"CLINICAL PROFILE RISK FACTORS AND OUTCOME OF NEWBORN BABIES WITH RETINOPATHY OF PREMATURITY IN A TERTIARY CARE CENTRE"

Dissertation submitted to

THE TAMIL NADU
DR.M.G.R.MEDICAL UNIVERSITY

In partial fulfilment of regulations

For the award of degree of

M.D DEGREE (PEDIATRICS) BRANCH VII

INSTITUTE OF CHILD HEALTH AND

HOSPITAL FOR CHILDREN MADRAS MEDICAL COLLEGE

APRIL2013

INSTITUTIONAL ETHICS COMMITTEE
MADRAS MEDICAL COLLEGE, CHENNAI -3

Telephone No : 044 25305301
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CERTIFICATE OF APPROVAL

To
Dr. V. Boopathy
PG in MD Paediatrics
Madras Medical College, Chennai -3

Dear Dr. V. Boopathy

The Institutional Ethics committee of Madras Medical College, reviewed and discussed your application for approval of the proposal entitled " clinical profile, risk factors & outcome of Newbron babies with Retinopathy of prematurity in a tertiary care centre " No.20032012.

The following members of Ethics Committee were present in the meeting held on 22.03.2012 conducted at Madras Medical College, Chennai -3.

1.	Prof. S.K. Rajan. MD	-- Chairperson
2	Prof. Pregna B. Dolia MD Vice Principal, Madras Medical College, Chennai -3 (Director , Institute of Biochemistry, MMC, Ch-3)	-- Member Secretary
3.	Prof. B. Kalaiselvi. MD Prof of Pharmacology ,MMC, Ch-3	-- Member
4.	Prof. C. Rajendiran, MD Director , Inst. Of Internal Medicine, MMC, Ch-3	-- Member
5.	Thiru. S. Govindsamy. BA BL	-- Lawyer
6.	Tmt. Arnold Soulina MA MSW	-- Social Scientist

We approve the proposal to be conducted in its presented form.

Sd/ Chairman & Other Members

The Institutional Ethics Committee expects to be informed about the progress of the study, and SAE occurring in the course of the study, any changes in the protocol and patients information / informed consent and asks to be provided a copy of the final report.

Member Secretary, Ethics Committee

CERTIFICATE

This is to certify that the dissertation titled, **"Clinical Profile, Risk Factors and outcome of New Born babies with Retinopathy of Prematurity in a Tertiary Care Centre"** submitted by **Dr.V.Boopathy** to the Faculty of Pediatrics, The Tamil Nadu Dr.M.G.R Medical University, Chennai, in partial fulfilment of the requirements for the award of M.D. Degree (Pediatrics) is a bonafide research work carried out by him under our direct supervision and guidance, during the academic year 2010-2013.

Prof. Dr. V. Kanagasabhai, M. D.
Dean,
Madras Medical College,
Chennai-600003.

Prof. M. Kannaki, M.D.,DCH.
Director and Superintendent,
Institute Of Child Health &
Hospital for Children,
Egmore, Chennai- 600 008.

Prof. Dr. D. Gunasingh,M.D.,DCH,
Professor of Pediatrics,
Institute Of Child Health and Hospital
For Children,
Egmore, Chennai- 600 008.

DECLARATION

I, **Dr.V.Boopathy,** solemnly declare that the dissertation titled **"Clinical Profile, Risk Factors and outcome of New Born babies with Retinopathy of Prematurity in a Tertiary Care Centre"** has been prepared by me.

This is submitted to The Tamil Nadu Dr. M.G.R. Medical University, Chennai in partial fulfilment of the rules and regulations for the M.D. Degree Examination in Pediatrics.

Dr.V.Boopathy

Place: Chennai

Date:

ACKNOWLEDGEMENT

My sincere thanks to **Prof. Dr.V.Kanagasabai,M.D,** Dean, Madras Medical College, Chennai for permitting me to utilize the clinical materials of the hospital for the successful execution of my study.

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I sincerely thank all the children and their parents who have submitted themselves for this study

Above all, I thank the Lord Almighty, without whom this venture could not have been possible and successful.

Dr.V.Boopathy


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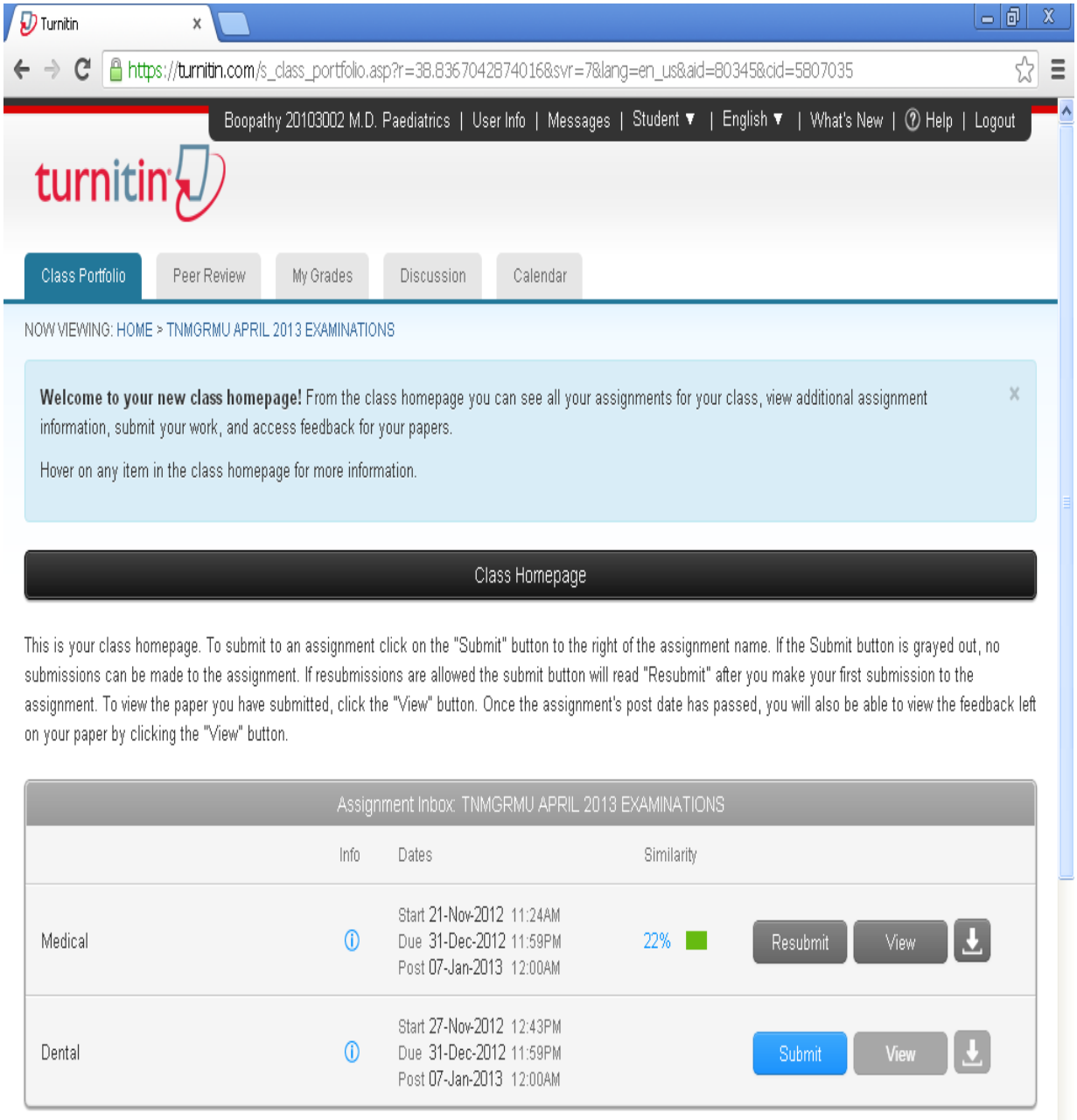
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CONTENTS

INTRODUCTION

INTRODUCTION

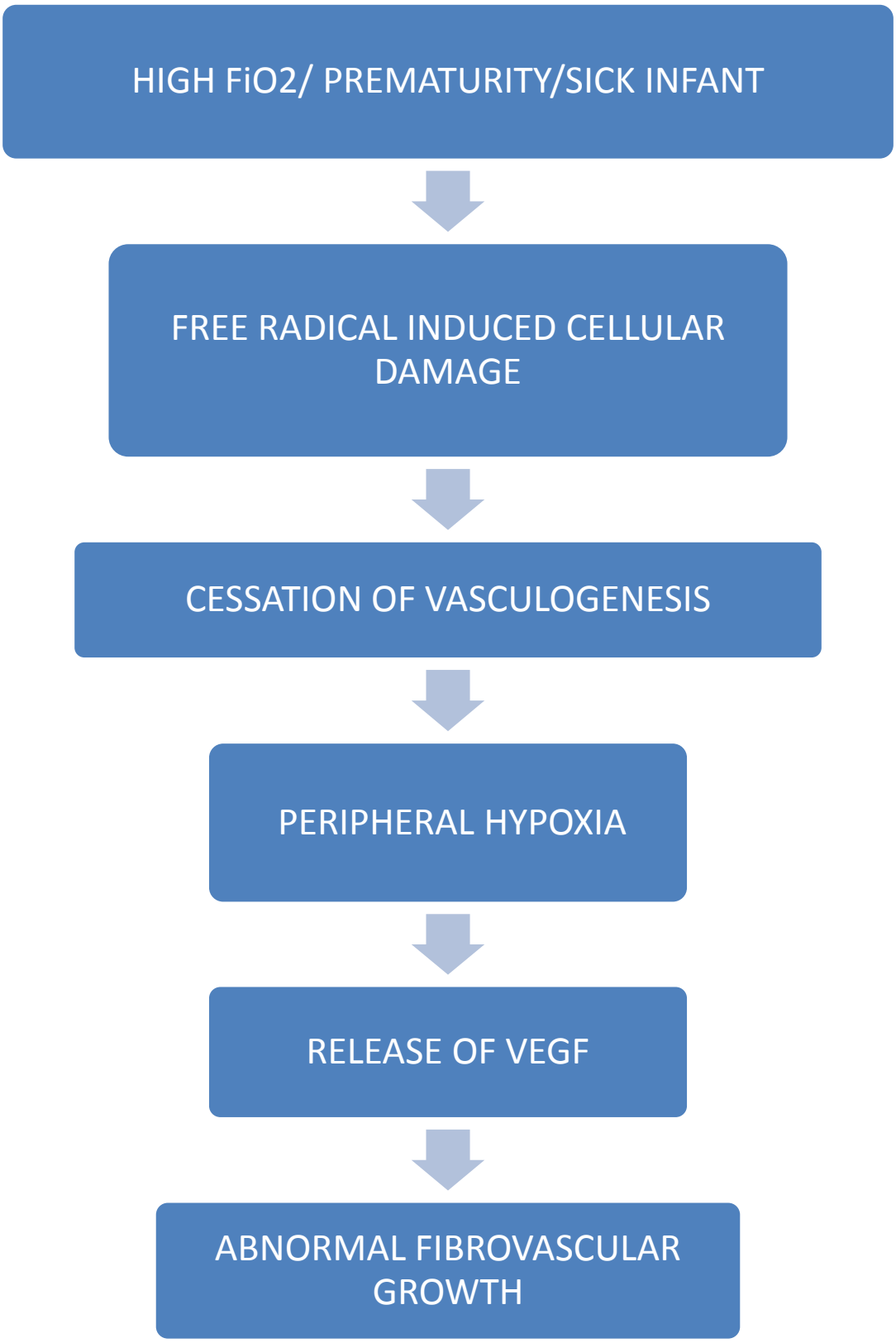
Retinopathy of Prematurity is a neovascularising disease of premature retina that in it's most severe form can lead to retinal detachment and subsequent blindness. ROP is a multifactorial vasoproliferative disorder of retina, that increases in incidence with decreasing gestational age and birth weight. Approximately 65% of infants with a birth weight of <1250 gm, and 80% of infants with a birth weight <1000 gm, will develop some degree of ROP. In view of ongoing trend for resuscitation of smaller infants with lower gestational ages along with increased survival of VLBW & ELBW babies, an increase in incidence of ROP is expected[1,2].

In 1942, Terry found out this disorder and termed it as "Retrolental fibroplasia[3]". Initially it was thought to be due to oxygen exposure. So with restricted oxygen use, the incidence of ROP came down. Then with improvement of neonatal intensive care facilities, more and more premature infants are surviving and are more prone to develop ROP[4]. The natural course of ROP is either it may resolve spontaneously or with laser therapy, or it may cause mild myopia to total blinding retinal detachment.

Pathogenesis of ROP

Beginning at 16 weeks, retinal angiogenesis normally proceeds from the optic disc to periphery reaching the outer rim of the retina nasally at about 36 weeks and extending temporally by approximately 40 weeks[20].

