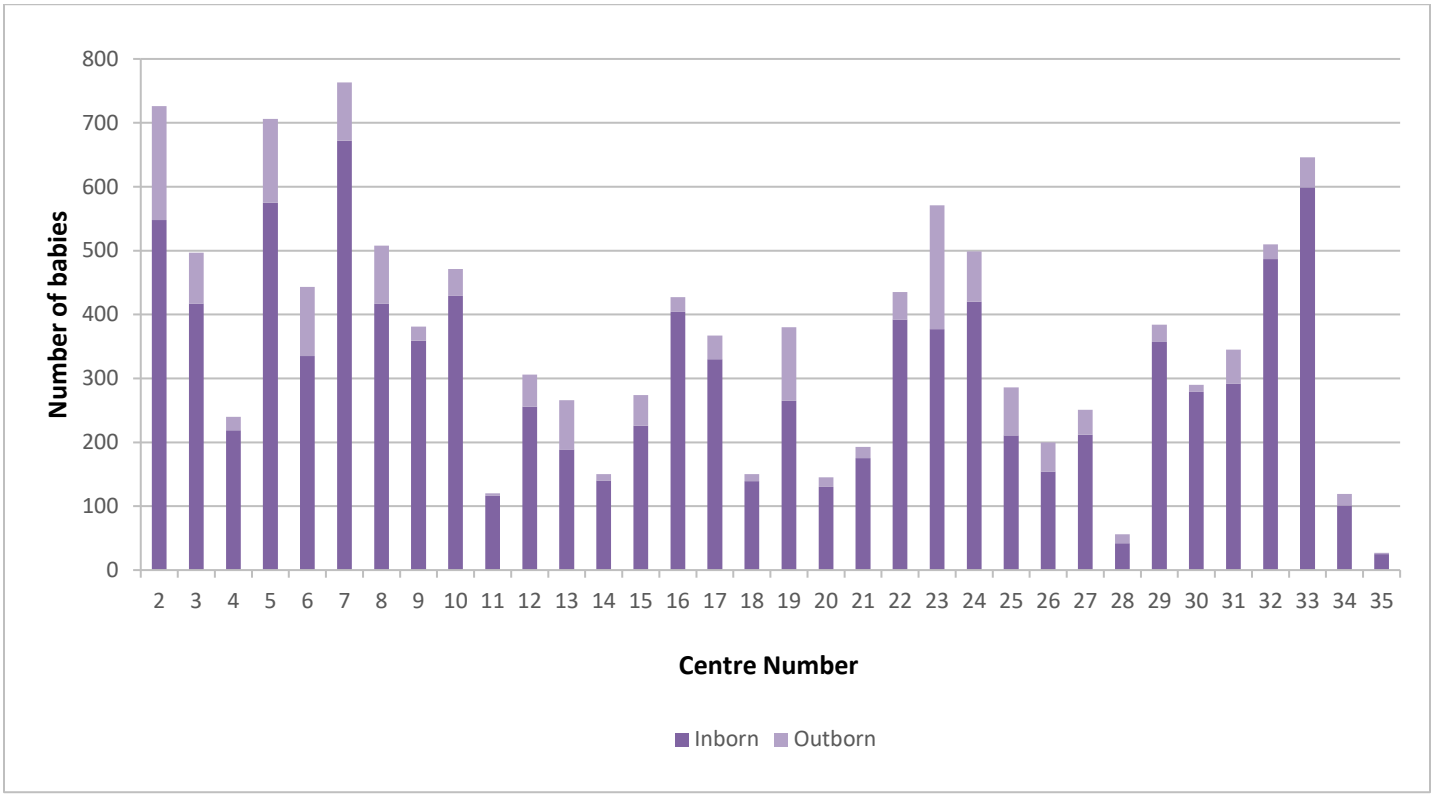
2.4 Data Verification

Missing or anomalous data identified by a manual check and then queried and corrected with the respective centre. Further data verification 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



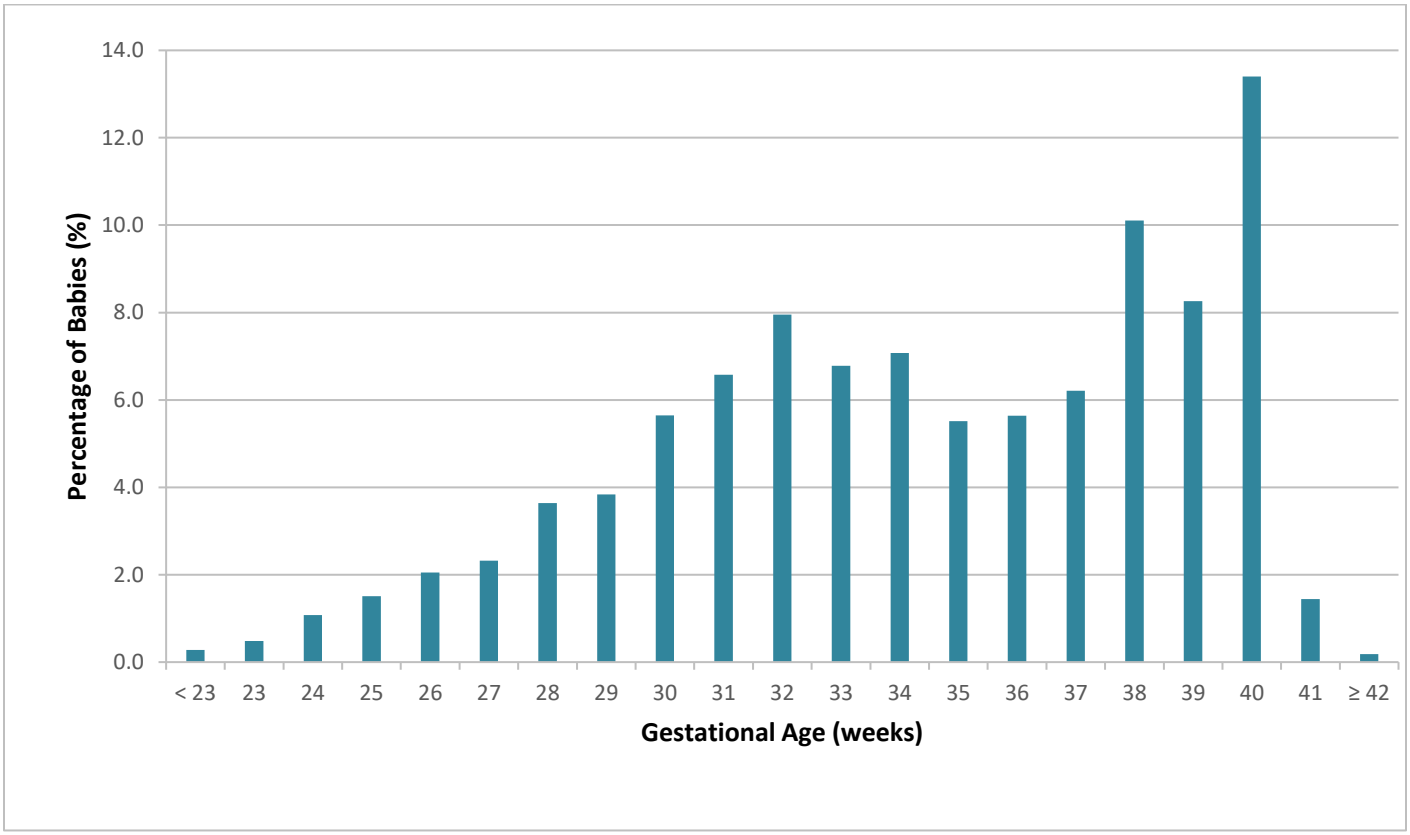
COMMENT: There were 10290 inborn and 1843 outborn in the MNNR.

Table 1:
No. of babies according to place of birth

Hospitals		Admission Status		Total
		Inborn	Outborn	
2	n	548	178	726
	(%)	75.5	24.5	100
3	n	417	80	497
	(%)	83.9	16.1	100
4	n	219	21	240
	(%)	91.3	8.8	100
5	n	575	131	706
	(%)	81.4	18.6	100
6	n	335	108	443
	(%)	75.6	24.4	100
7	n	672	91	763
	(%)	88.1	11.9	100
8	n	417	91	508
	(%)	82.1	17.9	100
9	n	359	22	381
	(%)	94.2	5.8	100
10	n	429	42	471
	(%)	91.1	8.9	100
11	n	116	4	120
	(%)	96.7	3.3	100
12	n	256	50	306
	(%)	83.7	16.3	100
13	n	189	77	266
	(%)	75.4	28.9	104
14	n	140	10	150
	(%)	93.3	6.7	100
15	n	226	48	274
	(%)	82.5	17.5	100
16	n	404	23	427
	(%)	94.6	5.4	100
17	n	330	37	367
	(%)	89.9	10.1	100
18	n	139	11	150
	(%)	92.7	7.3	100
19	n	265	115	380
	(%)	69.7	30.3	100
20	n	130	15	145
	(%)	89.7	10.3	100
21	n	175	18	193
	(%)	90.7	9.3	100
22	n	392	43	435
	(%)	90.1	9.9	100
23	n	377	194	571
	(%)	66	34	100
24	n	420	79	499
	(%)	84.2	15.8	100
25	n	211	75	286
	(%)	73.8	26.1	100
26	n	154	46	200
	(%)	77	23	100
27	n	212	39	251
	(%)	84.5	15.5	100
28	n	42	14	56
	(%)	75	25	100
29	n	357	27	384
	(%)	93	7	100
30	n	279	11	290
	(%)	96.2	3.8	100
31	n	292	53	345
	(%)	84.6	15	100
32	n	487	23	510
	(%)	95.5	4.5	100
33	n	599	47	646
	(%)	92.7	7.3	100
34	n	101	18	119
	(%)	84.9	15.1	100
35	n	25	2	27
	(%)	92.6	7.4	100
T	n	**10,290**	**1843**	**12,132**
	(%)	**84.8**	**15.2**	**100**

Figure 2

Frequency distribution of all babies in MNNR 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	Percent
< 23	34	0.3
23	59	0.5
24	131	1.1
25	183	1.5
26	249	2.1
27	282	2.3
28	442	3.6
29	466	3.8
30	685	5.6
31	798	6.6
32	965	8.0
33	823	6.8
34	858	7.1
35	669	5.5
36	684	5.6
37	753	6.2
38	1226	10.1
39	1002	8.3
40	1626	13.4
41	175	1.4
≥ 42	22	0.2
Total included	12132	100
Total no. of missing (GA)	0	
Overall Total babies	12132	

Figure 3

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

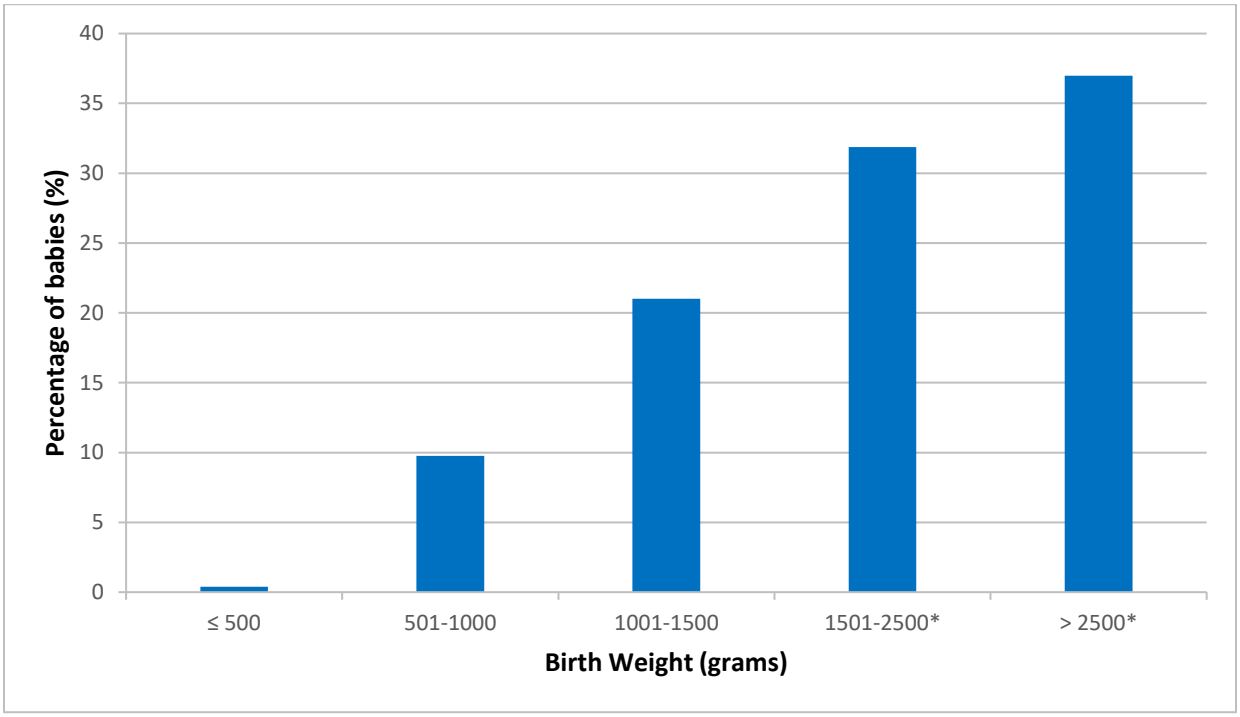


Table 3

Birth weight (grams)	Frequency	Percent from total number of babies
≤ 500	46	0.4
501-1000	1183	9.8
1001-1500	2550	21.0
1501-2500*	3867	31.9
More than 2500*	4486	37.0
Total included	12132	100
Total no. of missing (BW)	0	
Overall total no. babies	12132	

*COMMENT: * For the category >1500 grams birth weight , calculated percentage does not include all live births in the hospitals who do not fit inclusion criteria*.

Figure 4

Survival to Discharge of All Live Births Admitted to MNNR Hospitals According to Gestational Age

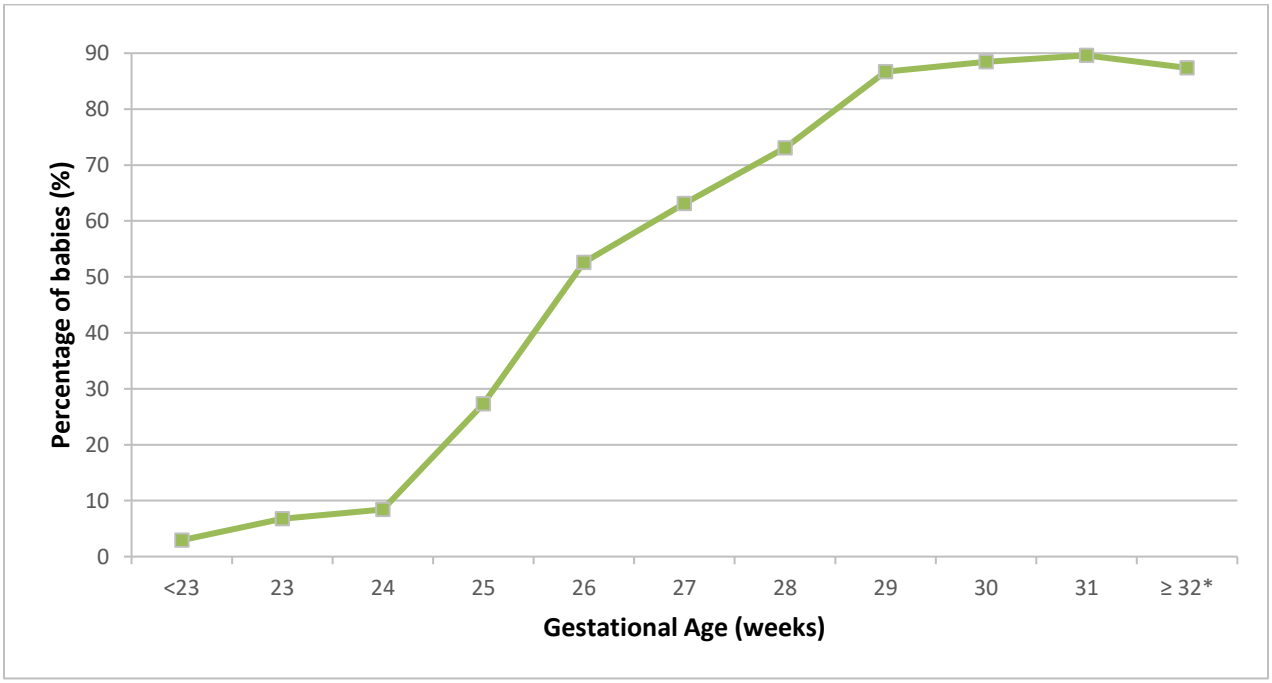


Table 4

Gestational age (completed weeks)	Total number of inborn & outborn babies	Number of survivors	% survival
<23	34	1	4.3
23	59	4	8.9
24	131	11	9.9
25	183	50	30.5
26	249	131	53.7
27	282	178	64.0
28	442	323	74.8
29	466	404	87.3
30	685	606	89.1
31	798	715	90.5
≥ 32*	8803	7692	87.9
Total included	12132	10115	83.4
Total no. of missing (GA)	0		
Overall Total babies	12132		

*COMMENT: *For the category ≥ 32 weeks gestational age, calculated survival rate only include all admitted live births in that category who fullfill inclusion criteria. Includes inborn and outborn babies.*

Figure 5

Survival to discharge of all babies in the MNNR according to birth weight categories

Table 5

Birth weight (grams)	Total number of babies	Number of survivors	% survivors
≤500	46	2	4.3
501-1000	1183	587	49.6
1001-1500	2550	2201	86.3
1501-2500*	3867	3367	87.1
>2500*	4486	3958	88.2
Total included	12132	10115	83.4
Total no. of missing (BW)	0		
Overall Total babies	12132		

*COMMENT: *For the category more than 1500 gram birth weight, the calculated percentage does not include all live births in the hospitals who do not fit inclusion criteria.*

Figure 6

Prevelance of patent ductus arteriosus (PDA) among all admitted inborn babies in the MNNR by gestational age

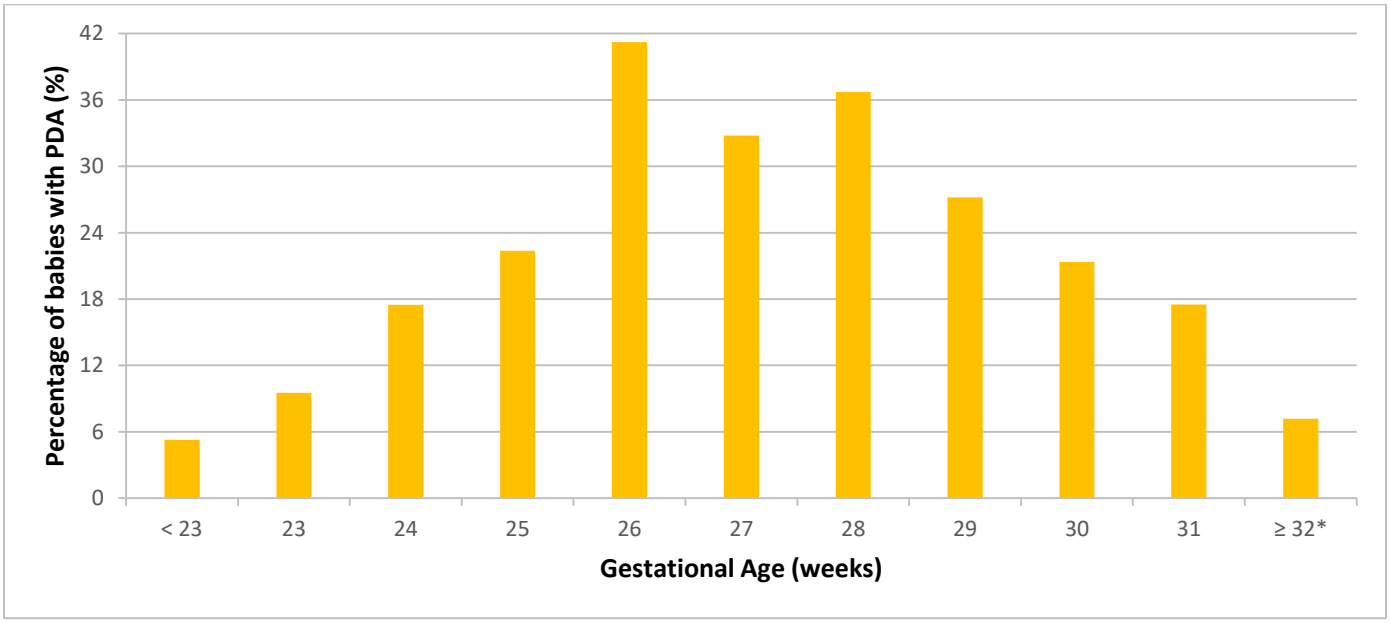


Table 6

Gestational age (completed weeks)	Total number of admitted inborn babies		PDA		Confirmed by ECHO		Indomethacin/ Ibuprofen		Ligation	
	n	%	*n*	%	*n*	%	*n*	%	*n*	%
<23	19	0.2	1	5.3	1	0.0	1	5.3	0	0.0
23	42	0.4	4	9.5	2	50.0	0	0.0	0	0.0
24	103	1.0	18	17.5	16	88.9	8	44.4	0	0.0
25	143	1.4	32	22.4	29	90.6	22	68.8	2	6.3
26	211	2.1	87	41.2	76	87.4	45	51.7	2	2.3
27	244	2.4	80	32.8	62	77.5	45	56.3	1	1.3
28	365	3.6	134	36.7	121	90.3	67	50.0	3	2.2
29	386	3.8	105	27.2	95	90.5	67	63.8	0	0.0
30	590	5.8	126	21.4	113	89.7	60	47.6	2	1.6
31	674	6.6	118	17.5	101	85.6	46	39.0	0	0.0
≥32*	7366	72.6	529	7.2	500	94.5	102	19.3	7	1.3
Total included	10143	100	1234	12.2	1116	90.4	463	37.5	17	1.4
Total no. of missing (GA)	0									
Overall Total babies	10143									

*COMMENT: *For the category ≥ 32 weeks gestation, calculated percentage does not include all livebirths in the hospital that do not fit inclusion criteria.*

Figure 7

Prevelance of Patent Ductus Arteriosus (PDA) among all admitted inborn babies in the MNNR by birth weight

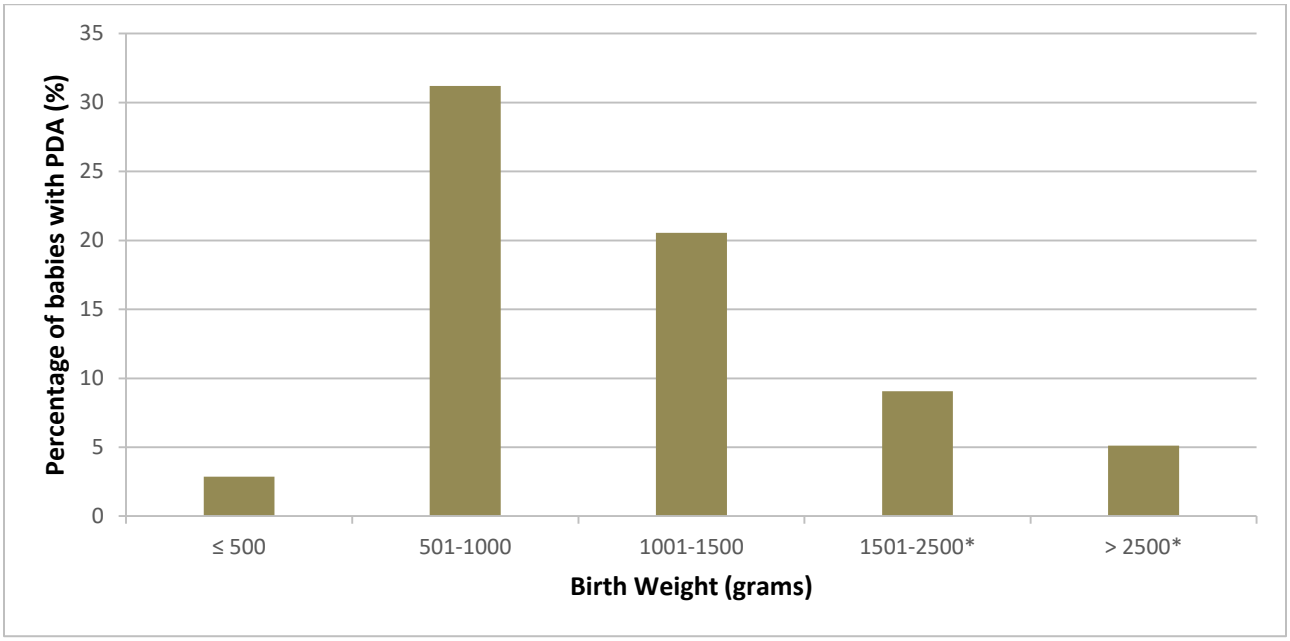


Table 7

Birth weight (grams)	Total number of admitted inborn babies		PDA		Confirmed by ECHO		Indomethacin/ Ibuprofen		Ligation	
	n	%	*n*	%	*n*	%	*n*	%	*n*	%
≤500	35	0.3	1	2.9	1	0.0	0	0.0	0	0.0
501-1000	974	9.6	304	31.2	260	85.5	154	50.7	6	2.0
1001-1500	2150	21.2	442	20.6	398	90.0	223	50.5	5	1.1
1501-2500*	3285	32.4	298	9.1	273	91.6	73	24.5	3	1.0
≥2500*	3699	36.5	189	5.1	184	97.4	13	6.9	3	1.6
Total included	10143	100	1234	12.2	1116	90.4	463	37.5	17	1.4
Total no. of missing (BW)	0									
Total babies	10143									

Table 8

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

Gestational age at birth (weeks)	Total no. of admitted inborn babies		No. of babies with data available on PDA diagnosis		No. of babies with diagnosed PDA		Confirmed by ECHO		Treatment			
									Indo-methacin/ Ibuprofen		Ligation	
	n	%	*n*	%	*n*	%	*n*	%	*n*	%	*n*	%
22-24	159	5.7	159	100	22	13.8	18	81.8	8	36.4	0	00
25-27	598	21.6	598	100	199	33.3	167	83.9	112	56.3	5	2.5
28-31	2015	72.7	2015	100	483	24.0	430	89.0	240	49.7	5	1.0
Total included	2772	100	2772	100	704	25.4	615	87.4	360	51.1	10	1.4

Table 9

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

Birth weight (grams)	Total number of admitted inborn babies		No. of babies with data available on PDA diagnosis		No. of babies with diagnosed PDA		Confirmed by ECHO		Treatment			
									Indo-methacin/ Ibuprofen		Ligation	
	n	%	*n*	%	*n*	%	*n*	%	*n*	%	*n*	%
≤ 750	352	11.1	352	100	72	20.5	62	86.1	35	48.6	3	4.2
751-1000	657	20.8	657	99.8	233	35.5	199	85.4	119	51.1	3	1.3
1001-1250	900	28.5	900	100	243	27.0	219	90.1	127	52.3	4	1.6
1251-1500	1250	39.6	1250	100	199	15.9	179	89.9	96	48.2	1	0.5
Total included	3159	100	3159	100	747	23.6	659	88.2	377	50.5	11	1.5

Figure 10

Incidence of Intraventricular Haemorrhage (IVH) in admitted inborn babies < 32 weeks gestational age

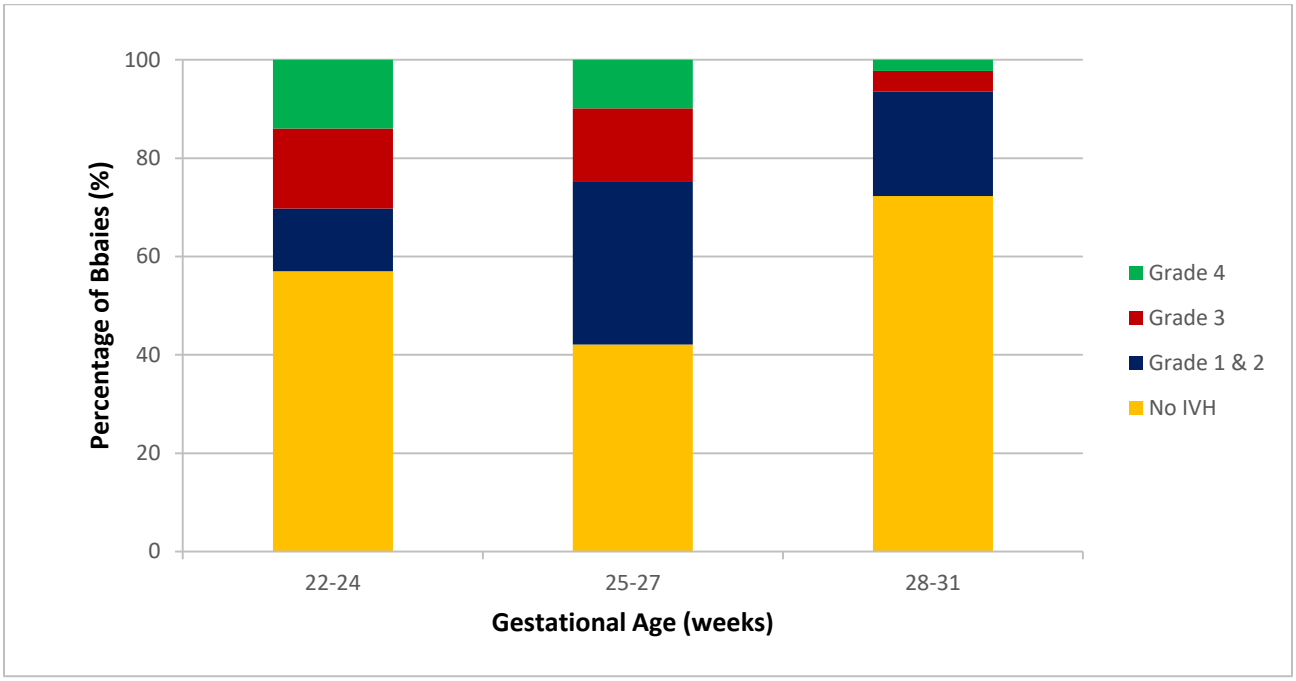


Table 10

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	No. of babies with CUS	
								Alive	Dead
22-24	n	159	86	49	11	14	12	13	73
	%	5.7	54.1	57.0	12.8	16.3	14.0		
25-27	n	598	515	217	170	77	51	303	212
	%	21.6	86.0	42.1	33.0	15.0	9.9		
28-31	n	2015	1882	1361	400	78	43	1674	208
	%	72.7	93.4	72.3	21.3	4.1	2.3		
Total included	n	2772	2483	1627	581	169	106	1990	493
	%	100	89.5	65.5	23.4	6.8	4.3		
Total no. of missing (GA)	0								
Total babies	2772								

CUS – cranial untrasound

Figure 11

Incidence of Intraventricular Haemorrhage (IVH) in admitted inborn babies ≤ 1500 grams birth weight

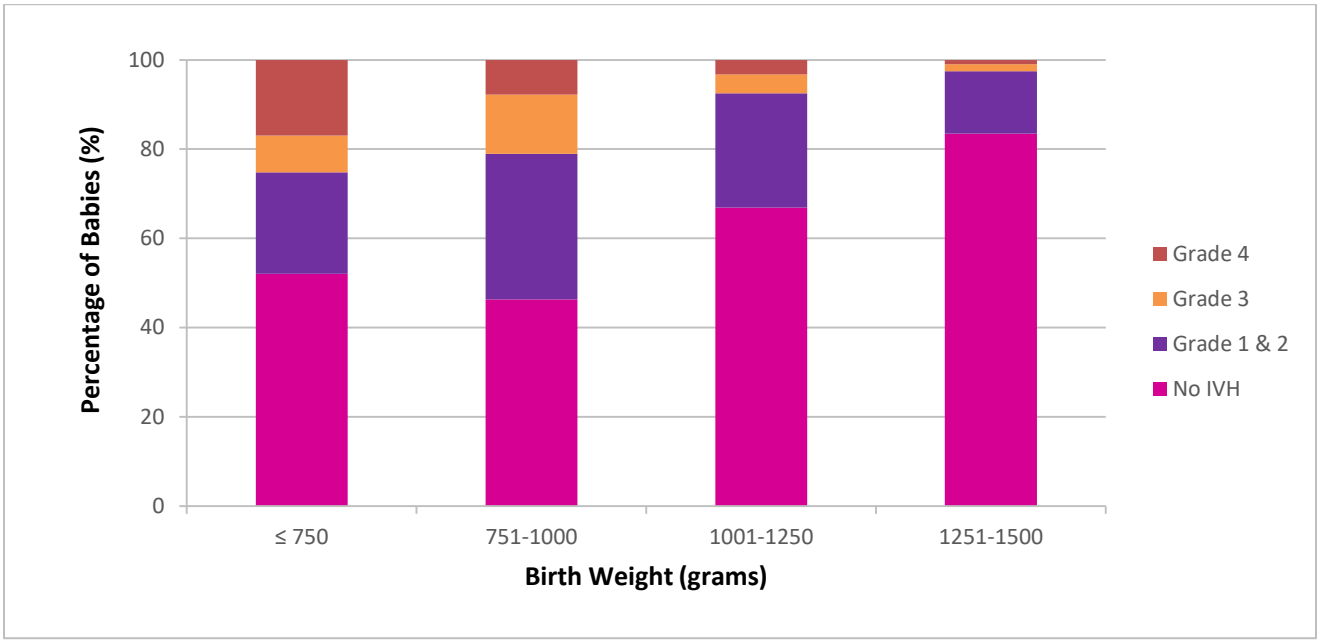


Table 11

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	No. of babies with CUS	
								Alive	Dead
≤ 750	n	352	242	126	55	20	41	93	149
	%	11.1	68.8	52.1	22.7	8.3	16.9		
751-1000	n	657	594	275	194	79	46	416	178
	%	20.8	90.4	46.3	32.7	13.3	7.7		
1001-1250	n	900	856	573	219	36	28	731	125
	%	28.5	95.1	66.9	25.6	4.2	3.3		
1251-1500	n	1250	1132	945	158	18	11	1037	95
	%	39.6	90.6	83.5	14.0	1.6	1.0		
Total included	n	3159	2824	1919	626	153	126	2277	547
	%	100.0	89.4	68.0	22.2	5.4	4.5		
Total no. of missing (GA)	0								
Total babies	2954								