Injury to this process may result in pathological changes in the growing retina. Initially it causes cessation of vasculogenesis followed by abrupt termination of vessels marked by a thin line in the retina which then grows into an ridge made up of mesenchymal and endothelial cells. Cell division and differentiation may resume later and vascularisation of retina may proceed. Sometimes, abnormal proliferation of vessels out of the plane of the retina, into the vitreous and over the surface of the retina may occur. Then it is followed by cicatrization and traction on the retina may occur and which can lead to retinal detachment.


HIGH FiO2/ PREMATURITY/SICK INFANT
FREE RADICAL INDUCED CELLULAR DAMAGE
CESSATION OF VASCULOGENESIS
PERIPHERAL HYPOXIA
RELEASE OF VEGF
ABNORMAL FIBROVASCULAR GROWTH

Risk factors:

The Major risk factors associated with ROP are prematurity and associated retinal immaturity. The other contributory factors are, oxygenation, respiratory distress , apnea, bradycardia, heart Disease infection, hypercarbia, acidosis, anemia and the need for transfusion. Generally, the lower the gestational age, the lower the birth weight, and the sicker the infant are, the greater the risk is for ROP.

Risk factors contributing to development of ROP:

1. Lower birth weight
2. Lesser gestational age
3. Respiratory distress
4. Apnea
5. Bradycardia
6. Heart disease
7. Infection
8. Oxygenation
9. Hypercarbia
10. Anaemia
11. Acidosis
12. Need for transfusion

The basic pathogenesis of ROP is unclear. Probably free radical mediated cellular damage in newborns who are exposed to high inspired oxygen concentrations. Then followed by peripheral hypoxia and release of VEGF. in the non vascularised retina. Retinal hypoxia may be due to poor pulmonary function, which causes upregulation of VEGF, which produces abnormal fibrovascular growth in susceptible infants. This faulty neovascularisation may cause scarring and loss of vision.

The following factors are believed to be protective against the development of ROP, though the effect is not yet proven.

1. Antenatal steroids
2. Vitamin E

Classification:

The phases and severity of the disease process are classified into five stages.

Stage I

Is characterized by a demarcation line separating vascularised and avascular retina within the retinal plane.

Stage II

Is characterized by a ridge, enlargement of demarcation line extending up and out of retinal plane

Stage III

Is characterized by a ridge and development of extra retinal fibrovascular tissue.

Stage IV

Is characterised by subtotal retinal detachment caused by traction from the proliferating tissue in the vitreous or on the retina

Stage $IV_{a:}$ Subtotal retinal detachment not involving macula

Stage $IV_{b:}$ Subtotal retinal detachment involving Macula

Stage V

Total Retinal Detachment

ROP is classified according to ICROP[5] (international classification of ROP.

The current classification of ROP describes the location, extent and severity of the disease. Retina is divided into three concentric Zones around the optic disc.

Zone I

The posterior or the inner zone is marked upto the extent of twice as the disc macular distance (or) 30 degree in all directions from the optic disc.

Zone II

The middle zone is marked from the outer edge of zone I to the ora serrata nasally and to the anatomic equator temporally.

Zone III

The outer zone is marked by the residual crescent which extends from the outer border of zone II to the ora serrata temporally.

The extent of involvement is marked by the number of circumferential clock hours involved.

Zones of Retina

Terminology related to ROP

PLUS disease:

A form of ROP when the blood vessels of retina become enlarged and twisted, indicating a worsening of the disease.

Threshold ROP:

Threshold is a level of severity of ROP at which the risk of blindness is predicted to approach 50%. It is marked as zone I or zone II with ROP stage III with PLUS disease.

Prethreshold ROP:

It is less serious than threshold ROP which includes any stage of ROP in zone I or zone II,

Stage 2 ROP with PLUS disease or zone II,

Stage 3 ROP.

Clinical Course

In about 90% of at risk infants, ROP resolve spontaneously. In remaining 10%, the disease progress to severe course. Some children with regressed ROP may present with demarcation lines, undervascularisation of peripheral retina, retinal pigmentary changes, retinal breaks. Others may develop total retinal detachment. Some may develop cataract, glaucoma and inflammatory signs. The end stage of ROP is a painful blind eye or a phthisical eye.

Diagnosis:

Systematic serial ophthalmologic examinations of infants with birth weight <1500 gm, and infants of gestational age <34 weeks should be done. The initial examination should be done at 4-6 weeks of chronological age. Follow-up period is usually 2 weeks or less.

Treatment:-

Cryotherapy or Laser photocoagulation of avascular retina is the treatment of choice for ROP in infants with advanced stages. Serial ophthalmological examinations are required in others. Regarding prevention of ROP, oxygen alone is neither sufficient nor necessary to produce ROP and no safe level of oxygen has yet been determined.

REVIEW OF LITERATURE

REVIEW OF LITERATURE

1. In a study, conducted by chaudhari S. et al[6] Division of Neonatology, Department of Paediatrics, KEM Hospital, Pune, named "Retinopathy of prematurity in a tertiary care center – incidence, risk factors and outcome" revealed that the incidence of ROP in the 552 infants who were screened was 22.3%. No ROP was found in infants weighing ≥ 2000gm, or with a gestational age more than 36 weeks. Risk factors Predisposing ROP were Septicemia (P<0.001), apnea (P=0.0001) and oxygen therapy (P=0.031). Out of the 123 infants who had ROP, 41, (33.6%) needed laser photocoagulation. 22 children(53.6%) were seen at 3 years of age, of which 10 children had myopia, 1 had amblyopia, 9 children had completely normal outcome. They concluded that one third of the infants with ROP needed Laser photocoagulation, risk factors predisposing to ROP were septicemia, apnea, oxygen therapy and use of blood products.

2. Santhosh Mahapatra, et-al [7] had done a study named "Incidence of ROP at Neonatal Intensive Care Units at tertiary care centers of Orissa" in S.C.B. Medical College and SBVPGI of Pediatris, Cuttak. The study results showed that out of 656 screened infants, 26 developed ROP. Babies with higher stages of ROP had lesser birth weights. In the study, the incidence of ROP was 3.96%. The causes for the lower incidence rate might be high infant mortality rate in Orissa, high fall outs, and poor health awareness among the people.

3. Padmani Karna at el[8] conducted a study named "Retinopathy of Prematurity and risk factors: a prospective cohort study" at Division of Neonatology, Dept. of Pediatrics & Human development, Michigan State University, USA. The study results showed that out of 576 neonates with ≤1500g birth weight, 7.8% developed severe ROP. Gestational age and duration on ventilation were associated with development of ROP.

4. May May choo et al[9] conducted a study named "Retinopathy of Prematurity in extremely low birth weight infants in Malaysia" at University of Malaya Medical Centre, Kualalampur. The study revealed that out of 70 ELBW infants, 41 (58.6%) developed ROP and 23 (32.9%) required laser treatment. The risk factors for development of ROP were gestational age <28 weeks (OR=1.8, P=0.001), duration of ventilation >1 week (OR=1.5, P=0.012) and intraventricular hemorrhage (Or=2.5, P=0.010)

5. Maheshwari R et al[10] conducted a study named "Incidence and risk factors of Retinopathy of Prematurity in a tertiary care newborn unit in New Delhi". The Study showed that the incidence of ROP was 20% and the occurrence of ROP was inversely related to the gestational age and birth weight. Blood transfusion and clinical sepsis were the associated significant risk factors for ROP.

6. AHA Abdel Hakeem et al[11] conducted a study named "Retinopathy of Prematurity: A study of incidence and risk factors in NICU of Al-Miniya University Hospital in Egypt". at Department of pediatrics, Faculty of Medicine Al-Miniya University, Egypt. The study showed that out of 172 screened infants, 33 (19.2%) developed ROP. Of which 18 (54.5%) cases were in stage I, 9 (27.3%) cases in stage II, 6 (18.2%) cases in stage III, no cases in stage IV stage V. Among the risk factors, there was a significant relationship between the occurrence of ROP and gestational age (P=0.000), sepsis (P=0.004), oxygen therapy (P=0.018) & frequency of blood transfusions (P=0.030). On the other hand, there is no significant relationship between ROP and sex, mode of delivery, birth weight, RDS, PDA, IVH, duration of oxygen therapy, mechanical ventilation and CPAP.

7. Swarna Rekha et-al[12] conducted a study named "Retinopathy of Prematurity: Incidence and risk factors" in the Departments of Pediatrics and Ophthalmology, St.John's Medical College Hospital, Bangalore. They screened about 100 newborn babies with birth weight <1500gm and/or gestational age ≤ 34 weeks and found out 21 babies had stage I ROP, 14 had stage II, 8 had stage III, and 3 had Stages IV and V. The incidence of ROP was found to be 46%. The incidence ROP among <1000 gm babies was found to be 73.3 and 47.3% among <1500g babies.

   The incidence of ROP among 28-29 weeks of gestational age group was 83% and among 30-31 weeks gestational age group was 60%, and among 32-33 weeks group was 50%. The significant risk factors associated with development of ROP were anemia, apnea, blood transfusions, exposure to oxygen. Of total 46 babies, 9 underwent cryotherapy and found to be regressed.

8) Mojgan – Bayat-Mokhtari et.al[13], conducted a study at Islamic Azad University, Mashhad, IR, Iran named “Incidence and Risk factors of ROP among preterm infants in shiraz/Iran”. They included screening of preterm babies with birth weight under 1500gm, and clinically unstable preterm babies with birth weight of 1500 – 2000 gm. The results showed that out of 199 preterm, 84 babies had ROP. Incidence of ROP was 42.2%. 19 preterm babies out of 199, required laser photo coagulation (9.5%). Spontaneous regression of ROP was found in 65 infants (32.6%). The significant risk factors were gestational age, birth weight, Apgar score at one minute, mean duration of mechanical ventilation, mean duration of oxygen therapy, hypoxia, hyperoxia, PaCo2 > 60mmHg, pH > 7.45 and frequent blood transfusions.

9) A.A. Binkhathlan et.al[14] : conducted a study at King Fahad Medical city, Riyadh, Saudi Arabia named “Retinopathy of prematurity in Saudi Arabia incidence, risk factors and the applicability of current screening criteria”. They screened infants born at < 36 weeks of gestation, and weighing 2000g at birth. The results showed that out of 174 infants, ROP was found to be in 93 infants (56%) ; 15% of those infants with ROP were in stage 3. The most significant risk factor for the development of ROP was gestational age at birth. The mean gestational age was found to be 30 weeks for the ROP positive group.

10) Mostafa Feghhi et.al[15] conducted a study in the south western region of Iran named " Incidence of ROP and Risk factors in the south-western region of Iran". They screened all the infants with birth weight ≤ 2000g, and with gestational age < 32 weeks who were admitted in the NICU's. The results showed that out of 576 total infants, 183 developed ROP. The majority of infants with ROP were in stage I or II (74.8%).Only 25.1% of infants had ROP of stage III or more. The significant risk factors were found to be lesser gestational age, lower birth weight, sepsis, duration of oxygen administration. The other factors like jaundice, phototherapy, sex and blood transfusion were not found to be significant.

STUDY JUSTIFICATION

STUDY JUSTIFICATION

As already cited, more & more VLBW and ELBW babies are surviving today and no good epidemiological data on ROP in India is available. Moreover ROP is a preventable cause of blindness and vision related morbidity. The incidence of ROP in various studies in India varies from as low as 20% to as high as 60.1%.

AIM & OBJECTIVES OF THE STUDY

AIM OF THE STUDY

1. To find out the incidence, risk factors and outcome of newborn babies with Retinopathy of Prematurity in a tertiary care centre.
2. To find out the effectiveness of laser photocoagulation among the Newborn babies with Retinopathy of Prematurity.

OBJECTIVES OF THE STUDY

1. To study the clinical profile of ROP in new born babies with ROP in an extramural centre.
2. To find out the outcome of ROP following laser therapy.
3. To follow up the newborn babies with ROP after screening for the final outcome.

MATERIALS AND METHODS

MATERIALS AND METHODS

1. Methodology

a. Study place

(i) Department of Neonatology,

Institute of child Health & Hospital for children,
Egmore,
Madras Medical College,
Chennai.

(ii) Retina Clinic

Regional Institute of Ophthalmology and Government ophthalmic Hospital,
Egmore,
Madras Medical College,
Chennai.

b. Study design:

Descriptive study

c. Study period

March 2012 – November 2012

d. Subjects:

Inclusion Criteria

All preterm babies admitted to newborn wards with birth weight <1500 g and gestational age <34 weeks.

Exclusion Criteria:

Preterm babies having congenital retinal detachment

e. Sample size

Approximately 200

2. Manoeuvre

All the newborn babies admitted in the newborn wards with birthweight <1500g and gestational age <34 weeks were enrolled on the basis of inclusion criteria and after obtaining written informed consent from the parents. Ethical clearance was obtained from the hospital ethics committee.

Eligible preterm babies with defined criteria were registered. Neonatal risk factors like RDS, anaemia, apnoea, Prematurity, septicaemia, neonatal hyperbilirubinemia were noted.