Figure 12

Blood culture positive early onset sepsis in admitted inborn babies

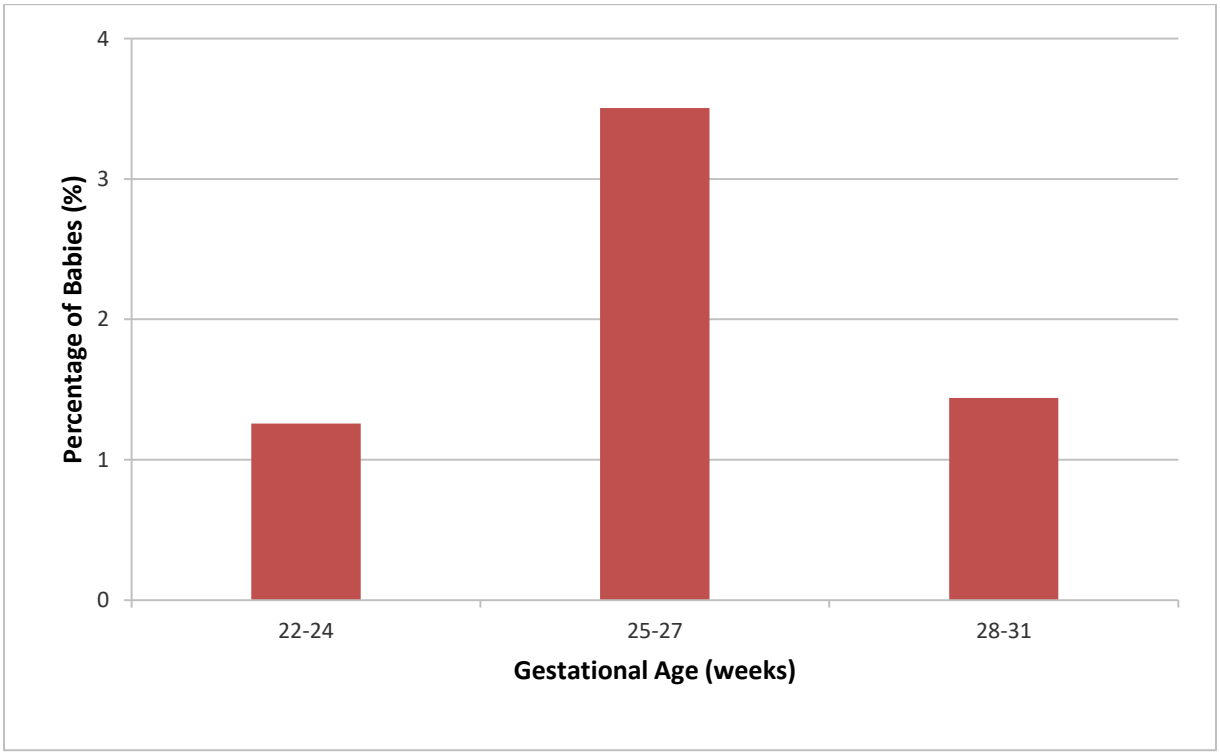


Table 12

Gestational age at birth (completed weeks)	Total number of admitted inborn babies	No. of babies with early infection	
	n	*n*	%
22-24	159	2	1.3
25-27	598	21	3.5
28-31	2015	29	1.4
Total included	2772	52	1.9
Total no. of missing (GA)	0		
Total babies	2772		

Figure 13

Incidence of blood culture positive late onset sepsis in admitted inborn babies (by gestational age)

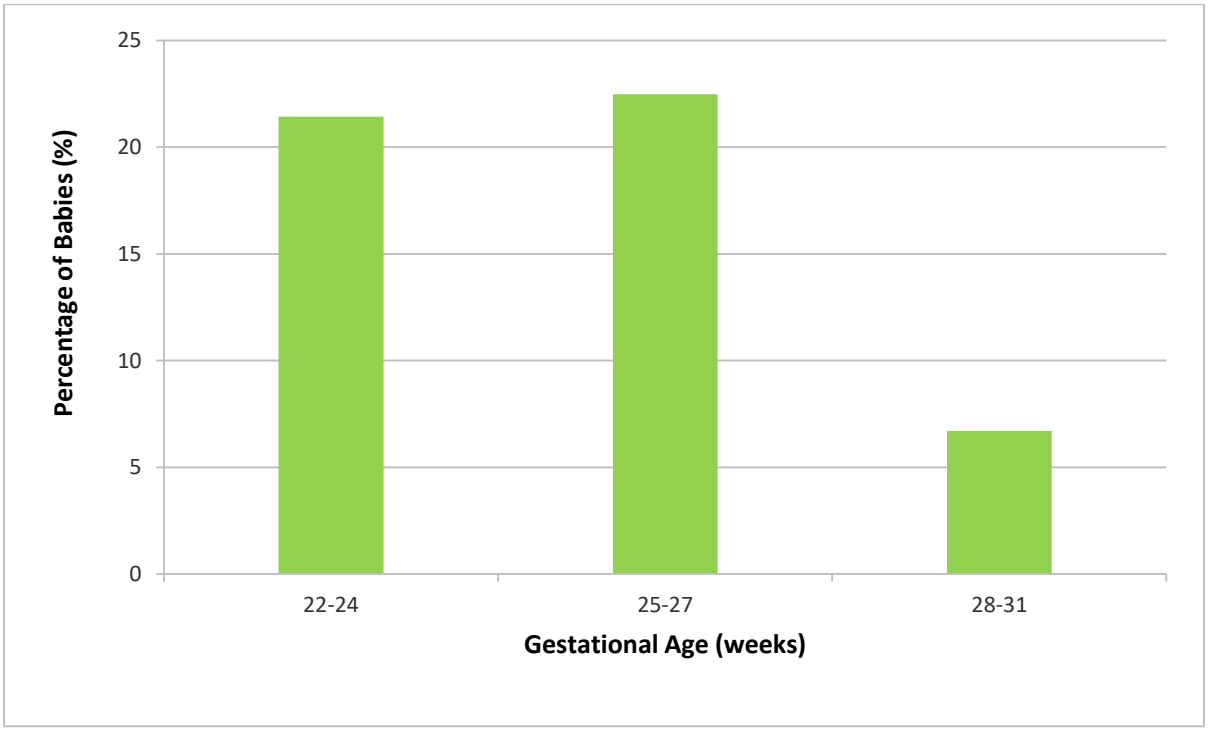


Table 13

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	159	5.7	14	0.7	3	21.4
25 – 27	598	21.6	307	14.9	69	22.5
28 – 31	2015	72.7	1743	84.4	117	6.7
Total included	2772	100	2064	100	189	9.2
Total no. of missing (GA)	0					
Total babies	2772					

Figure 14

Incidence of blood culture positive late onset sepsis in admitted inborn babies (by birth weight)

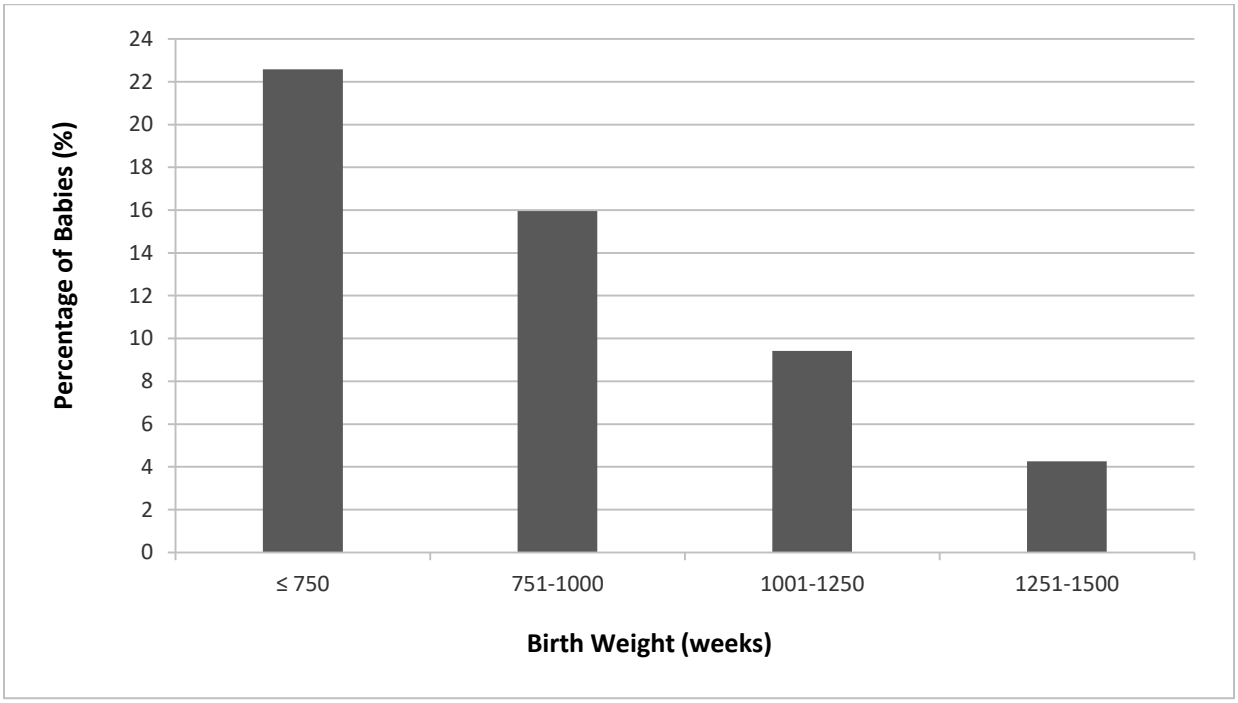


Table 14

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	352	11.1	93	3.9	21	22.6
751-1000	657	20.8	420	17.6	67	16.0
1001-1250	900	28.5	743	31.2	70	9.4
1251-1500	1250	39.6	1125	47.2	48	4.3
Total included	3159	100	2381	100	206	8.7
Total no. of missing (BW)	0					
Overall total babies	3159					

Figure 15

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

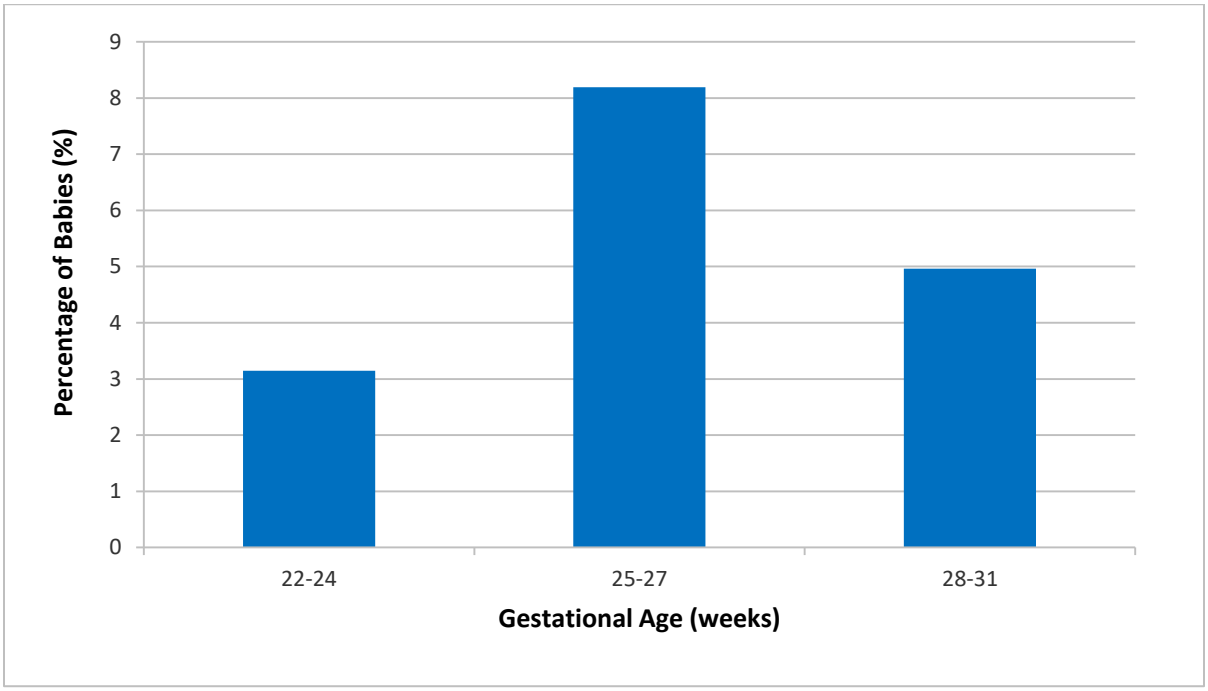


Table 15

Gestational age (weeks)	Total number of admitted inborn babies	Babies with NEC		No NEC		Surgical treatment			
						Yes		No	
	n	*n*	*%*	*n*	*%*	*n*	*%*	*n*	*%*
22-24	159	5	3.5	154	96.9	1	20.0	4	80.0
25-27	598	49	8.2	549	91.8	13	26.5	36	73.5
28-31	2015	100	5.0	1915	95.0	20	20.0	80	80.0
Total included	2772	154	5.6	2618	94.4	34	22.1	120	77.9
Total no. of missing (GA)	0								
Overall Total babies	2772								

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

Figure 16

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

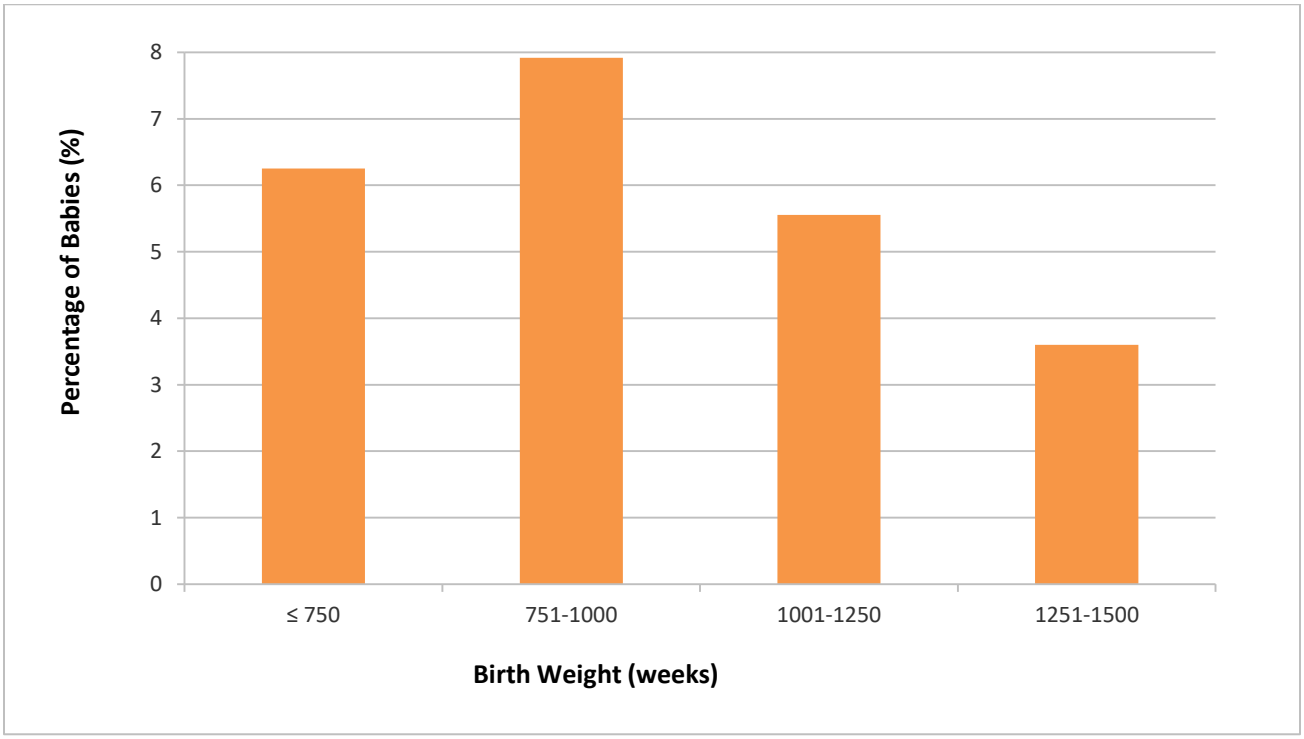


Table 16

Birth weight (grams)	Total number admitted of inborn babies	Babies with NEC		No NEC		Surgical treatment			
						Yes		No	
	n	*n*	*%*	*n*	%	*n*	%	*n*	%
≤ 750	352	22	6.3	330	93.8	4	18.2	18	81.8
751-1000	657	52	7.9	605	92.1	10	19.2	42	80.8
1001-1250	900	50	5.6	850	94.4	15	30.0	35	70.0
1251-1500	1250	45	3.6	1205	96.4	7	15.6	38	84.4
Total included	3159	169	5.3	2990	94.7	36	21.3	133	78.7
Total no. of missing (BW)	0								
Overall total babies	3159								