Treatment details like oxygen therapy, CPAP, ventilator, use of blood products, phototherapy were noted. Using + 20 D Ophthalmoscope all the preterm babies were screened for ROP. Some of the babies with severe ROP were treated with laser photo coagulation. Others were followed up regularly for every 2 weeks. The babies who were treated with laser photocoagulation were also followed up regularly for every 2 weeks or weekly, if required.

Screening methods:

The screening was done with a binocular direct ophthalmoscope. Eyes were examined using topical anaesthetic drops after applying topical tropicamide drops till full dilatation occurred. Retinopathy was graded into Stages and Zone as per the ICROP classification. Infants with normal vascularisation upto retinal periphery are not examined again. Those with ROP examined every two weeks till regression. Infants with Stage III ROP with plus disease are considered threshold for laser treatment

Laser treatment.

Laser photo coagulation was done for infants with severe ROP using 810nm red laser with laser indirect ophthalmoscope as early as possible, at least within 5 days of diagnosis of threshold disease. Avascular retina beyond the ridge was ablated by confluent medium intensity burns over one session. Topical treatment with tobraymycin and steroids was given for 3 days after the procedure. If skip areas were seen on subsequent examination, laser was repeated after one or two weeks according to the situation.

FOLLOW UP:

Stages	Zone I	Zone II Posterior	Zone II anterior	Zone III
Immature	One Week	Every Week	2 Weeks	2 Weeks
1	”	”	2 Weeks	”
1+	”	”	Weekly	”
2	”	”	”	”
2+	”	”	”	”
3	”	”	”	”
3+	3 days	”	”	”

When to end screening:

a. **Immature:**

- No ROP
- Vessels are short of 1 DD of nasal or temporal ora serrata
- Immature 1,2,3
- Regular follow up till both nasal and temporal retina is vascularised.

  (40-45 Weeks)

b. **Mature:**

Vessels have reached at or within 1DD of ora serrata.

Statistical Analysis:

Statistical analysis was done using SPSS 16.0 version software. Descriptive statistics like mean, standard deviation, variance and range were arrived. Various risk factors were calculated using,

- Univariate analysis

- Multivariate analysis

RESULTS

RESULTS

Totally 202 infants were screened for ROP in our newborn wards. Their gestational age ranged from 26 weeks to 36 weeks.

Their birth weight ranged from 700 gm to 2000 gm. Out of 202 infants screened, 73 babies developed some stages of ROP and the overall incidence of ROP found to be 36.1%. Incidence of ROP among ELBW infants was 77.7%. Totally 62, among 126 VLBW babies developed ROP with the incidence rate of 49.2%.

There was no sex predilection in the incidence of ROP . There was no difference in the incidence of ROP between AGA (appropriate for gestational age) and SGA (small for gestational age).

TABLE NO.1 PERCENTAGE OF ROP IN GESTATIONAL AGE GROUP

Gestational Age in weeks	ROP +ve	ROP –ve	Total	% of ROP +ve
<28	3	1	4	75%
28 – 30	21	7	28	75%
31 – 32	39	22	61	64%
>33 – 34	6	54	60	10%
>34	4	45	49	8.1%

FIGURE : 1 PERCENTAGE OF ROP IN GESTATIONAL AGE GROUP

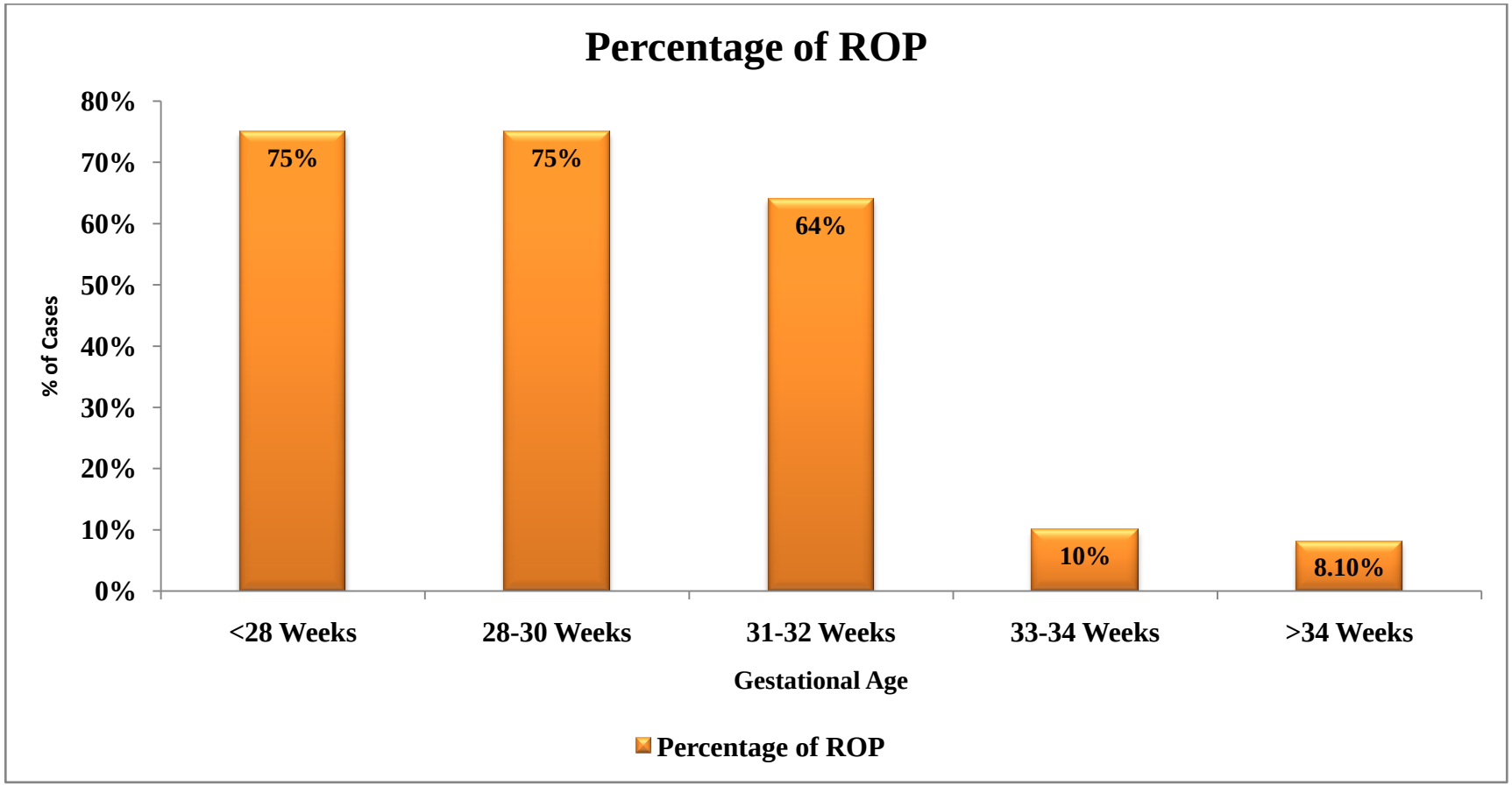


FIGURE : 2 GESTATIONAL AGE DISTRIBUTION

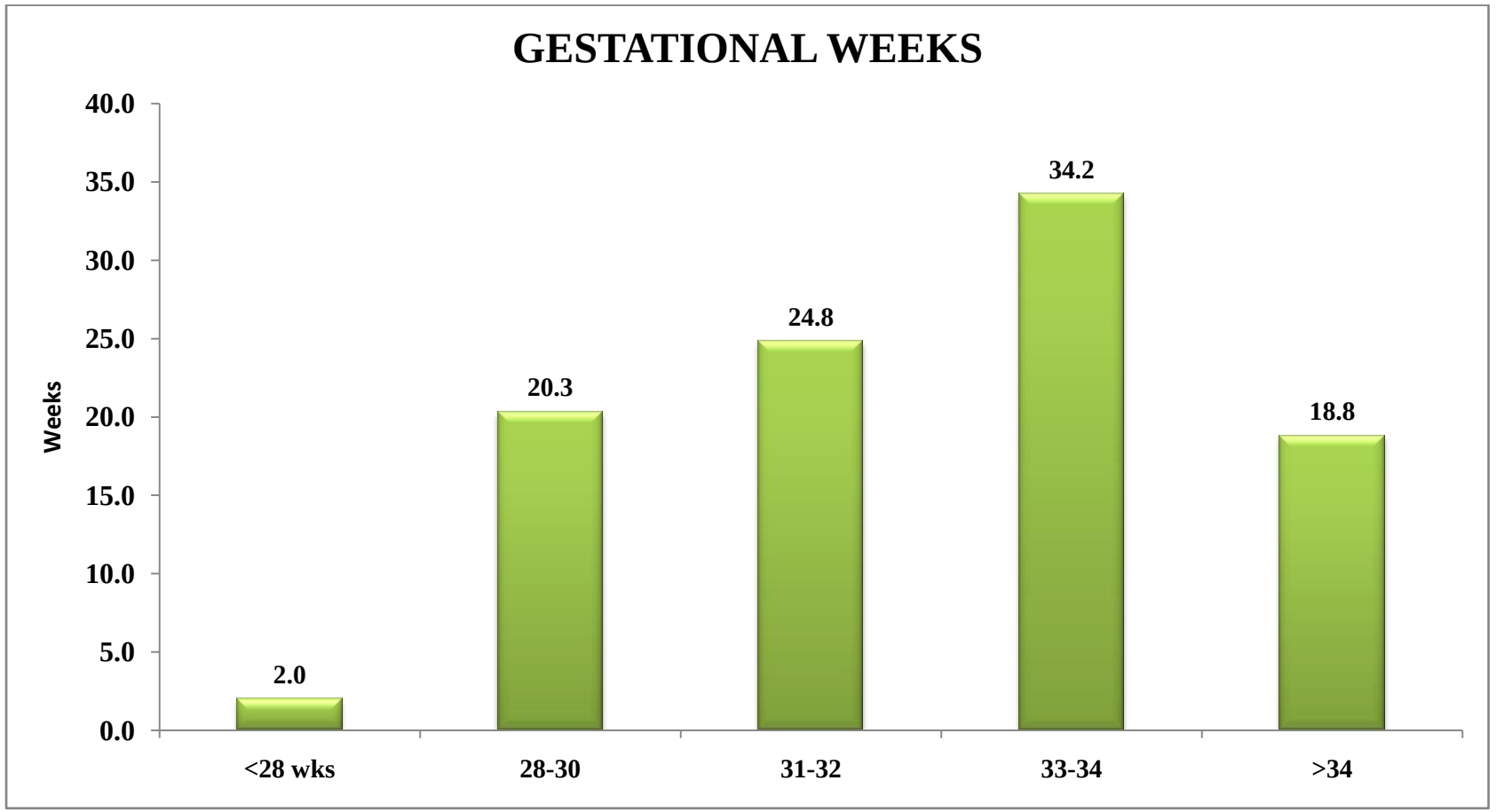


TABLE NO.2 PERCENTAGE OF ROP IN BIRTH WEIGHT GROUP

Birthweight in kg	ROP +ve	ROP –ve	Total	% of ROP +ve
<1	7	2	9	77.7%
1 – 1.3	42	23	65	64.6%
1.31-1.5	13	39	52	25%
1.51-1.8	10	49	59	16.9%
>1.8	1	16	17	5.8%

FIGURE : 3 PERCENTAGE OF ROP IN BIRTH WEIGHT GROUP

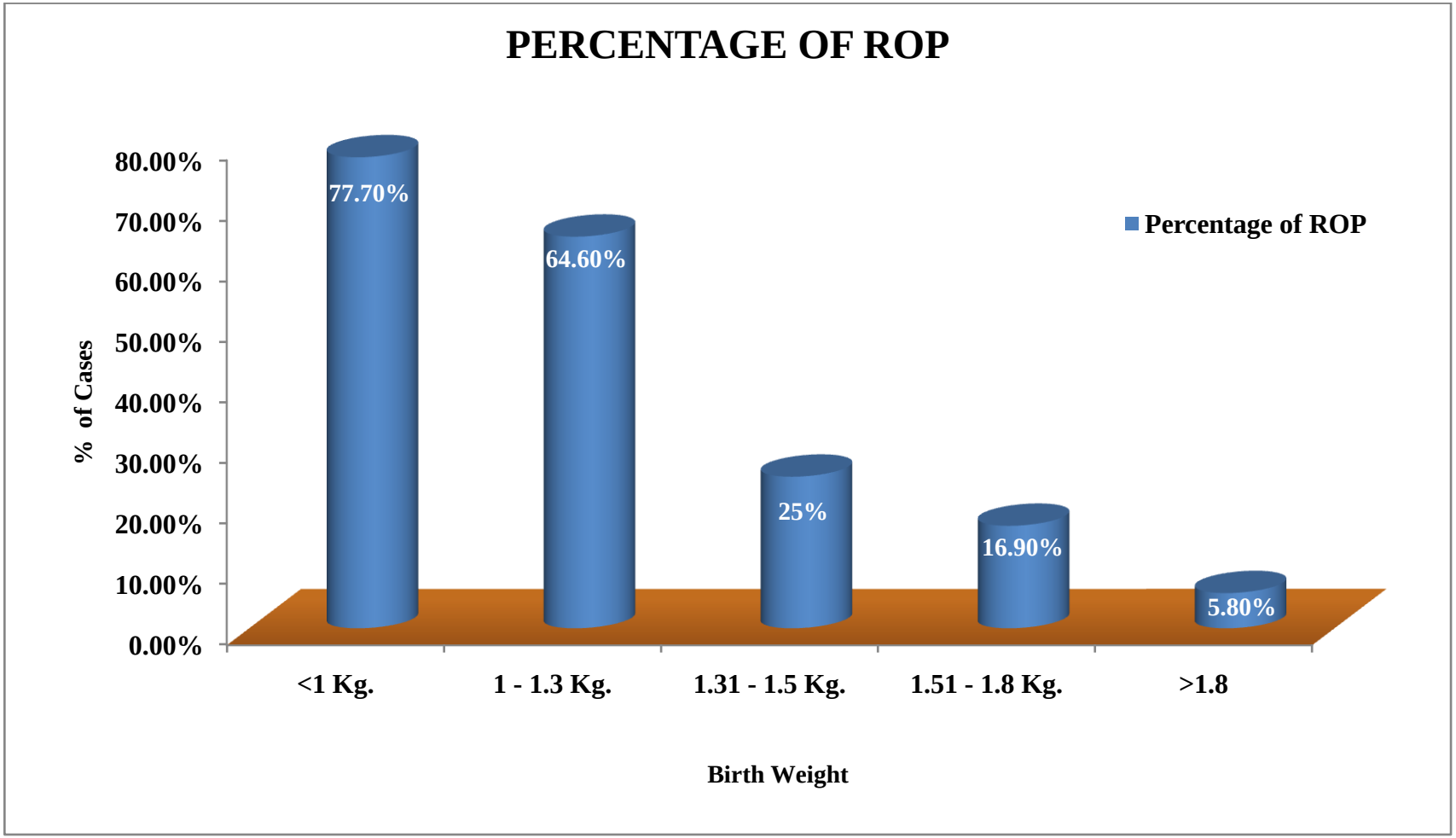


FIGURE : 4 BIRTH WEIGHT DISTRIBUTION

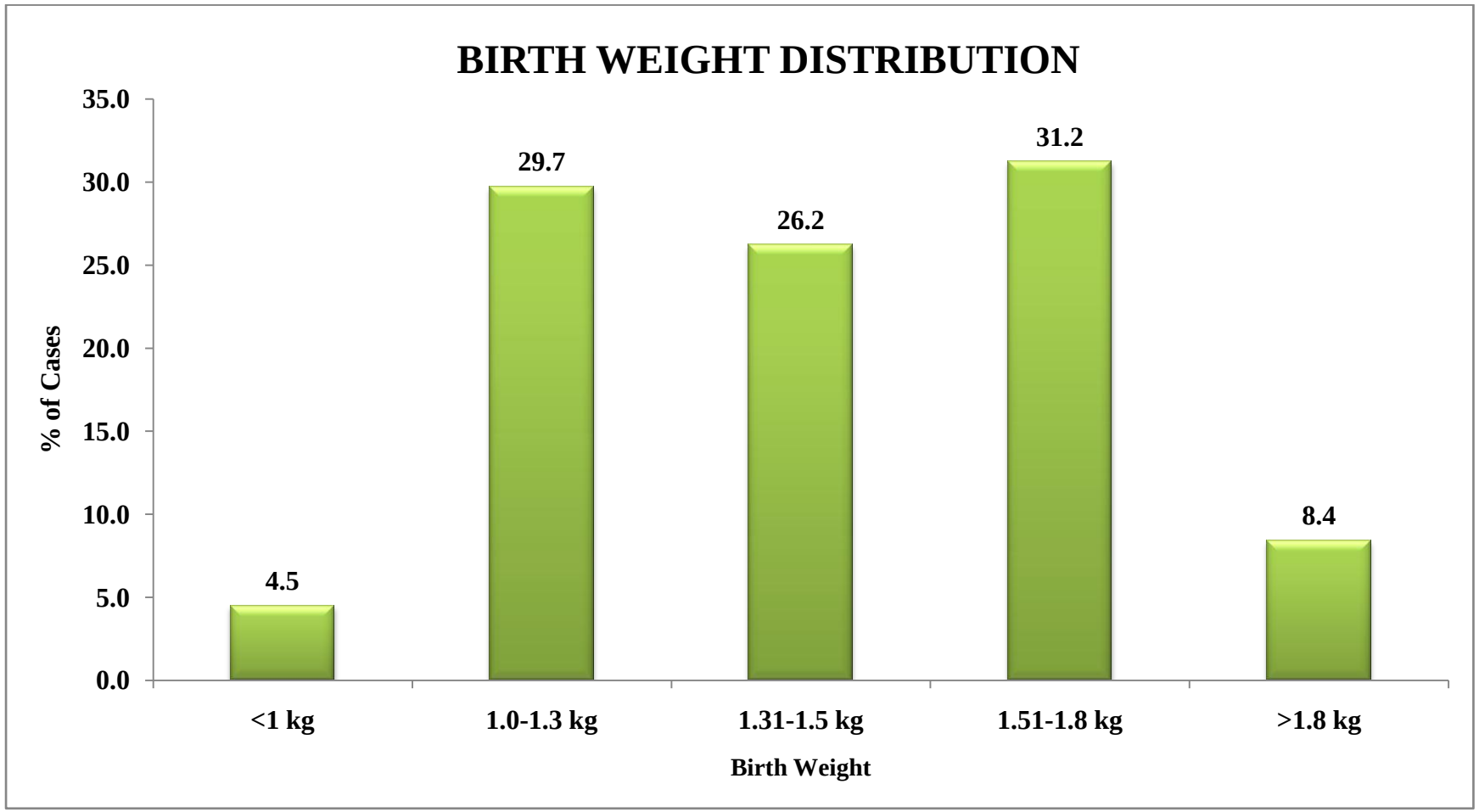


TABLE NO.3 SEX PREDILECTION OF ROP

Total cases of ROP	Males	Females
73	37	36
	50.7%	49.3%

FIGURE : 5 SEX PREDILECTION OF ROP

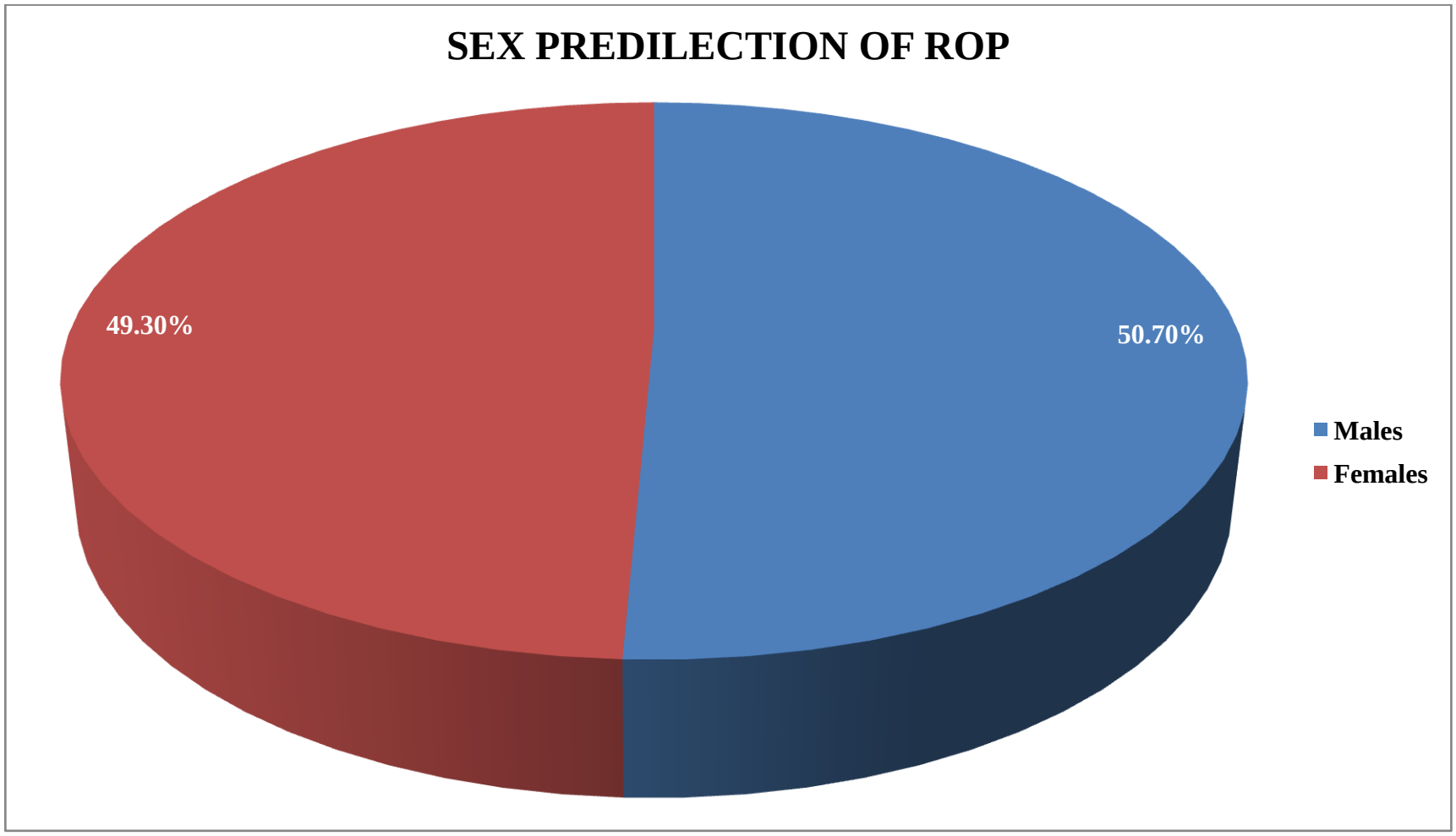


FIGURE : 6 GENDER DISTRIBUTION OF ROP

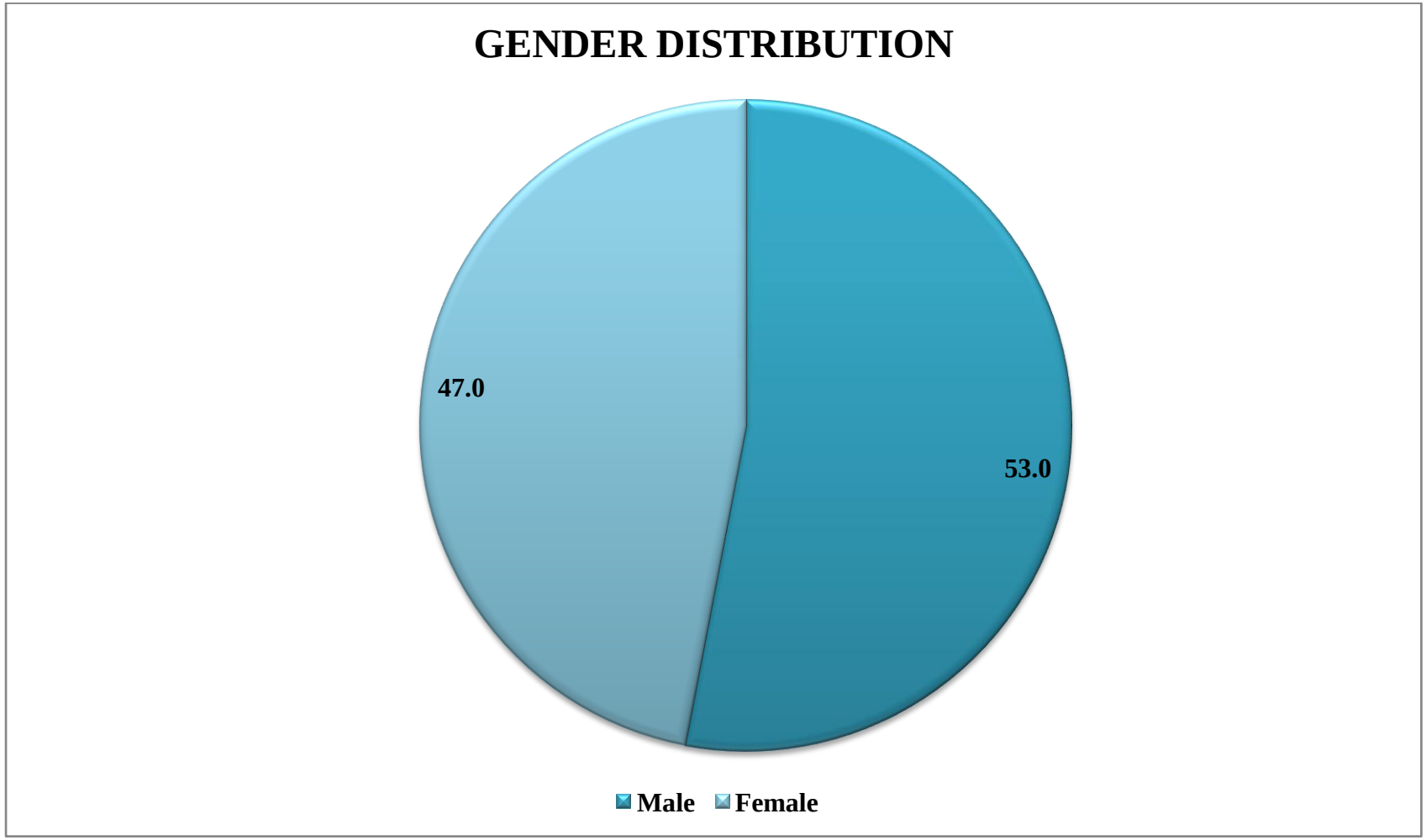


FIGURE : 7 INCIDENCE OF ROP

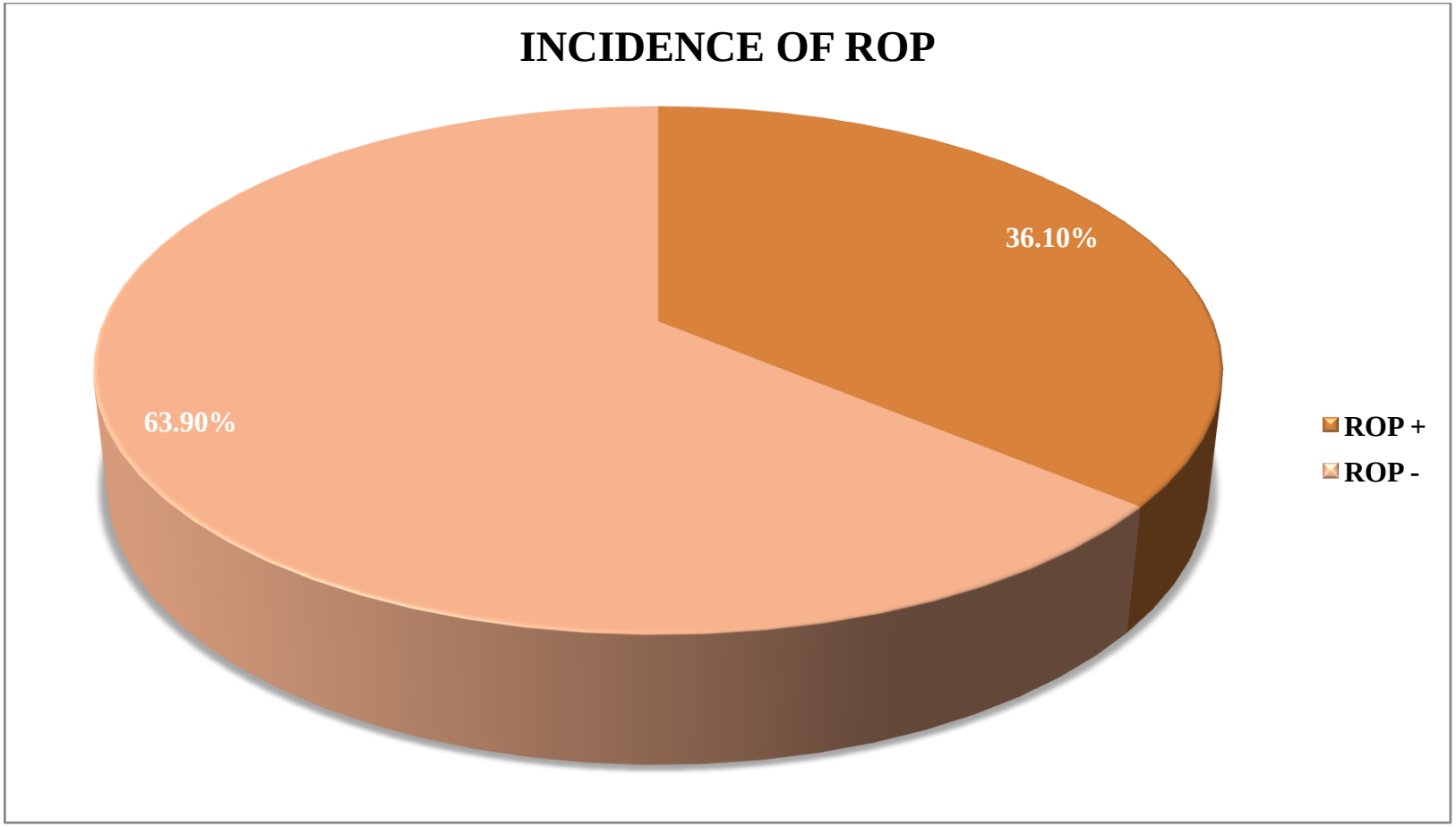
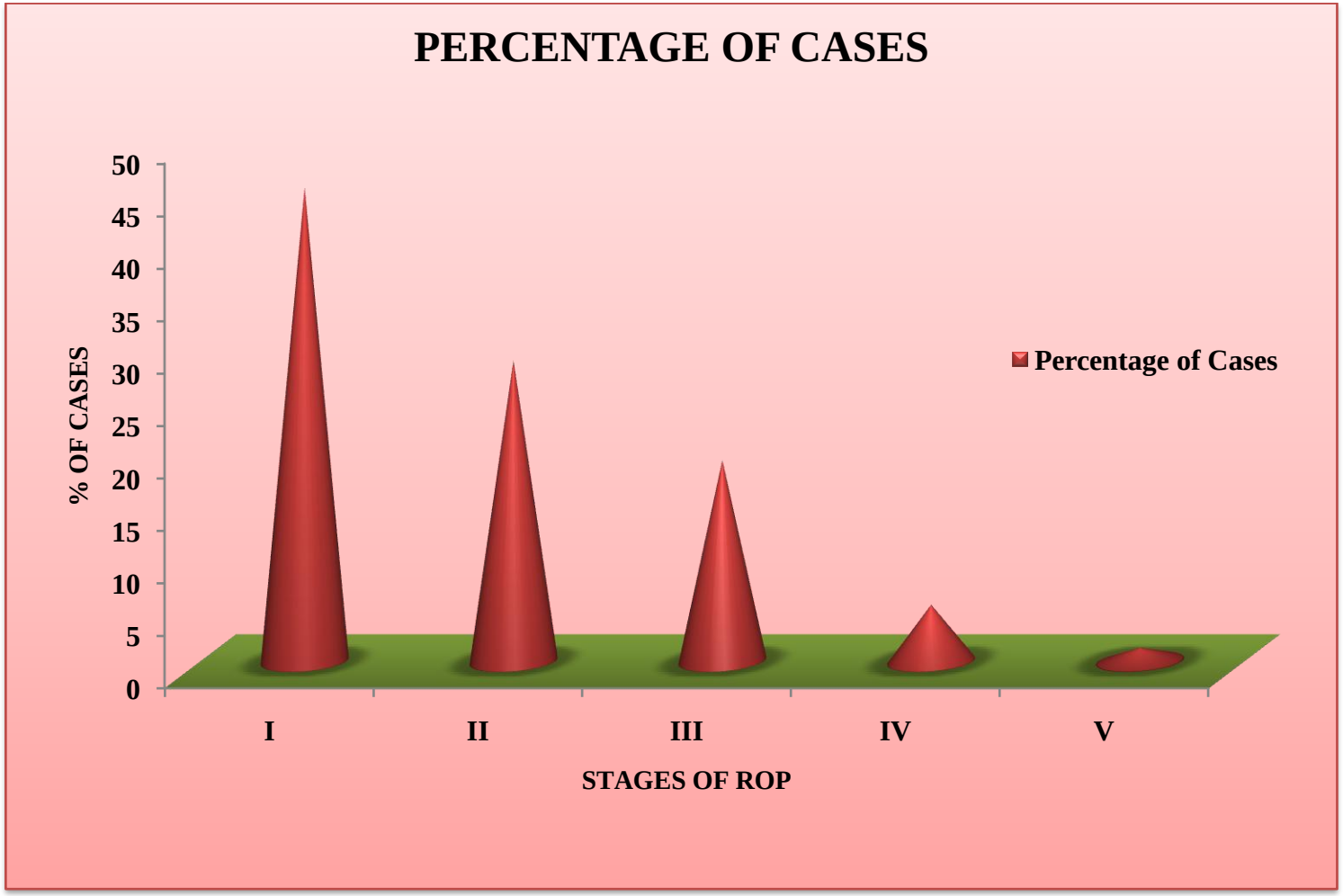


TABLE NO.4 PERCENTAGE OF ROP IN VARIOUS STAGES

S.No.	Stage	No. of Cases (Total 73)	%
1	I	33	45.2
2	II	21	28.7
3	III	14	19.2
4	IV	4	5.4
5	V	1	1.3

Out of 73 infants who had ROP, 33 were in stage I, 26 infants were in stage II, 14 were in stage III, 4 were in stage IV, one infant found to be in stage V.

FIGURE : 8 PERCENTAGE OF CASES IN VARIOUS STAGES



Among 73 infants who developed ROP , 38 infants required laser photocoagulation out of which 36 babies showed regression of ROP . Other 2 infants progressed to higher stages of ROP, of which one developed retinal detachment.