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

Figure 17a

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

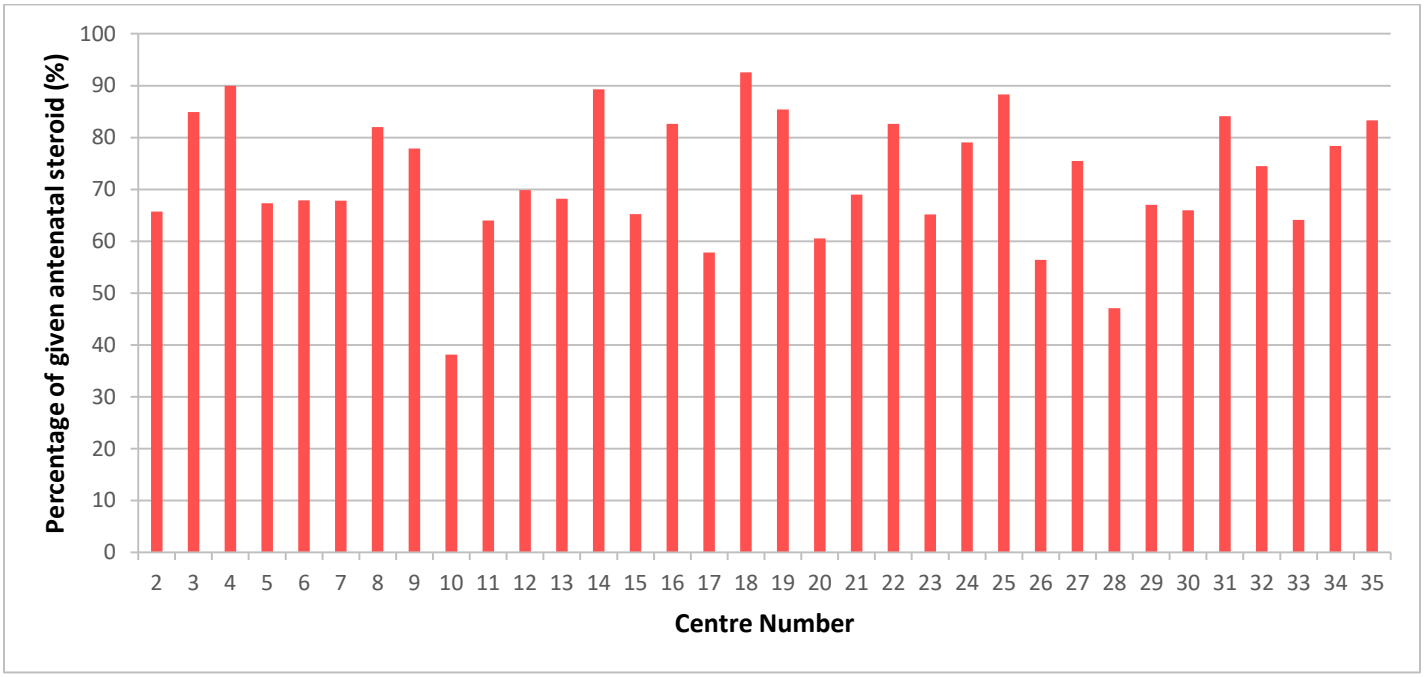


Figure 17b

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

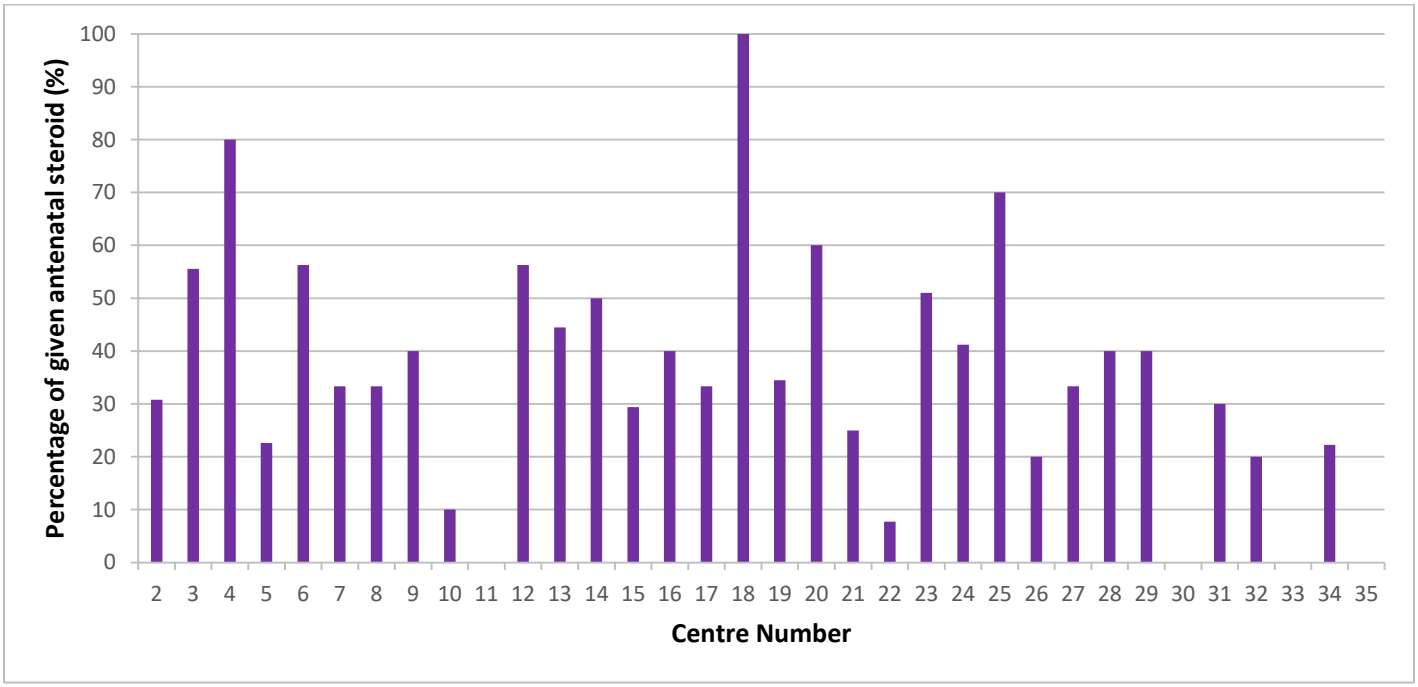


Table 17:
Antenatal corticosteroid for all babies born at < 32 weeks gestational age according to centres

Hospitals	Inborn					Outborn				
	Total number of babies		Given Antenatal Steroid		Unknown	Total number of babies		Given Antenatal Steroid		Unknown
	n	%	*n*	%	*n*	*n*	%	*n*	%	*n*
Overall	2872	100	2087	72.7	101	457	100	172	37.6	43
2	137	4.8	90	65.7	20	39	8.5	12	30.8	11
3	166	5.8	141	84.9	9	18	3.9	10	55.6	5
4	40	1.4	36	90.0	0	5	1.1	4	80.0	0
5	245	8.5	165	67.3	2	31	6.8	7	22.6	0
6	84	2.9	57	67.9	10	16	3.5	9	56.3	1
7	199	6.9	135	67.8	1	24	5.3	8	33.3	0
8	139	4.8	114	82.0	2	21	4.6	7	33.3	2
9	122	4.2	95	77.9	7	5	1.1	2	40.0	0
10	76	2.6	29	38.2	2	10	2.2	1	10.0	0
11	25	0.9	16	64.0	1	1	0.2	0	0.0	1
12	73	2.5	51	69.9	3	16	3.5	9	56.3	1
13	44	1.5	30	68.2	7	18	3.9	8	44.4	2
14	56	1.9	50	89.3	1	2	0.4	1	50.0	0
15	92	3.2	60	65.2	6	17	3.7	5	29.4	4
16	98	3.4	81	82.7	2	5	1.1	2	40.0	0
17	83	2.9	48	57.8	1	9	2.0	3	33.3	0
18	54	1.9	50	92.6	0	1	0.2	1	100.0	0
19	89	3.1	76	85.4	0	29	6.3	10	34.5	0

Table 17 (continued):

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

Hospitals	Inborn					Outborn				
	Total number of babies		Given Antenatal Steroid		Unknown	Total number of babies		Given Antenatal Steroid		Unknown
	n	%	*n*	%	*n*	*n*	%	*n*	%	*n*
20	38	1.3	23	60.5	0	5	1.1	3	60.0	0
21	58	2.0	40	69.0	0	4	0.9	1	25.0	0
22	92	3.2	76	82.6	0	13	2.8	1	7.7	1
23	109	3.5	71	65.1	8	51	11.2	26	51.0	5
24	129	4.5	102	79.1	1	17	3.7	7	41.2	0
25	60	2.1	53	88.3	0	20	4.4	14	70.0	0
26	78	2.7	44	56.4	0	15	3.3	3	20.0	1
27	53	1.8	40	75.5	2	15	3.3	5	33.3	4
28	17	0.6	8	47.1	0	5	1.1	2	40.0	0
29	88	3.1	59	67.0	4	5	1.1	2	40.0	0
30	50	1.7	33	66.0	7	2	0.4	0	0.0	0
31	88	3.1	74	84.1	4	20	4.4	6	30.0	4
32	102	3.6	76	74.5	0	5	1.1	1	20.0	1
33	39	1.4	25	64.1	1	4	0.9	0	0.0	0
34	37	1.3	29	78.4	0	9	2.0	2	22.2	0
35	12	0.4	10	83.3	0	0	0	0	0.0	0

Figure 18a

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

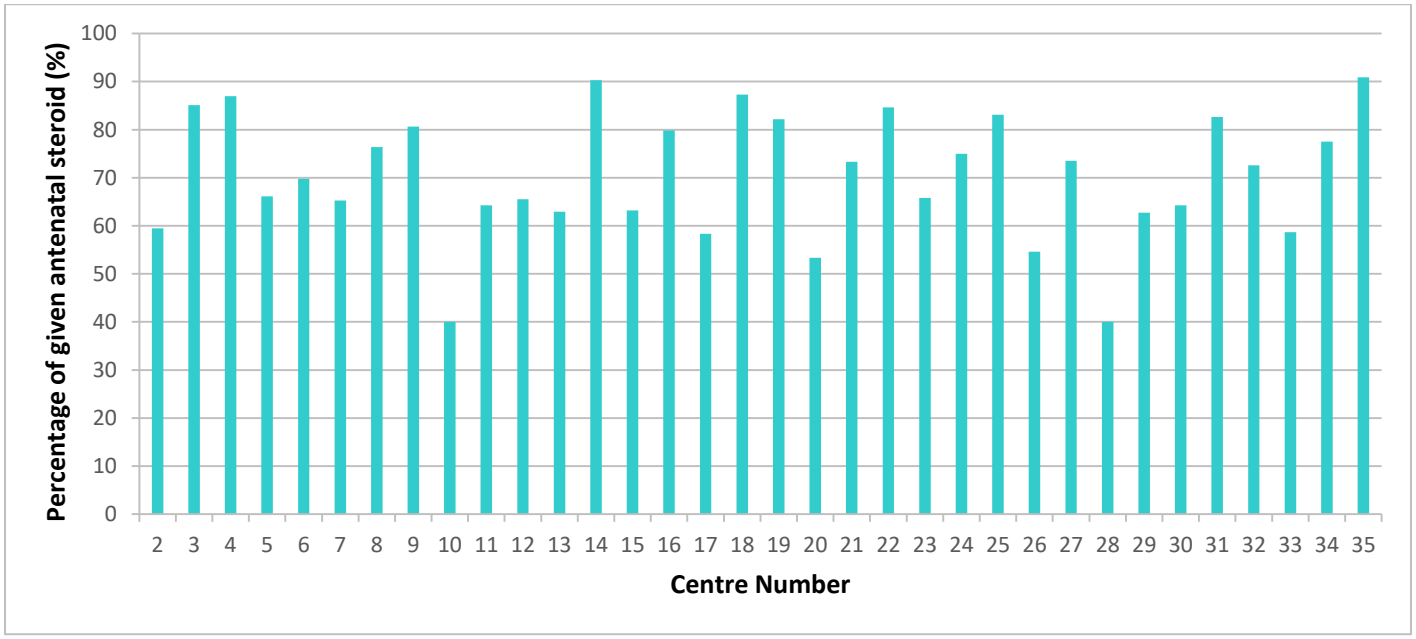


Figure 18b

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

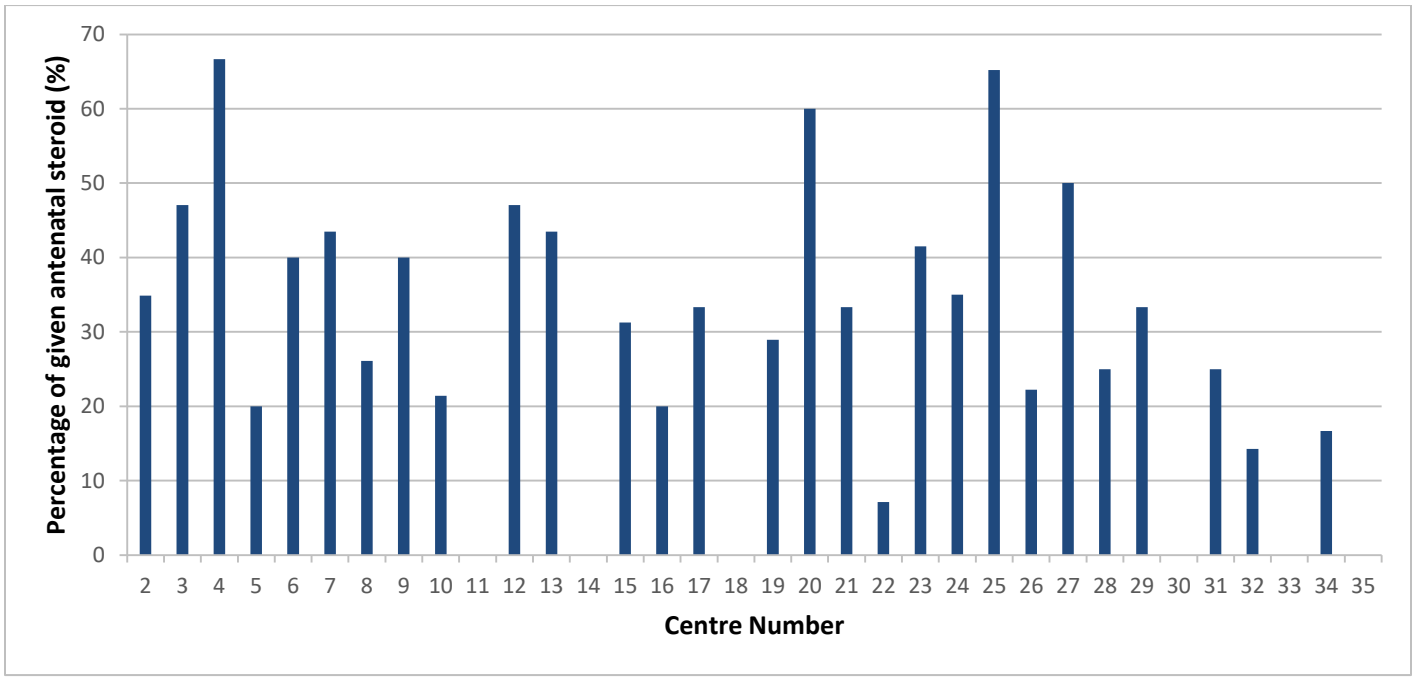


Table 18 :
Antenatal corticosteroidfor all babies born at ≤ 1500 grams birth weight according to centres

Hospitals	Inborn					Outborn				
	Total number of babies		Given Antenatal Steroid		Unknown	Total number of babies		Given Antenatal Steroid		Unknown
	n	%	*N*	%	*n*	*n*	%	*n*	%	*N*
Overall	3259	100	2300	70.6	110	520	100	174	33.5	47
2	153	4.7	91	59.5	24	43	8.3	15	34.9	10
3	188	5.8	160	85.1	9	17	3.3	8	47.1	5
4	46	1.4	40	87.0	0	6	1.2	4	66.7	0
5	257	7.9	170	66.1	2	30	5.8	6	20.0	0
6	96	2.9	67	69.8	10	25	4.8	10	40.0	3
7	210	6.4	137	65.2	1	23	4.4	10	43.5	0
8	144	4.4	110	76.4	2	23	4.4	6	26.1	2
9	129	4.0	104	8.6	7	5	1.0	2	40.0	0
10	115	3.5	46	40.0	1	14	2.7	3	21.4	0
11	28	0.9	18	64.3	1	2	0.4	0	0.0	1
12	87	2.7	57	65.5	3	17	3.3	8	47.1	2
13	54	1.7	34	63.0	9	23	4.4	10	43.5	3
14	62	1.9	56	90.3	1	1	0.2	0	0.0	0
15	87	2.7	55	63.2	5	16	3.1	5	31.3	3
16	109	3.3	87	79.8	2	5	1.0	1	20.0	1
17	96	2.9	56	58.3	1	9	1.7	3	33.3	0
18	55	1.7	48	87.3	0	1	0.2	0	0.0	1
19	118	3.6	97	82.2	1	38	7.3	11	28.9	0

Table 18 (continued):
Antenatal corticosteroid for allbabies born at ≤ 1500 grams birth weight according to centres