FIGURE : 9 PERCENTAGE OF ROP CASES REQUIRING LASER THERAPY

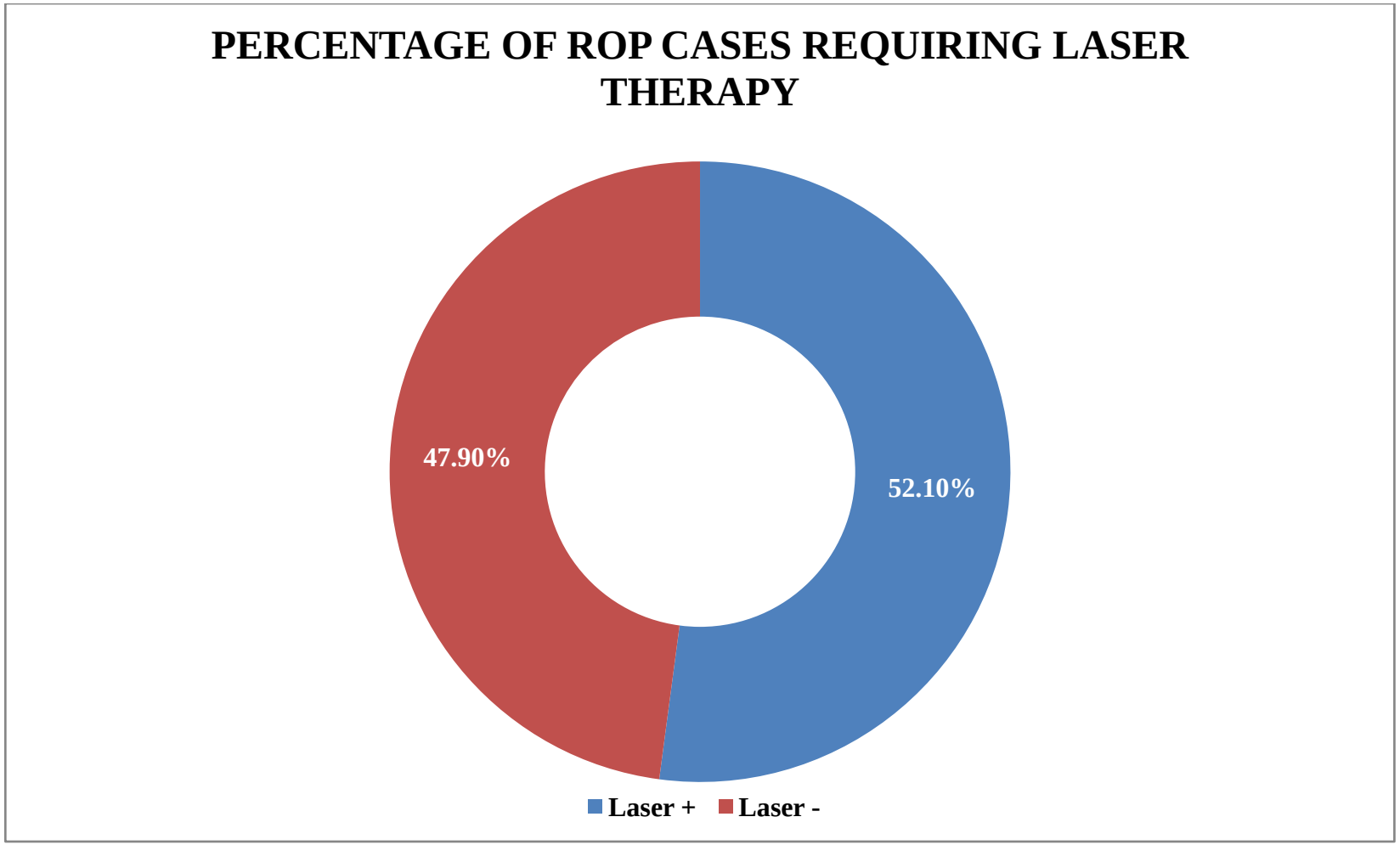
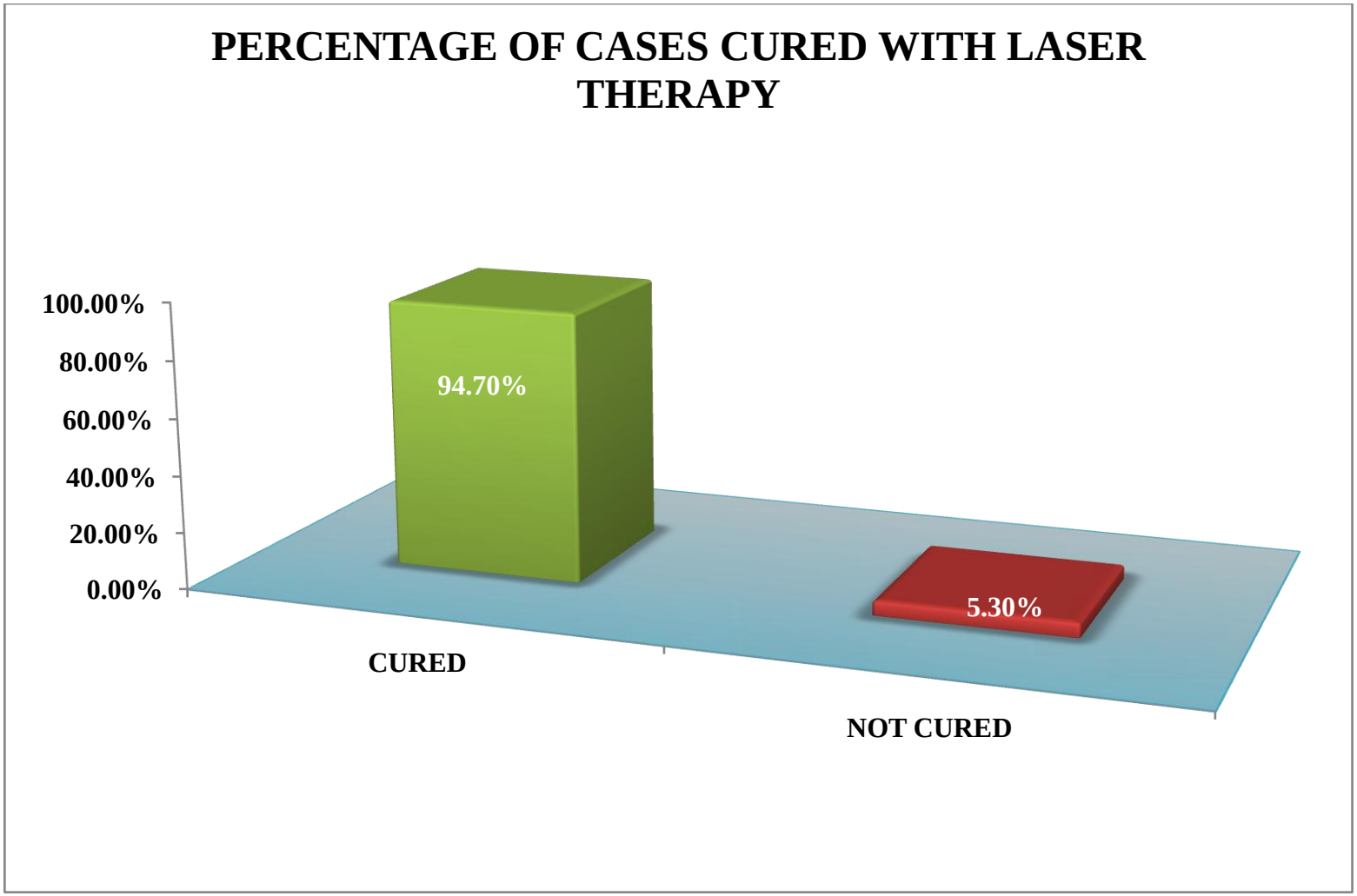


FIGURE : 10 EFFECTIVENESS OF LASER THERAPY



Univariate analysis was done accounting each risk factor. The risk factors included are,

1.Gestational age

2.Birthweight

3.Anemia

4. Respiratory Distress Syndrome

5.Apnea

6.Neonatal Hyperbilinibinaemia (NNH)

7.Oxygen therapy

8.Continuous Positive Airway Pressure (CPAP)

9.Ventilators

10.Use of blood products

Among the risk factors lesser gestational age (p=0.000) VLBW & ELBW , (P=0.000), RDS (P=0.0002) apnea (P=0.0001), NNH (P=0.008), 0_2 therapy (P=0.000), and use of blood products (P=0.000) were found to be significant.

FREQUENCY TABLE

Group

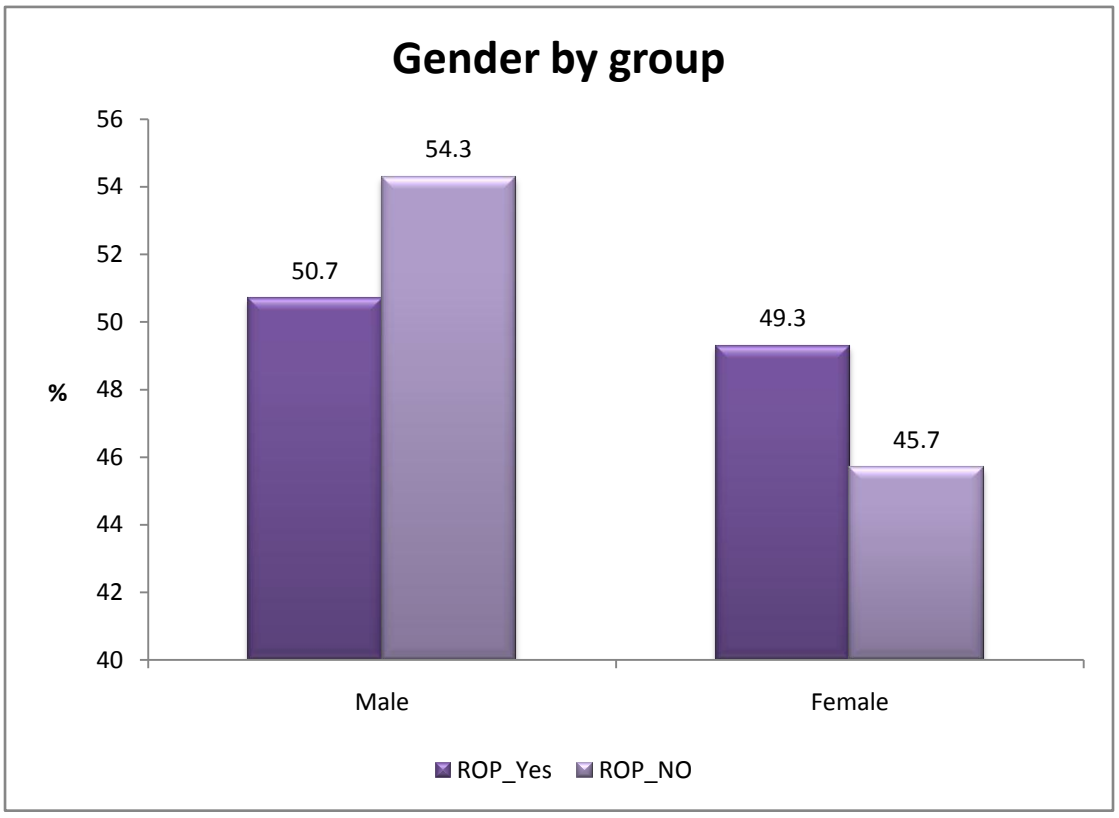
ROP	Frequency	Percent
Yes	73	36.1
No.	129	63.9
Total	202	100.00

Gestational Age

Gestational age in weeks	Frequency	Percent
<28	4	2.0
28-30	41	20.3
31-32	50	24.8
33-34	69	34.2
>34	38	18.8
Total	202	100.0

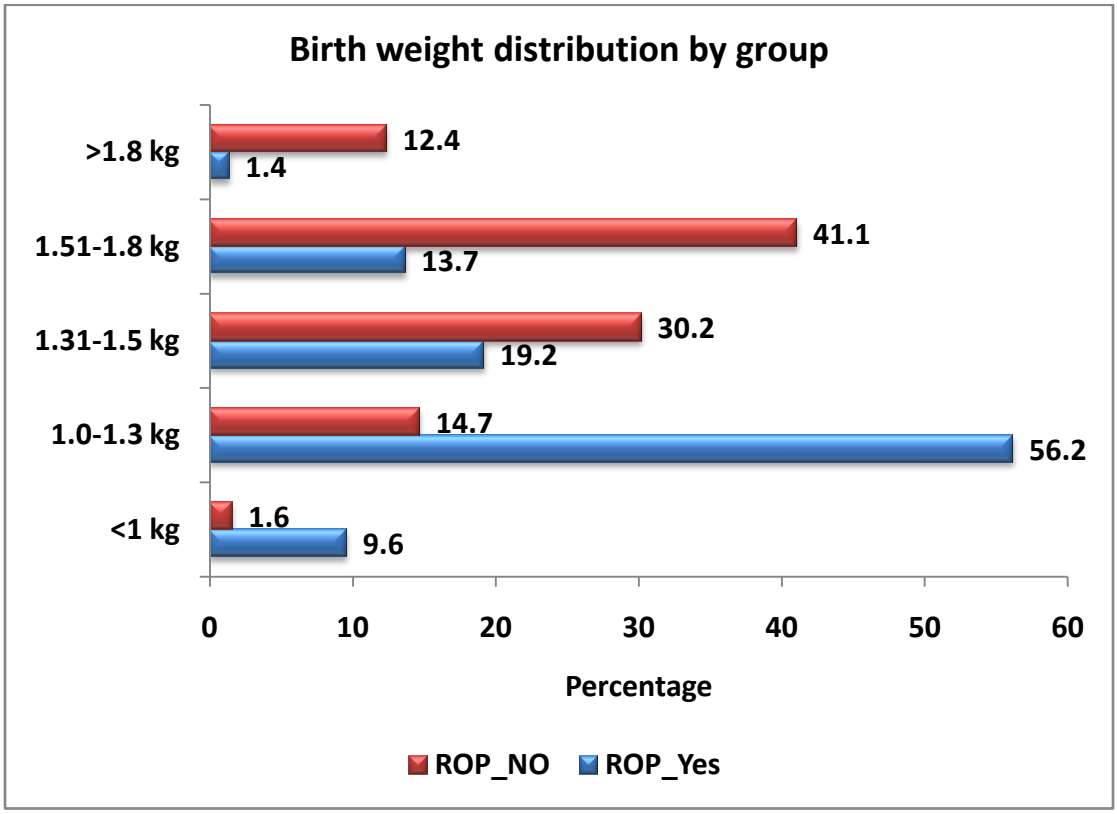
Sex

	Frequency	Percent
Male	107	53.0
Female	95	47.0
Total	202	100.00



Birth Weight

	Frequency	Percent
< 1Kg	9	4.5
1.0-1.3 Kg	60	29.7
1.31-1.5 Kg	53	26.2
1.51-1.8 Kg	63	31.2
>1.8 Kg	17	8.4
Total	202	100.00