Hospitals	Inborn					Outborn				
	Total number of babies		Given Antenatal Steroid		Unknown	Total number of babies		Given Antenatal Steroid		Unknown
	N	%	*n*	%	*n*	*N*	%	*N*	%	*N*
20	45	1.4	24	53.3	0	5	1.0	3	60.0	0
21	60	1.8	44	73.3	0	3	0.6	1	33.3	0
22	117	3.6	99	84.6	0	14	2.7	1	7.1	1
23	114	3.5	75	65.8	7	53	10.2	22	41.5	7
24	148	4.5	111	75.0	2	20	3.8	7	35.0	0
25	71	2.2	59	83.1	0	23	4.4	15	65.2	0
26	97	3.0	53	54.6	1	18	3.5	4	22.2	1
27	68	2.1	50	73.5	2	14	2.7	7	50.0	2
28	10	0.3	4	40.0	0	8	1.5	2	25.0	0
29	102	3.1	64	62.7	3	6	1.2	2	33.3	0
30	56	1.7	36	64.3	9	4	0.8	0	0.0	0
31	98	3.0	81	82.7	4	20	3.8	5	25.0	4
32	113	3.5	82	72.6	1	7	1.3	1	14.3	1
33	75	2.3	44	58.7	2	14	2.7	0	0.0	0
34	40	1.2	31	77.5	0	12	2.3	2	16.7	0
35	11	0.3	10	90.9	0	1	0.2	0	0.0	0

Figure 19

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

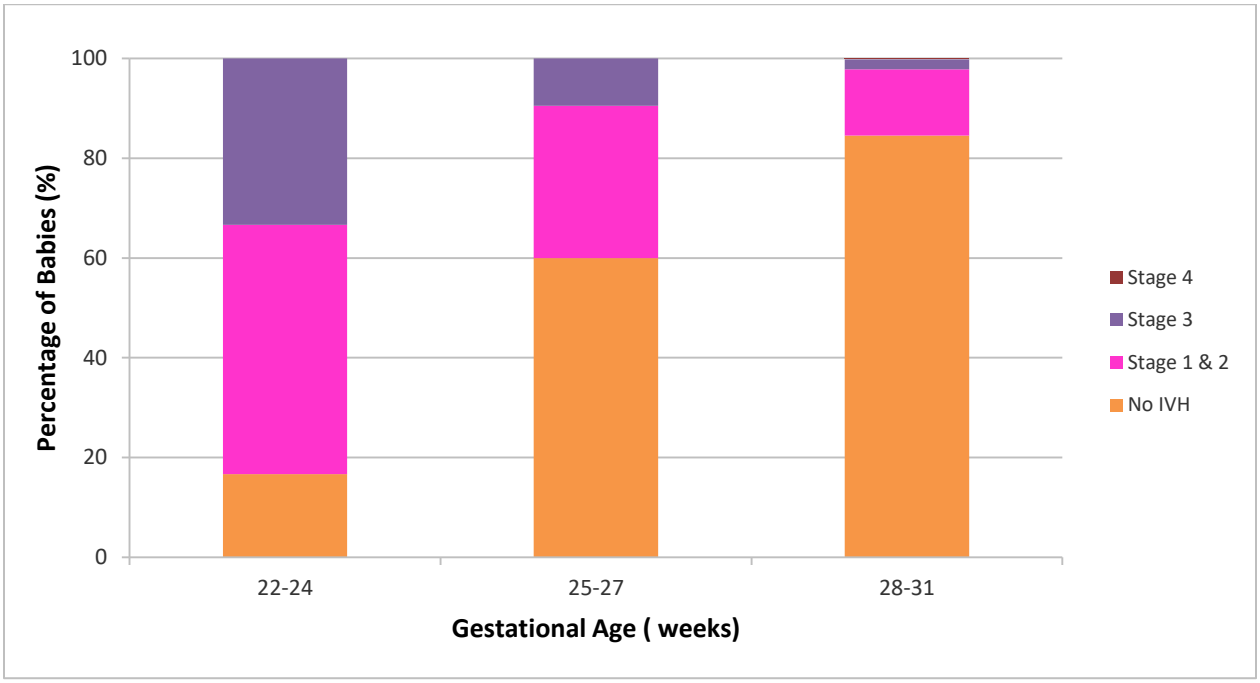


Table 19

Gestational age at birth (weeks)	Total number of admitted inborn babies		No. of babies alive at 6 weeks		No. of babies with known eye examination results		Retinopathy of prematurity							
							No ROP		ROP Stage 1 & 2		ROP Stage 3		ROP Stage 4 & 5	
	n	%	*n*	%	*n*	%	*n*	%	*n*	%	*n*	%	*n*	%
22-24	159	5.7	18	11.3	12	66.7	2	16.7	6	50	4	33.3	0	0.0
25-27	598	21.6	324	54.2	295	91.0	177	60.0	90	30.5	28	9.5	0	0.0
28-31	2015	72.7	1772	87.9	1138	64.2	962	84.5	151	13.3	23	2.0	2	0.2
Total included	2772	100	2114	76.3	1445	68.4	1141	79.0	247	17.1	55	3.8	2	0.1

Comment: Percentage of ROP is based on number of babies having had screening eye examinations. Percentage of babies with eye examinations based on total number of babies admitted according to each gestational age category

Figure 20

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

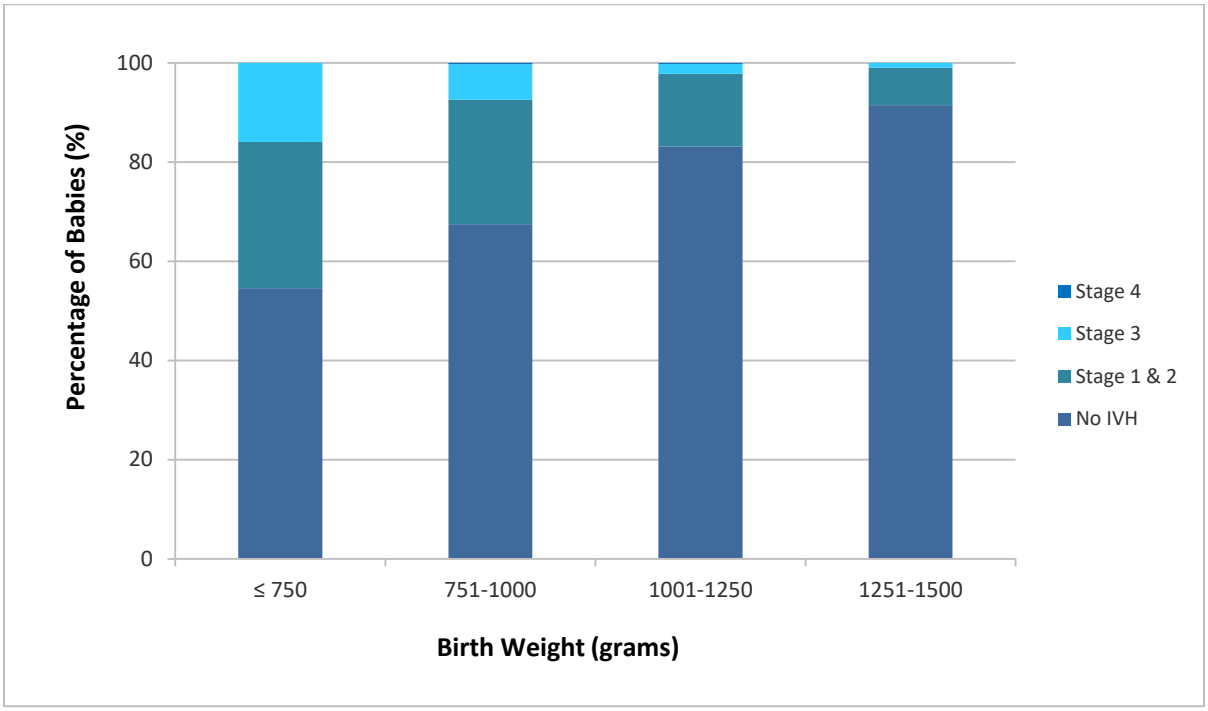


Table 20

Birth weight (grams)	Total no of admitted inborn babies		No. of babies alive at 6 weeks		No. of babies with known eye examination results		Retinopathy of prematurity							
							No ROP		Stage 1 & 2		Stage 3		Stage 4 & 5	
	n	%	*n*	%	*n*	%	*n*	%	*n*	%	*n*	%	*n*	%
≤ 750	352	11.1	96	27.3	88	91.7	48	54.5	27	30.7	3	3.4	0	0.0
751-1000	657	20.8	446	67.9	403	90.4	272	67.5	101	25.1	29	7.2	1	0.2
1001-1250	900	28.5	757	84.1	599	79.1	498	83.1	88	14.7	12	2.0	1	0.2
1251-1500	1250	39.6	1136	90.9	611	53.8	559	91.5	46	7.5	6	1.0	0	0.0
Total included	3159	100	2435	77.1	1701	69.9	1377	81.0	262	15.4	50	2.9	2	0.1

Comment: Babies screened for ROP after discharge are not included

Figure 21

Cryotherapy / laser therapy for admitted inborn babies with retinopathy of prematurity (by gestational age)

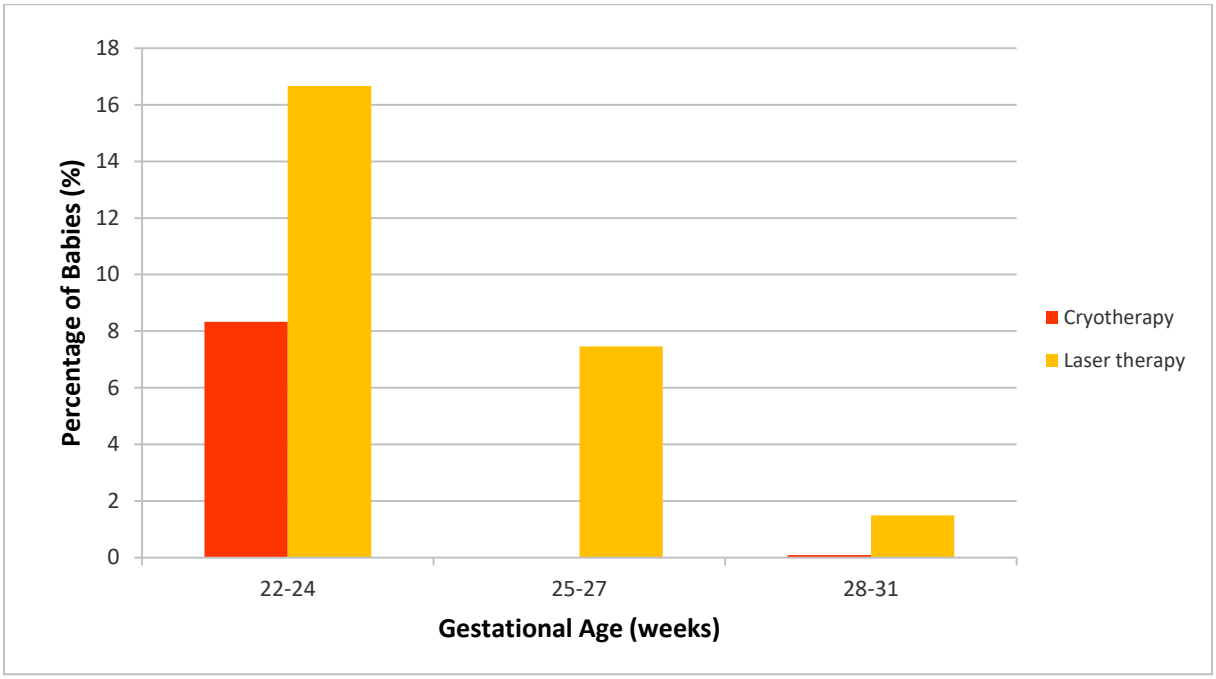


Table 21

Gestational age at birth (weeks)	Total number of admitted inborn babies		No. of babies with known eye examination results		Cryotherapy		Laser therapy	
	n	%	*n*	%	*n*	%	*n*	%
22-24	159	5.7	12	7.5	1	8.3	2	16.7
25-27	598	21.6	295	49.3	0	0.0	22	7.5
28-31	2015	72.7	1138	56.5	1	0.1	17	1.5
Total included	2772	100	1445	52.1	2	0.1	41	2.8
Total no. of missing (GA)	0							
Total babies	2772							

Figure 22

Cryotherapy / laser therapy for admitted inborn babies with retinopathy of prematurity (by birth weight)

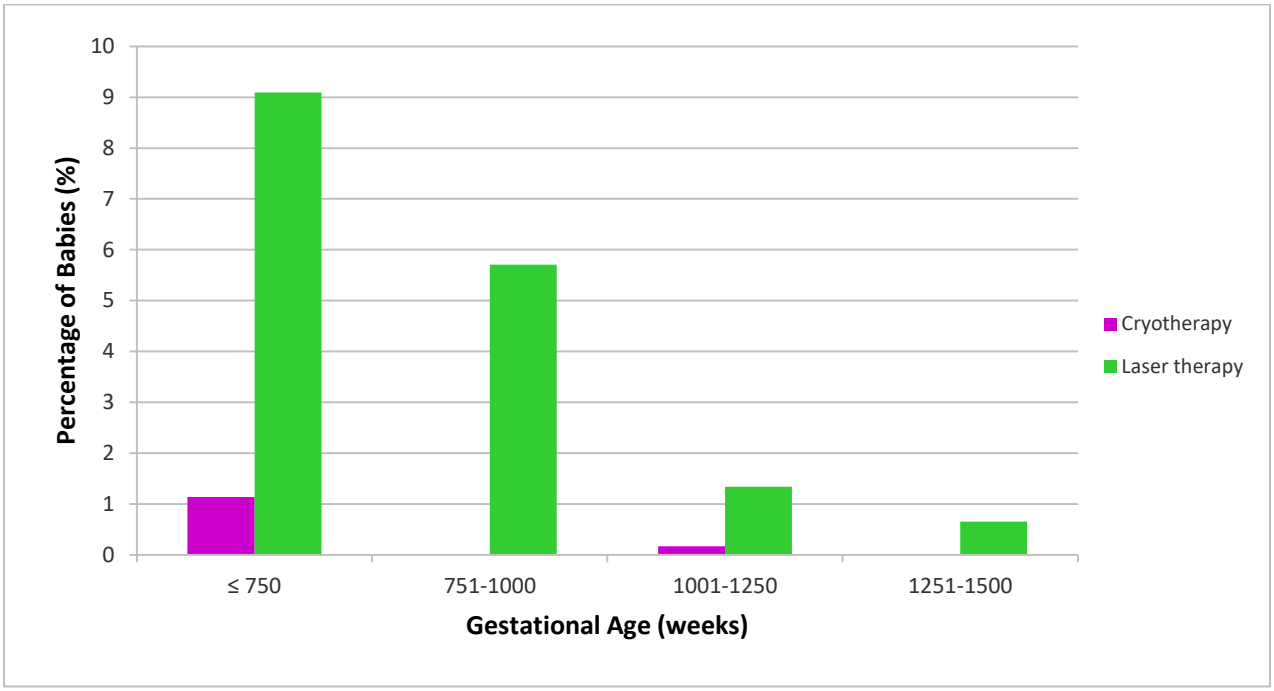


Table 22

Birth weight (grams)	Total number of admitted inborn babies		No. of babies with known eye examination results		Cryotherapy		Laser therapy	
	n	%	*n*	%	*n*	%	*n*	%
≤ 750	352	11.1	96	25.0	1	1.1	8	9.1
751-1000	657	20.8	446	61.3	0	0.0	23	5.7
1001-1250	900	28.5	757	66.6	1	0.2	8	1.3
1251-1500	1250	39.6	1136	48.9	0	0.2	4	0.7
Total included	3159	100	2435	53.81	2	0.1	43	2.5
Total no. of missing (BW)	0							
Total babies	3159							

Figure 23

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

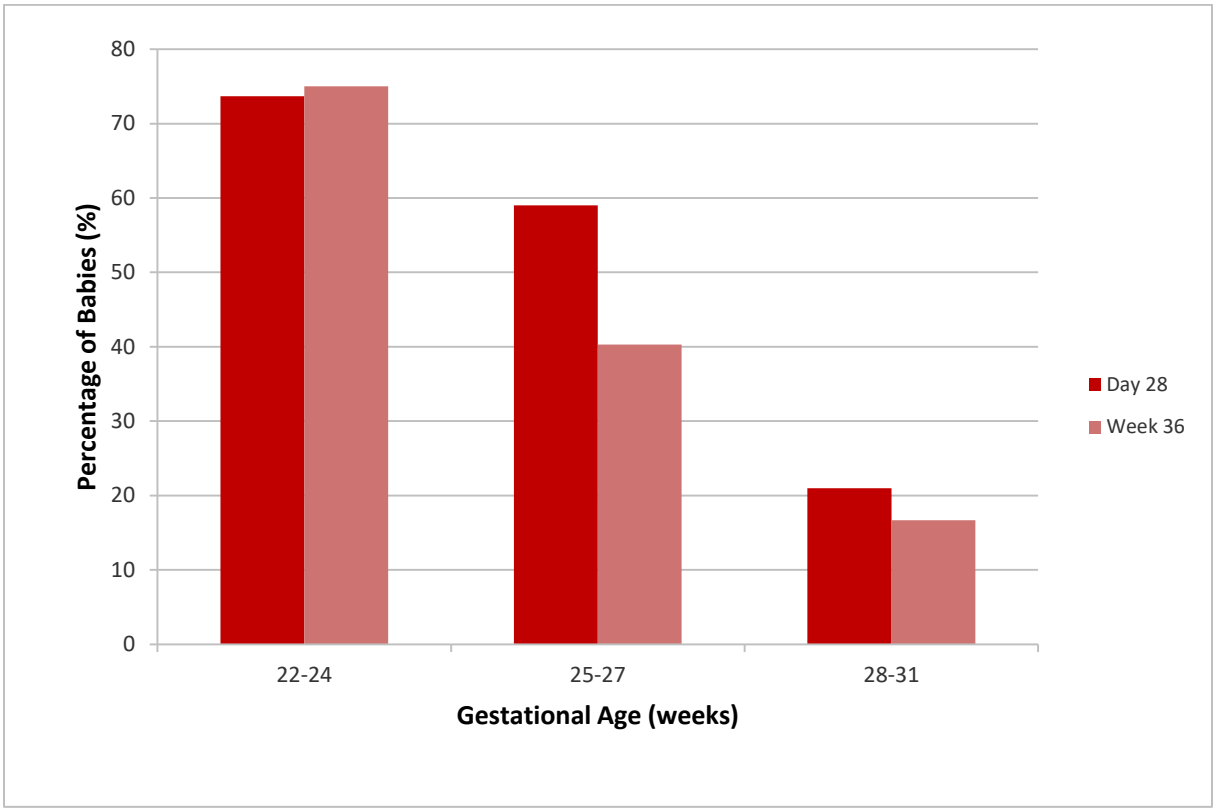


Table 23 :
Incidence of oxygen dependency among admitted inborn babies with gestational age < 32 weeks