ANEMIA

	Frequency	Percent
Yes	86	42.6
No	116	57.4
Total	202	100.0

Sepsis

	Frequency	Percent
Yes	82	40.6
No	120	59.4
Total	202	100.0

RDS

	Frequency	Percent
Yes	69	34.2
No	133	65.8
Total	202	100.0

Apnea

	Frequency	Percent
Yes	37	18.3
No	165	81.7
Total	202	100.0

NNH

	Frequency	Percent
Yes	142	70.3
No	60	29.7
Total	202	100.0

O2 Therapy

	Frequency	Percent
Yes	92	45.5
No	110	54.5
Total	202	100.0

CPAP

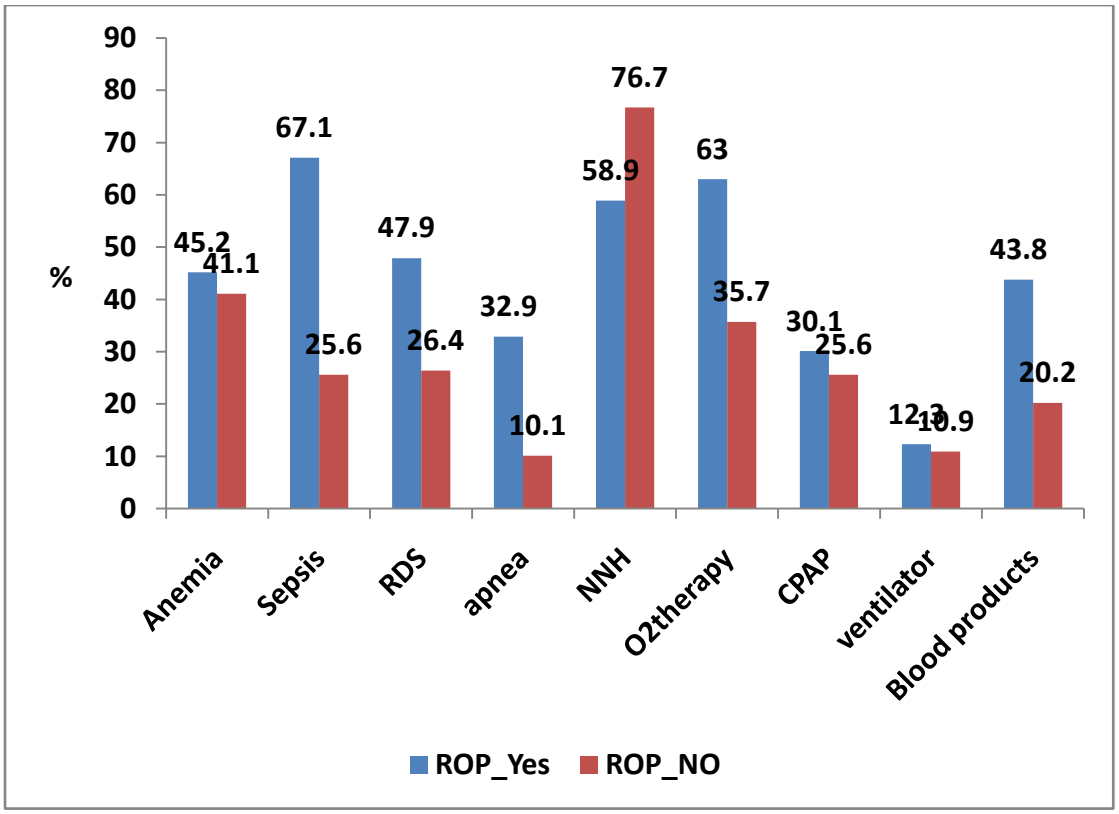
	Frequency	Percent
Yes	55	27.2
No	147	72.8
Total	202	100.0

VENTILATOR

	Frequency	Percent
Yes	23	11.4
No	179	88.6
Total	202	100.0

Blood Products

	Frequency	Percent
Yes	58	28.7
No	144	71.3
Total	202	100.0


90
80
70
60
50
40
30
20
10
0
%
45.2
41.1
67.1
25.6
47.9
26.4
32.9
10.1
58.9
76.7
63
35.7
30.1
25.6
12.3
10.9
43.8
20.2
Anemia
Sepsis
RDS
apnea
NNH
O2therapy
CPAP
ventilator
Blood products
ROP_Yes
ROP_NO

ASSOCIATION OF GESTATIONAL AGE WITH ROP

	Gestational Age in weeks					Total
	<28	28-30	31-32	33-34	>34	
Group ROP_Yes Count	3	34	28	5	3	73
% within group	4.1%	46.6%	38.4%	6.8%	4.1%	100%
ROP No Count	1	7	22	64	35	129
% within Group	.8%	5.4%	17.1%	49.6%	27.1%	100%
Total Count	4	41	50	69	38	202
% within Group	2.0%	20.3%	24.8%	34.2%	18.8%	100%

P=0.000

ASSOCIATION OF SEX WITH ROP

		Sex		
		Male	Female	
Group ROP_Yes	Count	37	36	71
	% within group	50.7%	49.3%	100%
ROP No	Count	70	50	129
	% within Group	54.3%	45.7%	100%
Total	Count	107	95	202
	% within Group	53.0%	47.0%	100%

P=0.624

ASSOCIATION OF BIRTH WEIGHT WITH ROP

		Birth Weight					Total
		<1 Kg	1.0-1.3 Kg	1.31-1.5 Kg	1.51-1.8 Kg	>1.8 Kg	
Group ROP_Yes	Count	7	41	14	10	1	73
	% within group	9.6%	56.2%	19.2%	13.7%	1.4%	100%
ROP No	Count	2	19	39	53	16	129
	% within Group	1.6%	14.7%	30.2%	41.1%	12.4%	100%
Total	Count	9	60	53	63	17	202
	% within Group	4.5%	29.7%	26.2%	31.2%	8.4%	100%

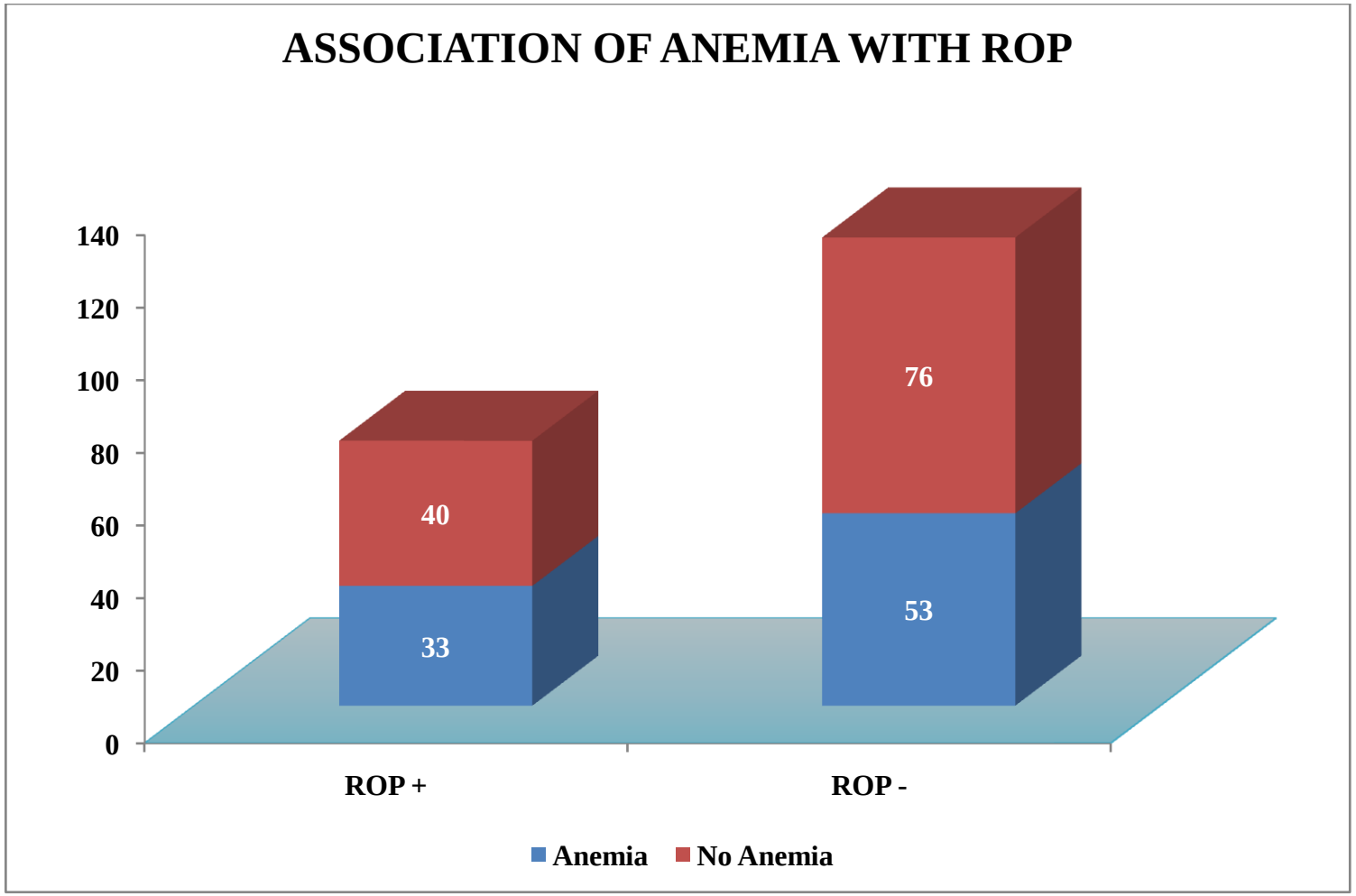
P=0.000

ASSOCIATION OF ANAEMIA WITH ROP

		Anemia		Total
		Yes	No	
Group ROP_Yes	Count	33	40	73
	% within group	45.2%	54.8%	100%
ROP No	Count	53	76	129
	% within Group	41.1%	58.9%	100%
Total	Count	86	116	202
		42.6%	57.4%	100%

P=0.569

FIGURE : 11 ASSOCIATION OF ANEMIA WITH ROP

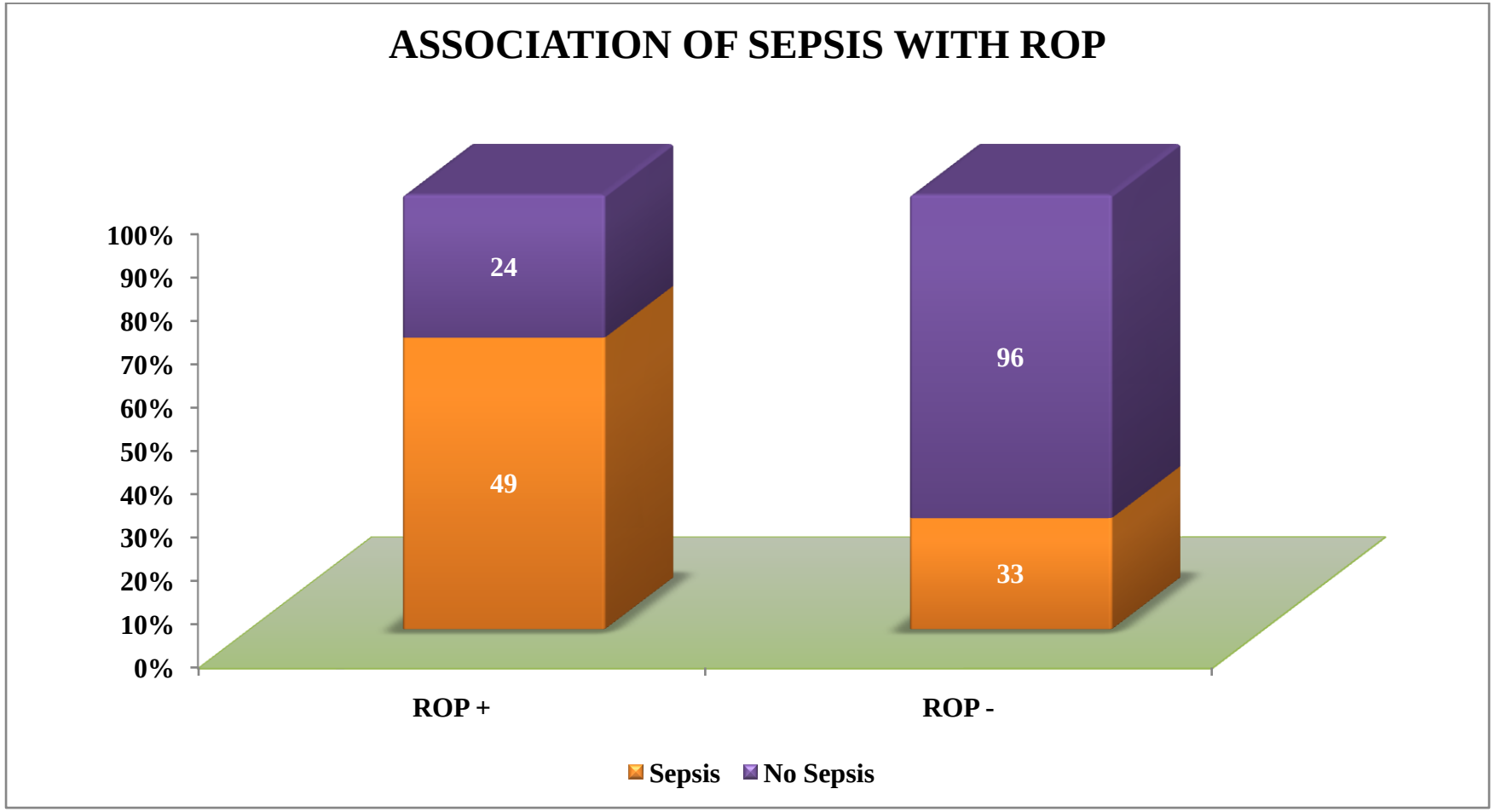


ASSOCIATION OF SEPSIS WITH ROP

		Sepsis		Total
		Yes	No	
Group ROP_Yes	Count	49	24	73
	% within group	67.1%	32.9%	100%
ROP No	Count	33	96	129
	% within Group	25.6%	74.4%	100%
Total	Count	82	120	202
		40.6%	59.4%	100%