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*	159	19	14	12	9
	%	5.7	11.9	73.7	7.5	75.0
25-27	*n*	598	322	190	216	87
	%	21.6	53.8	59.0	36.1	40.3
28-31	*n*	2015	1396	293	876	146
	%	72.7	69.3	21.0	43.5	16.7
Total Included	*n*	2772	1737	497	1104	242
	%	100	62.7	28.6	39.8	21.9
Total no. of missing (GA)		0				
Overall Total babies		2772				

Figure 24

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

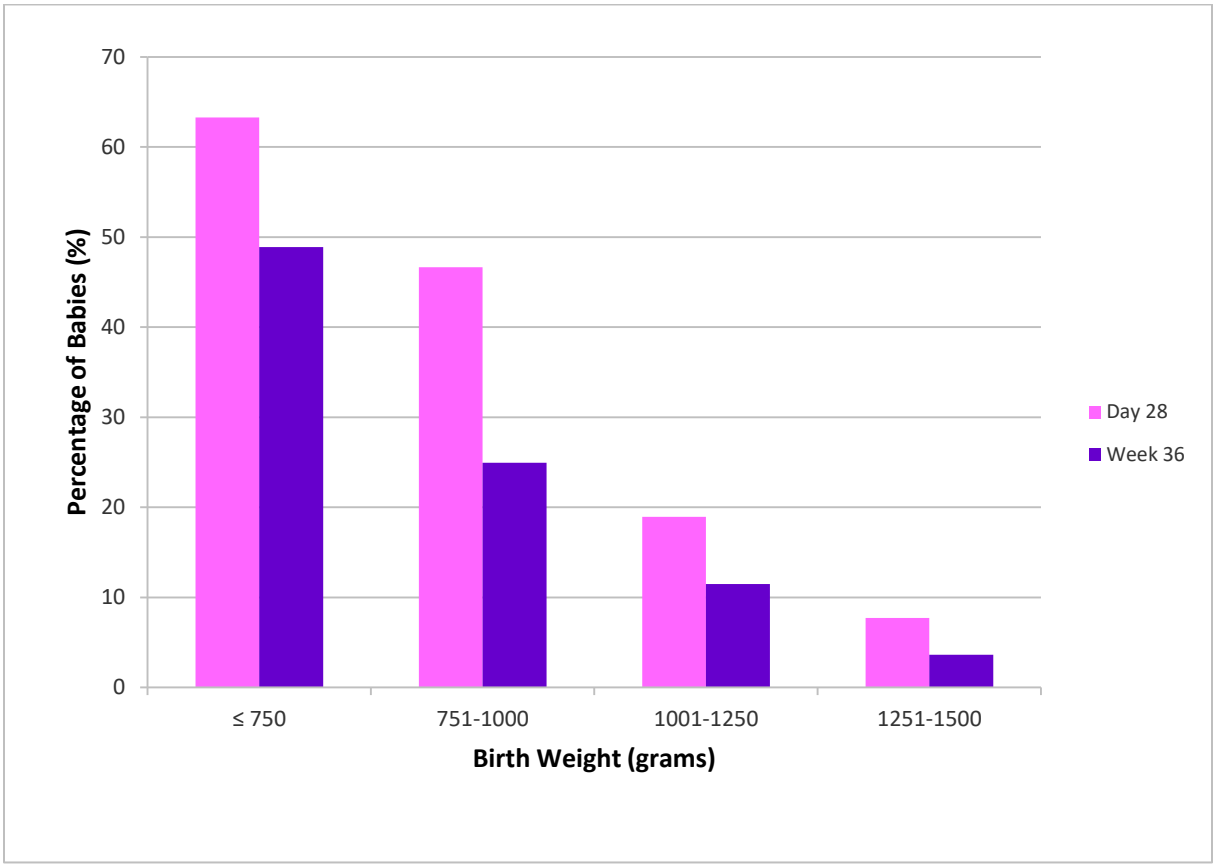


Table 24:
Incidence of oxygen dependency among admitted inborn babies with birth weight ≤ 1500 grams

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*	352	98	62	90	44
	%	11.1	27.8	63.3	25.6	48.9
751-1000	*n*	657	450	210	369	92
	%	20.8	68.5	46.7	56.2	24.9
1001 - 1250	*n*	900	718	136	558	64
	%	28.5	79.8	18.9	62.0	11.5
1251 - 1500	*n*	1250	842	65	747	27
	%	39.6	67.4	7.7	59.8	3.6
Total Included	*n*	3159	2018	473	1764	227
	%	100	66.7	22.4	55.8	12.9
Total no. of missing (GA)		0				
Total babies		3159				

Table 25a

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	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	159	14	4	2	3	0	0	5
	%	5.7	8.8	28.6	14.3	21.4	0.0	0.0	35.7
25-27	n	598	309	114	33	14	1	0	147
	%	21.6	51.7	36.9	10.7	4.5	0.3	0.0	47.6
28-31	n	2015	1756	276	48	9	0	0	1423
	%	72.7	87.1	15.7	2.7	0.5	0.0	0.0	81.0
Total Included	n	2772	2079	394	83	26	1	0	1575
	%	100	75.0	19.0	4.0	1.3	0.0	0.0	75.8
Total no. of missing (GA)	-								
Total babies	2772								

i. PDA requiring surgical ligation

ii. Stage 3 or 4 ROP

iii. Oxygen dependency at 36 weeks or discharge

iv. Confirmed sepsis

v. NEC

Table 25b

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

Gestational age at birth (weeks)		Total no. of admitted inborn babies	Survived	No. with any one morbidities prior to discharge among survivors	No. with any two morbidities prior to discharge among survivors	No. With any three morbidities prior to discharge among survivors	No. With any four morbidities prior to discharge among survivors	No. without any four morbidities prior to discharge among survivors
≤ 750	n	352	93	38	22	5	1	27
	%	11.1	26.4	40.9	23.7	5.4	1.1	29.0
751 - 1000	n	657	424	125	33	13	0	253
	%	20.8	64.5	29.5	7.8	3.1	0.0	59.7
1001 - 1250	n	900	748	149	20	6	0	573
	%	28.5	83.1	19.9	2.7	0.8	0.0	76.6
1251 – 1500	n	1250	1128	105	10	1	0	1012
	%	39.6	90.2	9.3	0.9	0.1	0.0	89.7
Total included	n	3159	2393	417	85	25	0	1865
	%	100	75.8	17.4	3.6	1.0	0.0	77.9
Total no. of missing (GA)	-							
Total babies	3159							

i. PDA requiring surgical ligation

ii. Stage 3 or 4 ROP

iii. Oxygen dependency at 36 weeks or discharge

iv. Confirmed sepsis

v. NEC

Table 26

Days on ventilatory support (by birth weight) for admitted inborn babies discharged directly home from MNNR hospitals

Birth weight (grams)	Total number of admitted inborn babies		Number ventilated		Ventilatory Days						
	n	%	*n*	%	Mean	SEM	Min	1st Quar -tile	Median	3rd Quartile	Max
≤ 750	352	11.1	186	52.8	11.9	1.6	0	1	3	11	301
751-1000	657	20.8	549	83.6	11.5	0.9	0	1	4	11	197
1001-1250	900	28.5	649	72.1	5.4	0.3	0	1	2	6	88
1251-1500	1250	39.6	635	50.8	3.0	0.2	0	0	1	3	99
Total included	3159	100	2019	63.9	6.6	0.3	0	1	2	6	301
Total no. of missing (BW)	-										
Total no. of babies discharged home	3159										

Figure 27a

Duration of hospital stay according to gestational age in admitted inborn babies

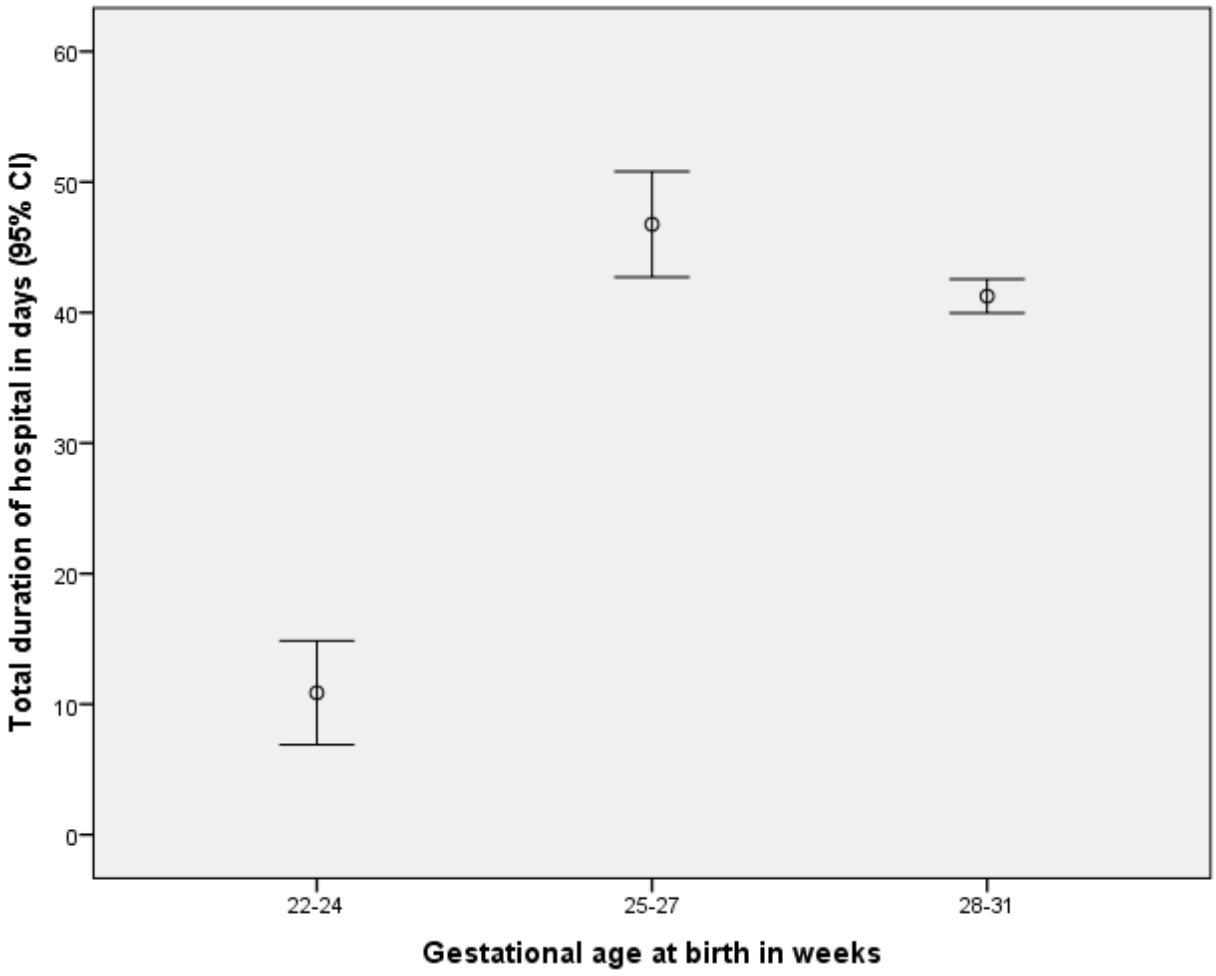


Table 27a :
Duration of hospital stay according to gestational age in admitted inborn babies

Gestational age (weeks)	Total no. of admitted inborn babies		No. of babies discharged alive		Mean	SEM	Min	1st Quartile	Median	3rd Quartile	Max
	n	%	*n*	%							
22-24	159	5.7	14	8.8	10.9	2.0	1	1	1	3	153
25-27	598	21.6	309	51.7	46.8	2.1	1	2	38	80	461
28-31	2015	72.7	1756	87.1	41.3	0.7	1	23	38	54	395
Total included	2772	100	2079	75.0	40.4	0.7	1	11	36	58	461

Total no. of missing (GA)	0
Total no. of babies discharged home from network hospitals	2079
Total no. of babies who died or were transferred out	693
Total babies	2772

Figure 27b

Duration of hospital stay according to birth weight in admitted inborn babies

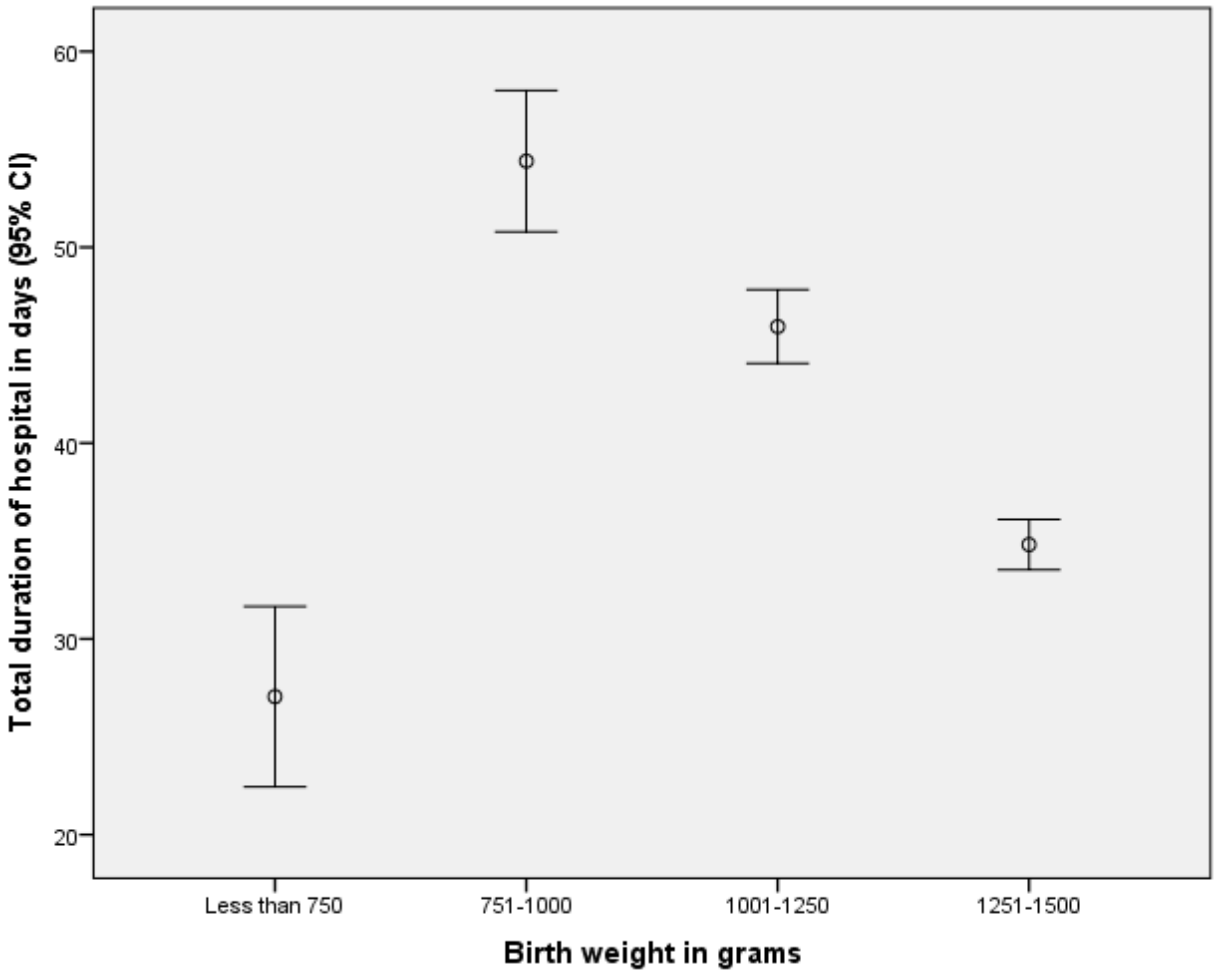


Table 27b :
Duration of hospital stay according to birth weight in admitted inborn babies

Birth Weight (grams)	Total no. of admitted inborn babies		No. of babies discharged alive		Mean	SEM	Min	1st Quartile	Median	3rd Quartile	Max
	n	%	*n*	%							
≤ 750	352	11.1	93	26.4	27.1	2.3	1	1	1	22	366
751 -1000	657	20.8	424	64.5	54.4	1.8	1	7	58	79	461
1001 - 1250	900	28.5	748	83.1	46.0	1.0	1	32	46	59	323
1251 - 1500	1250	39.6	1128	90.2	34.8	0.7	1	25	33	43	395
Total included	3159	100	2393	75.8	41.0	0.6	1	16	37	56	461

Total no. of missing (GA)	0
Total no. of babies discharged home from network hospitals	2393
Total no. of babies who died or were transferred out	766
Total babies	3159

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 will be considered as a readmission.

'Transfer from': Case transferred from another hospital and being admitted to NNU for first time.

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. ***Mother's I/C Number****:* MyKad number or Other ID document no. If "Other" please specify type of document.
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/ 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). Multiple pregnancy considered as ONE para (e.g twins)
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****:* 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****:* 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)****:* Weight in grams at birth hospital. If there are discrepant values, use the birth hospital value for outborn babies. If birth weight is unavailable, use the first weight taken up to 24 hours of life. If birth weight only listed as an estimate, record the estimate, but make a note on the CRF that this is an approximate birth weight.
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.

    b) ***Gestional 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 <10th centile; AGA 10-90th centile; LGA >90th 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.

25. ***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:*** 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) Bag-mask vent
    c) Endotracheal Tube Ventilation
    d) Cardiac Compression
    e) Adrenaline

28. ***Admission Temperature:*** Temperature 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 – if infant given Continuous Positive Airway Pressure (CPAP) applied through nose at any time of birth e.g. by Neopuff

b) 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.

c) HFJ/ HFOV – High frequency ventilation

d) Nitric oxide – gas delivered 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.

31. Surfactant: 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: 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

48a. Date of discharge/transfer/death*:* Enter the exact date

48b. 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.

49. 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)

50. Feeding at discharge/death: Refers to feeding received at the time of discharge

'Never Fed' – if infants did not received any enteral feeding at discharge either formula milk or human milk.

'Human milk only' – if infants was discharge receiving human milk either by breast-fed and/or expressed breast milk.

'Formula only' – if infants was discharge receiving formula milk at discharge

'Human milk with formula' –if infants was discharge receiving received both human milk and formula milk at discharge.

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.

50. 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. **This includes ROP findings after discharge.**

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. ***Gestation***
   < 37 or ≥ 37 weeks

c. ***Immaturity***
   This includes only livebirths < 37 weeks gestation after excluding LCM. Tick immediate secondary cause of death e.g. severe IVH, pulmonary haemorrhage

d. ***Asphyxial conditions***
   All term babies who died from birth asphyxia or meconium aspiration syndrome or PPHN

e. ***Infection***
   This refers to term babies (. 37 weeks gestation) whose primary cause of death is an infection. Some examples includes meningitis, group B streptococcal infection, intrauterine infections, etc.

f. ***Other specific causes***
   Specify any course of death not included in the above classification. This includes kernicterus, haemorrhagic shock/inborn error of metabolism/pneumothorax/pulmonary haemorrhage.

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: a. Presence of meconuim stained amniotic fluid at birth 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 intercostals retraction. 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 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. 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 made on autopsy finding of haemorrhage in the lungs).
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.
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: 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 AND 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). 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 afther thoracic surgery and wat not treated with a chest tube, tick **'No'**. For infants who had thoracic surgery and then later developed extra pleural air diagnosed by CXR or needle thoracocentesis, tick **'Yes'**. **Indicate whether pneumothorax developed during CPAP, Conventional ventilation or HFV.**
Supplemental oxygen & BPD For babies < 32 weeks – state if O_2 / any form of CPAP or ventilatory support required at Day 28 and 36 weeks corrected gestation For babies ≥ 32 weeks - state if O_2 / any form of CPAP or ventilatory support required at Day 28 and ≥ 56 postnatal days	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. '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 Persistent Pulmonary Hypertension (PPHN)	Failure of normal pulmonary vasculature relaxation at or shortly after birth, resulting in impedance to pulmonary blood flow, which exceeds systemic vascular resistance, such that deoxygenated blood shunted to the systemic circulation.
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. If ticked 'Yes', indicate whether ECHO was done and whether treatment (indomethacine/ibuprofen for > 24 hours or ligation) was given or not.
Necrotising enterocolitis (NEC) (Stage 2 and above) If 'yes' and managed surgically, tick 'Surgical Treatment' NEC present before admission to your centre? (applies to outborn babies)	NEC according to Bell's criteria stage 2 or higher **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). **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). **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) Maximum stage of ROP in left/right eye as defined by the International Committee on ROP (ICROP).	If an indirect ophthalmologic examination was performed at any time, enter the worst stage documented:

Score according to the grade of ROP assigned on an eye exam done by an ophthalmologist. If there is no explicit grade listed, then score according to the descriptions given by the ICROP. Tick 'Yes' if a retinal exam was done. State exact date of first screening and post conceptional age at screening. Specify only the worst stage**. Include if PLUS disease present** State if laser, cryotherapy or vitrectomy was done. If screening was not done, state 'No' and indicates whether an appointment for retinal examination was given. ROP present prior to admission? (applies to outborn babies)	**Stage 0:** No Evidence of ROP **Stage 1**: Demarcation Line **Stage 2**: Ridge **Stage 3**: Ridge with Extraretinal Fibrovascular Proliferation **Stage 4**: Retinal Detachment
Intraventricular haemorrhage (IVH) Tick 'Yes' if IVH is seen and enter the worst grade before or on 28 days of life. State if VP shunt/reservoir was inserted Tick 'No; if no IVH before or day 28 Tick 'Not Applicable' for term infant	If ultrasound of brain done on or before 28 days of life, enter the worst grade **Grade 1:** Subependymal germinal matrix (GM) haemorrhage only **Grade 2:** IVH without ventricular dilation **Grade 3:** IVH with ventricular dilation **Grade 4:** IVH with parenchymal involment
Central Venous Line	Presence of any of three types of catheters: 1) Umbilical catheters 2) Percutaneously inserted central catheters 3) Surgically placed Broviac catheter that terminates at or close to the heart or in one of the great vessels. Those great vessels considered are:

	NA – not applicable: no CVC line ○ Aorta ○ Superior vena kava ○ Brachiocephalic veins ○ Internal jugular veins ○ Subclavian veins ○ Inferior vena kava ○ External iliac veins ○ Common femoral veins
Seizures	Clinical evidence of subtle seizures, or of focal / multifocal, clonic or tonic seizures, confirmed by 2 or more clinicians or diagnosed by EEG. Used synonymously with fits or convulsions.
Confirmed sepsis Tick 'Yes'if there is evidence of confirmed sepsis. Do not include presumed or clinical sepsis. State whether the onset of first confirmed sepsis was On or before Day 3 of life OR after Day 3 of life. State the organism cultured: • Group B streptococcus • MRSA • CONS • ESBL • Fungal • Staphylococcus aureus • Klebsiella • Pseudomonas • Acinetobacter • Others, specify	***Confirmed sepsis*** Clinical evidence of sepsis plus culture-proven infection e.g. positive blood, urine, or CSF culture or positive bacterial antigen test. Includes congenital pneumonia if blood culture was positive. NOTE: The date of birth as day 1 regardless of the time of birth. For an infant born at 11.59 PM on September 1, day 3 will be September 3. <u>For CONS:</u> Place a tick if the infant has ALL 3 of the following: 1. CONS is recovered from a blood culture obtained from either a central line, or a peripheral blood sample and /or recovered from infants CSF AND 2. Signs of generalized infection (such as apnoea, temperature instability, feeding intolerance, worsening respiratory distress or haemodynamic instability) AND 3. Treatment with 5 or more days of IV antibiotics after the above cultures were obtained. If the patient died, was 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.

	Do not place a tick if any or all of the above are not true. <u>For FUNGAL infection</u>: 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	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) **Applied to <u>any gestation</u> so long the criteria fulfilled.**	HIE requires the presence of all 3 of the following criteria: 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 b. Abnormal muscle tone: hypertonia, hypotonia or flaccidity c. Abnormal deep tendon reflexes: increased, depressed or absent d. Seizures: subtle, multifocal or focal clonic e. Abnormal Moro reflex: exaggerated, incomplete or absent f. Abnormal suck: weak or absent g. Abnormal respiratory pattern: periodic, ataxic or apnoeic h. Oculomotor or papillary abnormalities: skew deviation, absent or reduced Doll's eye or fixed unreactive pupils **AND** 2. Three or more supporting findings from the following list: a. Arterial cord pH<7.00 b. Apgar score at 5 minutes of 5 or less c. Evidence of multi-organ system dysfunction – dysfunction of one or more of the following systems within 72 hours of birth:

	i. Renal: Oliguria or acute renal failure. ii. GI: necrotizing enterocolitis, hepatic dysfunction iii. Haematologic: thrombocytopaenia, disseminated intravascular coagulopathy. iv. Endocrine: hypoglycaemia, hyperglycaemia, hypercalcaemia, syndrome of inappropriate ADH secretion (SIADH). v. Pulmonary: persistent pulmonary hypertension vi. Cardiac: myocardial dysfunction, tricuspid insufficiency. 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 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. f. Abnormal EEG: low amplitude and frequency, periodic, paroxysmal or isoelectric. **AND** 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 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: Tick "none" if there is no HIE Tick '"Mild, Moderate, Severe " according to the definition	*HIE severity* a. Mild (normal or hyperalert) – infants in this category are alert or hyperalert with either a normal or exaggerated response to arousal. b. Moderate (lethargic or stupor) – infants in this category are arousable but have a diminished response to arousal maneuvers c. Severe (deep stupor or coma) – infants in this category are not arousable in response to arousal maneuvers

Major Congenital Abnormalities Tick 'Yes ' if major congenital anomaly is present even if it is an isolated one (i.e. only one abnormality) If Yes, state: 1. 'Known Syndrome', 2. 'Not a Recognised Syndrome' 3. 'Isolated major abnormality' If the syndrome is known, tick the specify syndromes or specify it. Types of Abnormalities: **Tick all major abnormalities found for recognisable syndrome, non-recognisable ones or isolated major congenital abnormality** Tick all the congenital anomalies found in patient. Please specify if there are abnormalities not listed.	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 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".

National Neonatal Registry

MONTHLY BIRTH CENSUS

Hospital : ……

Month : …… Year : …….

Total Births : ……. LiveBirths: ……. Stillbirths: ……..

Birth Weight (grams)	No. of Stillbirths	No. of Live Births	No. Admitted to Neonatal Unit	**No. who Died in Delivery Room
< 500				
500 – 600				
601 – 700				
701 – 800				
801 – 900				
901 – 1000				
1001 – 1250				
1251 – 1500				
1501 – 2000				
2001 – 2500				
>2500				
TOTAL				

Births versus Mode of Delivery

Mode of Delivery	No. of Stillbirths	No. of Live Births	No. Admitted to Neonatal Unit	**No. who Died in Delivery Room
Spontaneous Vertex (SVD)				
Breech				
Forceps				
Ventouse				
Lower Segment Caesarean Section (LSCS) Elective				
LSCS Emergency				
TOTAL				

Births versus Ethnic Group

Ethnic Group		**No. of Stillbirths**	**No. of Live Births**	**No. Admitted to Neonatal Unit**	****No. who Died in Delivery Room**
Malay					
Chinese					
Indian					
Orang Asli					
Bumiputra Sabah - specify ethnic group					
Bumiputra Sarawak – specify ethnic group					
Foreigner					
Other Malaysian					
TOTAL					

Remarks:

……

……

Name of Site Coordinator: ……

Chop: Date: ……

MALAYSIAN NATIONAL NEONATAL REGISTRY (CRF 2011)

Centre Name: _____

Date of Admission: ☐☐/☐☐/☐☐ (dd/mm/yy)

☐ New Case
☐ Readmission
☐ Transfer from, if relevant: .....

MNNR No. (Office use): ☐☐☐☐ / ☐☐☐☐
Centre: ☐☐☐☐

Admitted to neonatal ward: ☐ Yes → (Proceed to complete all sections in this CRF) ☐ No → (Proceed to complete [Sections 1, 2, 4(No. 45) and 5])

☐ Abandoned baby → (if box is ticked, item #1, 4a, 6-16 not mandatory)

Instruction: Where check boxes ☐ are provided, check (✓) one or more boxes. Where radio buttons ◉ are provided, check (✓) 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: ☐☐☐☐☐☐ - ☐☐ - ☐☐☐☐ Other ID document No: ☐☐☐☐☐☐☐☐☐☐☐☐ 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 ◉ Others, specify:
4b. Baby's MyKid number:	MyKid: ☐☐☐☐☐☐ - ☐☐ - ☐☐☐☐
5a. Date of birth of baby: (dd/mm/yyyy)	☐☐/☐☐/☐☐☐☐ **5b. Time of birth:** (24-hour format) (mandatory for death cases) ☐☐☐☐ (enter the best estimated time of birth if the exact time is unknown)
6. Ethnic group of mother:	◉ Malay ◉ Indian ◉ Bumiputra Sabah, specify: ..... ◉ Other Malaysian ◉ Chinese ◉ Orang Asli ◉ Bumiputra Sarawak, specify: ..... ◉ Non-citizen, specify country: .....
7. Maternal age:	☐☐ (years)
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 induced:	◉ Yes ◉ No ◉ Unknown
11. Maternal Eclampsia:	◉ Yes ◉ No ◉ Unknown
12. Maternal chorioamnionitis:	◉ Yes ◉ No ◉ Unknown
13. Maternal Anaemia:	◉ Yes ◉ No ◉ Unknown
14. Maternal abruptio placenta:	◉ Yes ◉ No
15. Maternal bleeding placenta praevia	◉ Yes ◉ No
16. Cord prolapse:	◉ Yes ◉ No

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 ◉ Neonatal assessment ◉ Unknown
21. Growth status:	◉ SGA ◉ AGA ◉ LGA
22. Gender:	◉ Male ◉ Female ◉ Ambiguous/ Indeterminate
23. Place of birth:	◉ Inborn ◉ Outborn → ◉ Home; ◉ Health clinic; ◉ Government hospital with specialist → ◉ District ◉ General; ◉ Government hospital without specialist; ◉ University hospital; ◉ Private hospital; ◉ Maternity home with specialist; ◉ Maternity home without specialist; ◉ Alternative Birthing Centre (ABC) → ◉ Urban ◉ Rural; ◉ Enroute/ During transport; ◉ Others, specify:.....; ◉ Unknown
24. Multiplicity:	◉ Singleton ◉ Twin ◉ Triplet ◉ Others, specify: .....
25. Final mode of delivery:	◉ Vaginal delivery → ◉ SVD ◉ Breech ◉ Instrumental → ☐ Vacuum ☐ Forcep ◉ Caesarean section → ◉ Elective ◉ Emergency ◉ Others, specify: → ◉ Unknown

SECTION 2 : BIRTH HISTORY (continue)

26. Apgar score at 1 min and 5 min (1-10) :	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) Cardiac compression:	◉ Yes	◉ No
	b) Bag-mask vent:	◉ Yes ◉ No	e) Adrenaline:	◉ Yes	◉ No
	c) Endotracheal tube vent:	◉ Yes ◉ No			
28. Admission temperature: (mandatory only if admitted to Neonatal Ward)	☐☐.☐ (°C)				

SECTION 3 : NEONATAL EVENT

29. Respiratory support:	◉ Yes → / ◉ No	a) CPAP done?	◉ Yes ◉ No
		i) Early CPAP within 1 hour from birth:	◉ Yes ◉ No
		ii) Total duration of CPAP at your centre:	☐☐ day(s)
		b) Conventional ventilation:	◉ Yes ◉ No
		i) Total duration of Conventional ventilation at your centre:	☐☐ day(s)
		c) HFJV/HFOV:	◉ Yes ◉ No
		i) Total duration of HFJ/HFOV at your centre:	☐☐ day(s)
		d) 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)	☐☐☐ (days)		
31. Surfactant:	◉ Yes → / ◉ No	◉ < 1 hr	◉ 1- 2 hrs ◉ > 2 hrs
32. Parenteral nutrition:	◉ Yes	◉ No	

SECTION 4 : PROBLEMS / DIAGNOSES

33. Respiratory :	☐ Meconium aspiration syndrome ☐ Transient tachypnoea of newborn	☐ Pulmonary haemorrhage ☐ Pulmonary interstitial emphysema	☐ Pneumonia
34. RDS:	◉ Yes	◉ No	
35. Pneumothorax:	◉ Yes → / ◉ No	Pneumothorax developed during:	◉ CPAP ◉ CMV ◉ HFV
36. Supplemental oxygen and BPD:	For babies < 32 weeks - State if O2 / any form of CPAP or ventilatory support required at Day 28 and 36 weeks corrected gestational age		
	a) Day 28: ◉ Yes ◉ No	b) 36 weeks corrected age:	◉ Yes ◉ No
	For babies ≥ 32 weeks, state if O2 / any form of CPAP or ventilatory support required at Day 28 and 56 postnatal days		
	a) Day 28: ◉ Yes ◉ No	b) > Day 56:	◉ Yes ◉ No
37.Cardiovascular:	PPHN: ◉ Yes ◉ No		◉ Unknown
38. PDA:	◉ Yes → / ◉ No	a) ECHO done:	◉ Yes ◉ No
		b) Indomethacin/Ibuprofen:	◉ Yes ◉ No
		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:	◉ Yes → (If yes, worst stage of ROP):	a) Date of first screening:	☐☐/☐☐/☐☐ (dd/mm/yy)
		b) Post conceptional age at screening:	☐☐ (autocalculate)
		c) ◉ No ROP ◉ Stage 1 ◉ Stage 2 ◉ Stage 3 ◉ Stage 4 ◉ Stage 5 ☐ PLUS disease	
		d) Laser therapy:	◉ Yes ◉ No
		e) Cryotherapy:	◉ Yes ◉ No
		f) Vitrectomy:	◉ Yes ◉ No
		g) ROP present prior to admission? (for outborn baby only)	◉ Yes ◉ No
	◉ No / ◉ Not applicable →	Appointment given:	◉ Yes ◉ No

SECTION 4 : PROBLEMS / DIAGNOSES (cont.)

41. IVH: * ◉ Yes ◉ No ◉ Not applicable (term infant) ◉ Ultrasound not done
If yes, worst grade : → ◉ Grade 1 ◉ Grade 2 ◉ Grade 3 ◉ Grade 4
☐ VP shunt / reservoir insertion

42. Central venous line: * ◉ Yes ◉ No

43. Seizures: * ◉ Yes ◉ No

44. Confirmed sepsis: * ◉ Yes → ◉ No

I) For first episode: ◉ On or before day 3 of life ◉ After day 3 of life

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

☐ Group B Streptococcus	☐ Fungal	☐ Acinetobacter
☐ MRSA	☐ Staphylococcus aureus	☐ Others, specify:
☐ CONS	☐ Klebsiella	
☐ ESBL organisms	☐ Pseudomonas	----------

45. Neonatal meningitis: * ◉ Yes ◉ No

46. Hypoxic ischaemic encephalopathy (HIE): * ◉ None ◉ Mild ◉ Moderate ◉ Severe

47. Congenital anomalies: *

47a. Major congenital anomalies:

◉ Yes → ◉ No

◉ Syndrome (known)
- ☐ Down
- ☐ Edward
- ☐ Patau
- ☐ Others, specify (Please refer to ICD 10):

◉ Not a recognised syndrome
◉ Isolated major abnormality

47b. Types of abnormalities **(Check all that are present. Applies to all including 'known syndromes', 'not a recognised syndrome' or 'isolated major abnormality')**

- ☐ CVS → ◉ Cyanotic ◉ Acyanotic; ☐ ECHO done
- ☐ CNS → ◉ Hydrocephalus ◉ Hydrancephaly ◉ Holoprosencephaly ◉ Others (Refer to ICD 10):
- ☐ Neural Tube Defect → ☐ Spina bifida ☐ Anencephaly ☐ Encephalocoele ☐ Others (Refer to ICD 10):
- ☐ Skeletal dysplasia
- ☐ Respiratory
- ☐ GIT
- ☐ Hydrops
- ☐ Renal
- ☐ Cleft → ◉ Lip ◉ Palate ◉ Lip and palate
- ☐ Others, specify
- ☐ None of the above

SECTION 5 : OUTCOME

48a. 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)

49. Weight and growth status on discharge / death: *
- a) Weight: ☐☐☐☐ (grams)
- b) Growth status: ◉ SGA ◉ AGA ◉ LGA

50. Feeding at discharge / death: * ◉ Never fed ◉ Human milk only ◉ Formula only ◉ Human milk with formula ◉ No data / Unknown

51. Total duration of hospital stay (Neonatal / Paeds Care): ☐☐☐ (in completed days) (autocalculate)

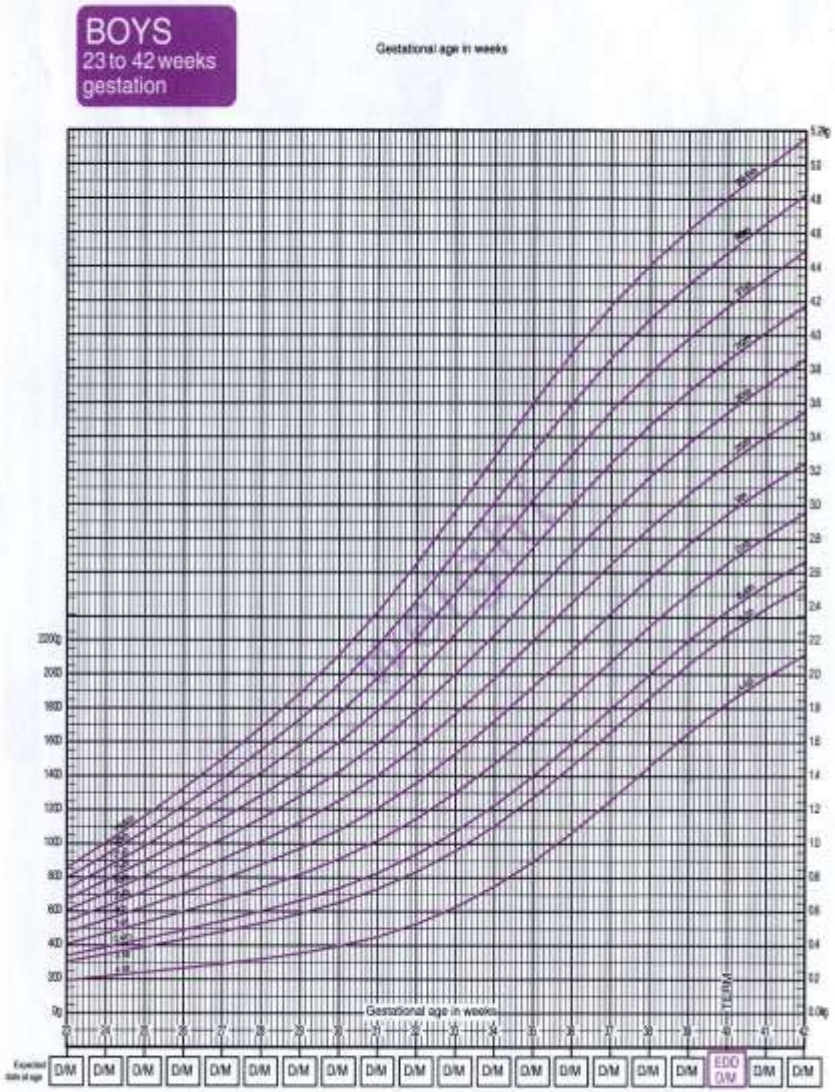
52. Outcome: *

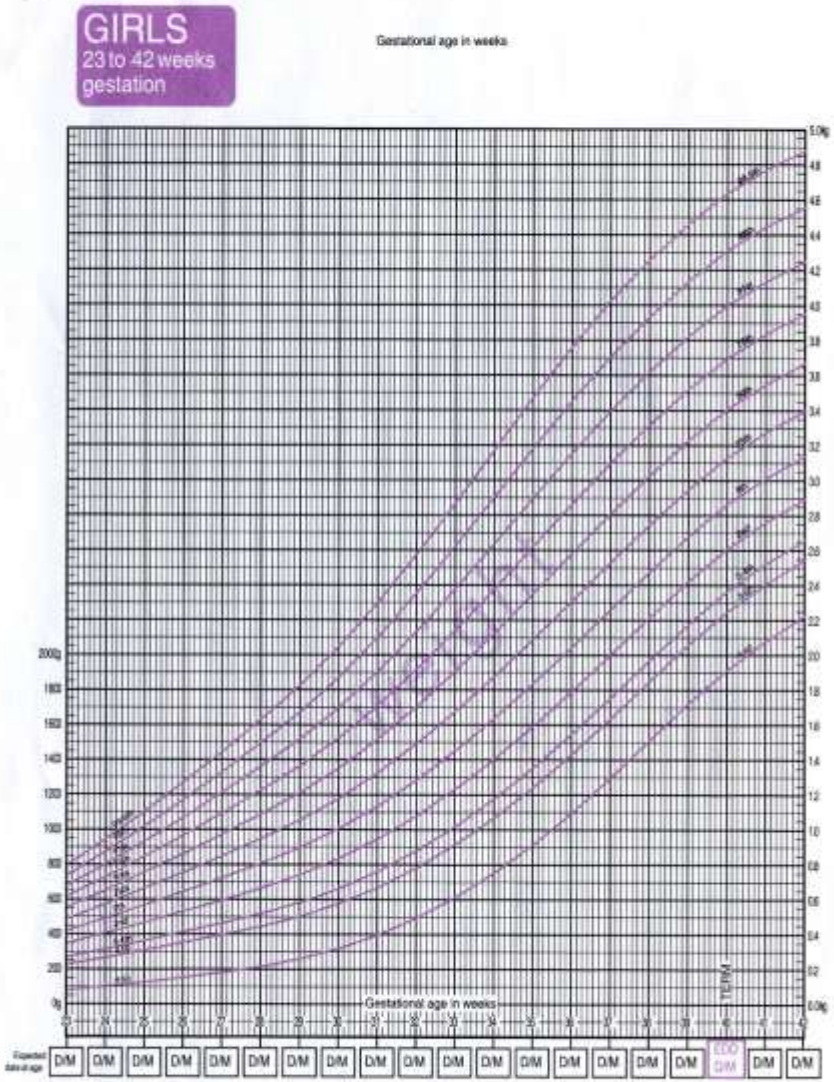
◉ Alive → **Place discharged to:**
- ◉ Home
- ◉ Social welfare home
- ◉ Other non Paeds Ward
- ◉ Still hospitalized as of 1st birthday
- ◉ Transfer to other hospitals →
  - a) Name of hospital:
  - b) Reason for transfer: ◉ Growth / Stepdown care ◉ Lack of NICU bed ◉ Chronic/Palliative care ◉ Acute medical / diagnostic services ◉ Surgery ◉ Social/ Logistic reason ◉ Others, specify:
  - c) Post transfer disposition: (Please fill this section if place transferred is not part of the NNR Network) ◉ Home ◉ Death ◉ Transferred again to another hospital ◉ Readmitted to your hospital

◉ Dead → **Place of death:** ◉ Labour room/OT ◉ In transit ◉ Neonatal unit ◉ Others, specify:

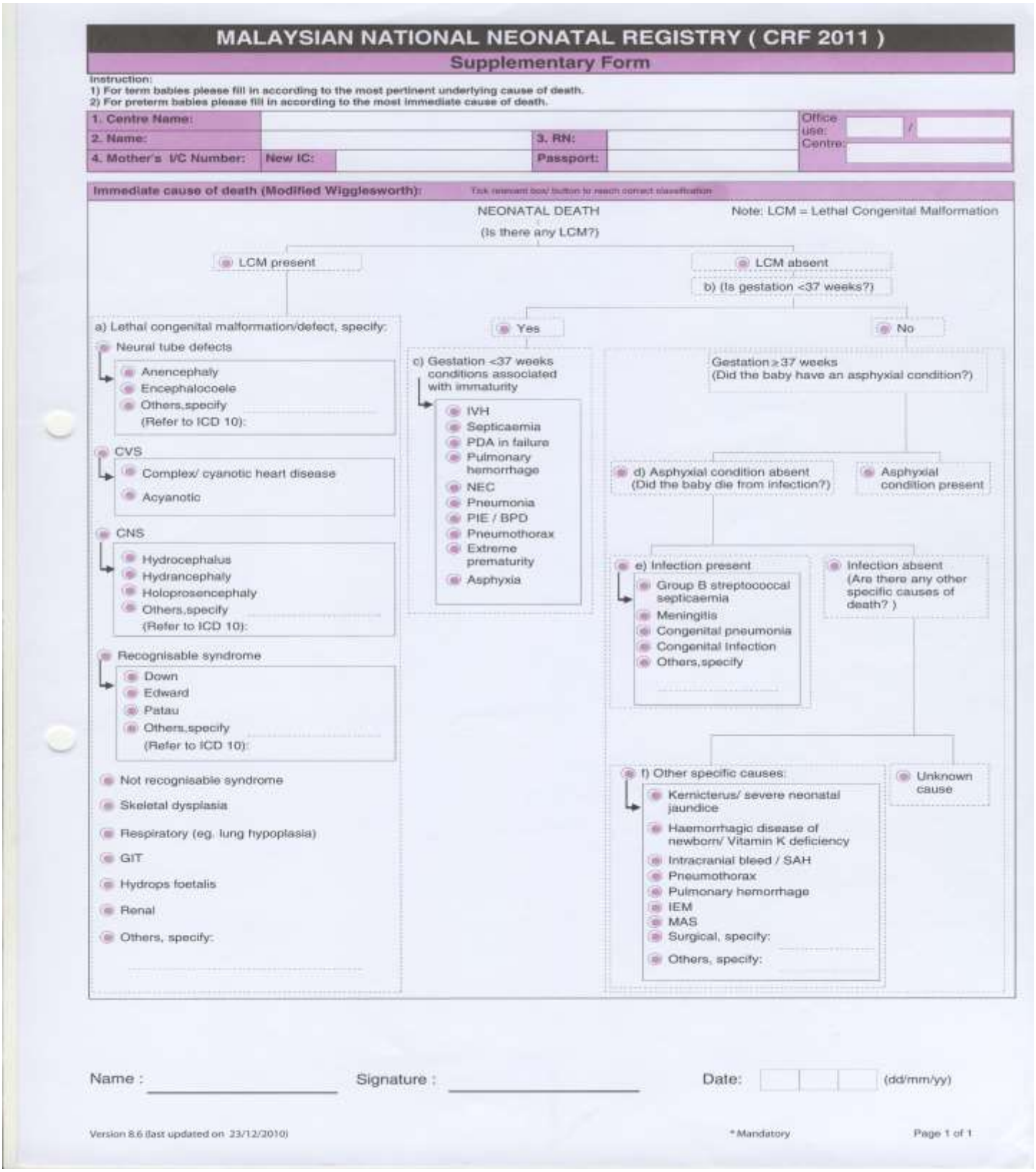
Name : _____ Signature : _____ Date: ☐☐☐ (dd/mm/yy)

INTRAUTERINE GROWTH CURVES (COMPOSITE MALE/FEMALE) (APPENDIX 2)





Appendix 4a Supplementary Form (Death cases)



MALAYSIAN NATIONAL NEONATAL REGISTRY (CRF 2011)

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 relevant box/ button to reach correct classification

NEONATAL DEATH
(Is there any LCM?)

Note: LCM = Lethal Congenital Malformation

- LCM present
  - a) Lethal congenital malformation/defect, specify:
    - Neural tube defects
      - Anencephaly
      - Encephalocoele
      - Others,specify (Refer to ICD 10):
    - CVS
      - Complex/ cyanotic heart disease
      - Acyanotic
    - CNS
      - Hydrocephalus
      - Hydrancephaly
      - Holoprosencephaly
      - Others,specify (Refer to ICD 10):
    - Recognisable syndrome
      - Down
      - 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 conditions associated with immaturity
        - IVH
        - Septicaemia
        - PDA in failure
        - Pulmonary hemorrhage
        - NEC
        - Pneumonia
        - PIE / BPD
        - Pneumothorax
        - Extreme prematurity
        - Asphyxia
    - No
      - Gestation ≥ 37 weeks (Did the baby have an asphyxial condition?)
        - d) Asphyxial condition absent (Did the baby die from infection?)
          - e) Infection present
            - Group B streptococcal septicaemia
            - Meningitis
            - Congenital pneumonia
            - Congenital infection
            - Others,specify
          - Infection absent (Are there any other specific causes of death?)
            - f) Other specific causes:
              - 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)

Version 8.6 (last updated on 23/12/2010) * Mandatory Page 1 of 1

Appendix 5 Presentations

POSTER, ABSTRACT AND PAPER PRESENTIONS

1. Neoh SH. *Survival of VLBW infants in SDP hospitals 2011.* Presented at the MNNR SDP Meeting, Selayang Hospital, Selangor, Malaysia, 2013

2. Boo NY. *HIE.* Presented at the MNNR SDP Meeting, Selayang Hospital, Selangor, Malaysia, 2013

3. Ramli N. *Trend in incidence intraventricular haemorrhage (2016 – 2011) and impact on survival*. Presented at the MNNR SDP Meeting, Selayang Hospital, Selangor, Malaysia, 2013

4. Ramli N. *Incidence of IVH*. Presented at the MNNR SDP Meeting, Selayang Hospital, Selangor, Malaysia, 2013

5. Chee SC. *Use of surfactant early CPAP – outcome in RDS, antenatal.* Presented at the MNNR SDP Meeting, Selayang Hospital, Selangor, Malaysia, 2013

6. Lee JKF. *Outcome of ventilated babies with congenital anomalies.* Presented at the MNNR SDP Meeting, Selayang Hospital, Selangor, Malaysia, 2013

7. Lee JKF. *Sepsis in VLBW.* Presented at the MNNR SDP Meeting, Selayang Hospital, Selangor, Malaysia, 2013

8. Lee JKF. *MAS.* Presented at the MNNR SDP Meeting, Selayang Hospital, Selangor, Malaysia, 2013

9. Teh SH. *Hypothermia and outcome in VLBW.* Presented at the MNNR SDP Meeting, Selayang Hospital, Selangor, Malaysia, 2013

10. Cheah IGS. *Morbidity data acroos SDP centres 2011 – Benchmarking.* Presented at the MNNR SDP Meeting, Selayang Hospital, Selangor, Malaysia, 2013

11. Cheah IGS. *Outcome of late pretem infants.* Presented at the MNNR SDP Meeting, Selayang Hospital, Selangor, Malaysia, 2013

12. Cheah IGS. *ROP Screening.* Presented at the MNNR SDP Meeting, Selayang Hospital, Selangor, Malaysia, 2013

13. Soo TL. *PDA.* Presented at the MNNR SDP Meeting, Selayang Hospital, Selangor, Malaysia, 2013