P = 0.000

FIGURE : 12 ASSOCIATION OF SEPSIS WITH ROP

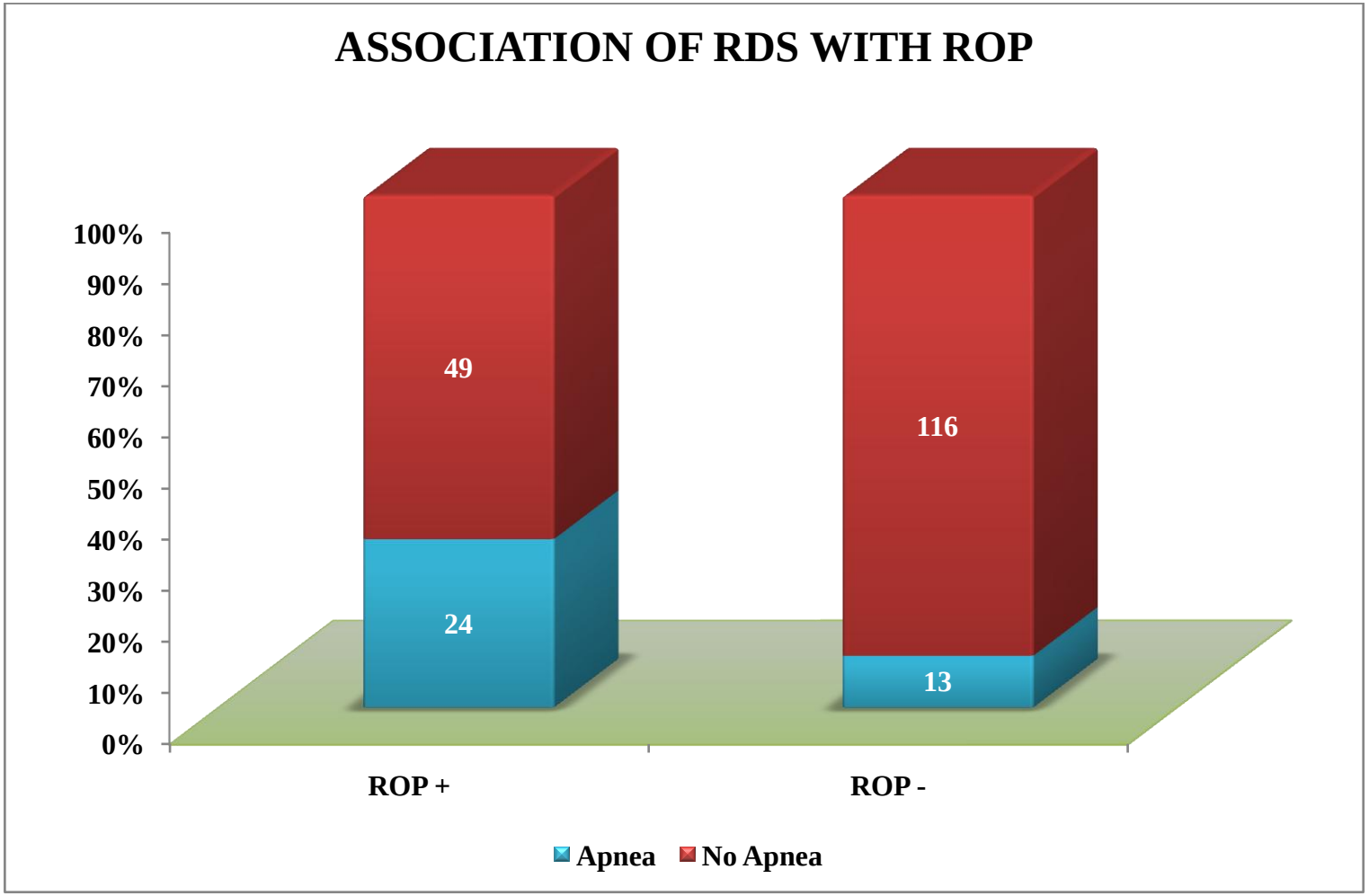


ASSOCIATION OF RDS WITH ROP

		RDS		Total
		Yes	No	
Group ROP_Yes	Count	35	38	73
	% within group	47.9%	52.1%	100%
ROP No	Count	34	95	129
	% within Group	26.4%	73.6%	100%
Total	Count	69	133	202
		34.2%	65.8%	100%

P = o.oo2

FIG : 13 ASSOCIATION OF RDS WITH ROP

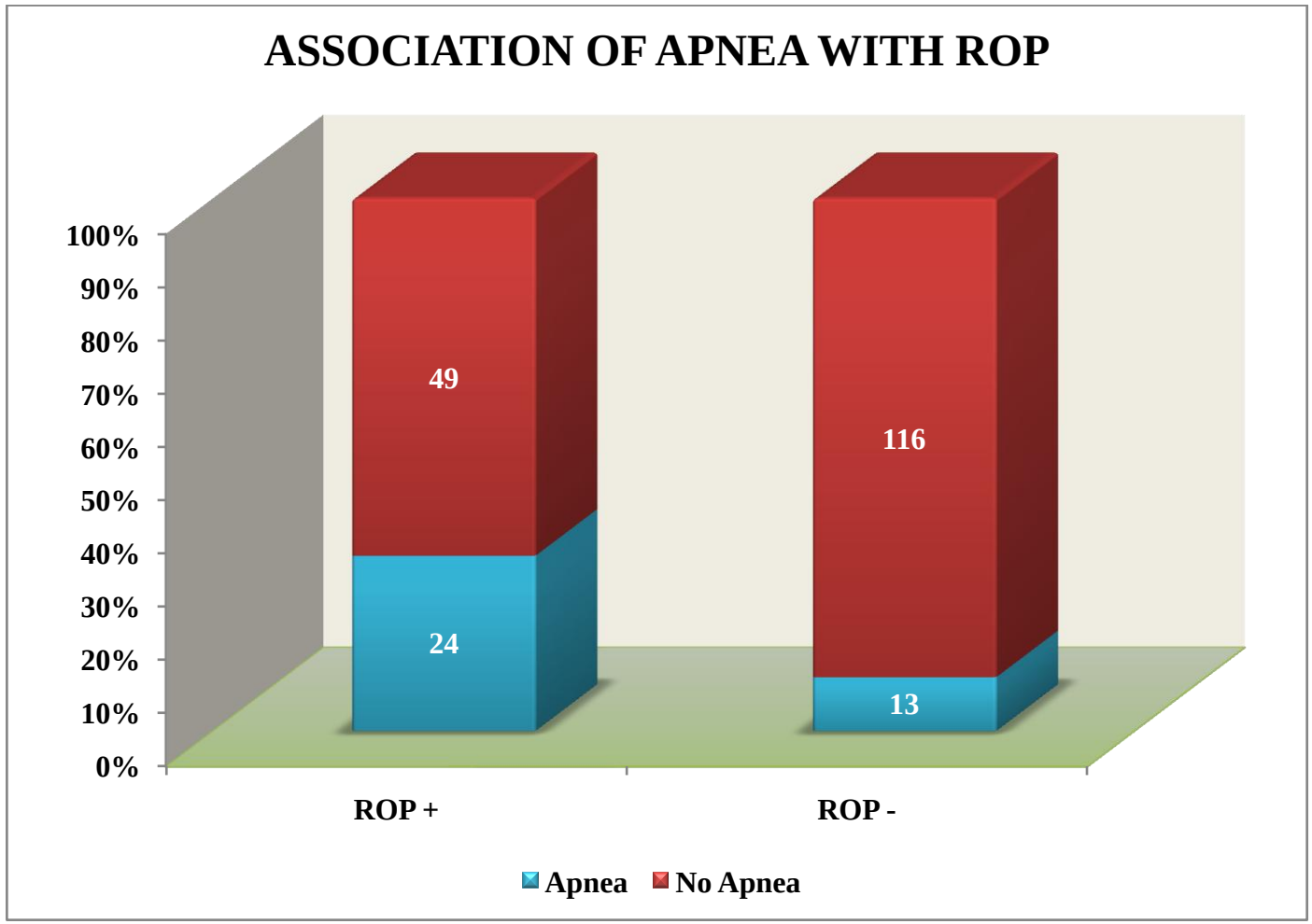


ASSOCIATION OF APNEA WITH ROP

		Apnea		Total
		Yes	No	
Group ROP_Yes	Count	24	49	73
	% within group	32.9%	67.1%	100%
ROP No	Count	13	116	129
	% within Group	10.1%	89.9%	100%
Total	Count	37	165	202
		18.3%	81.7%	100%

P=0.000

Figure : 14 ASSOCIATION OF APNEA WITH ROP

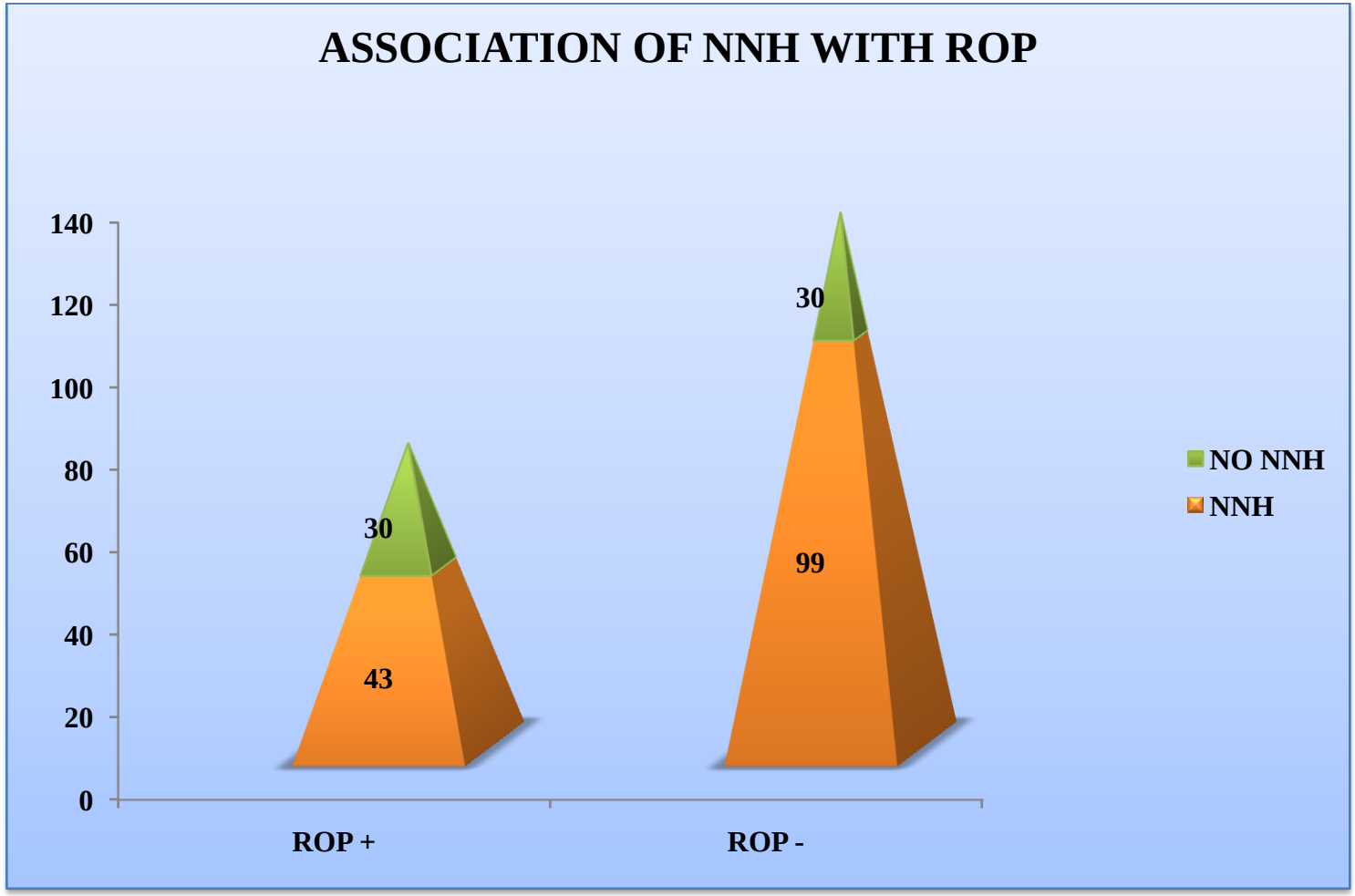


ASSOCIAITON OF NNH WITH ROP

		NNH		Total
		Yes	No	
Group ROP_Yes	Count	43	30	73
	% within group	58.9%	41.1%	100%
ROP No	Count	99	30	129
	% within Group	76.7%	23.3%	100%
Total	Count	142	60	202
		70.3	29.7	100%

P=0.008

FIGURE : 15 ASSOCIATION OF NNH WITH ROP

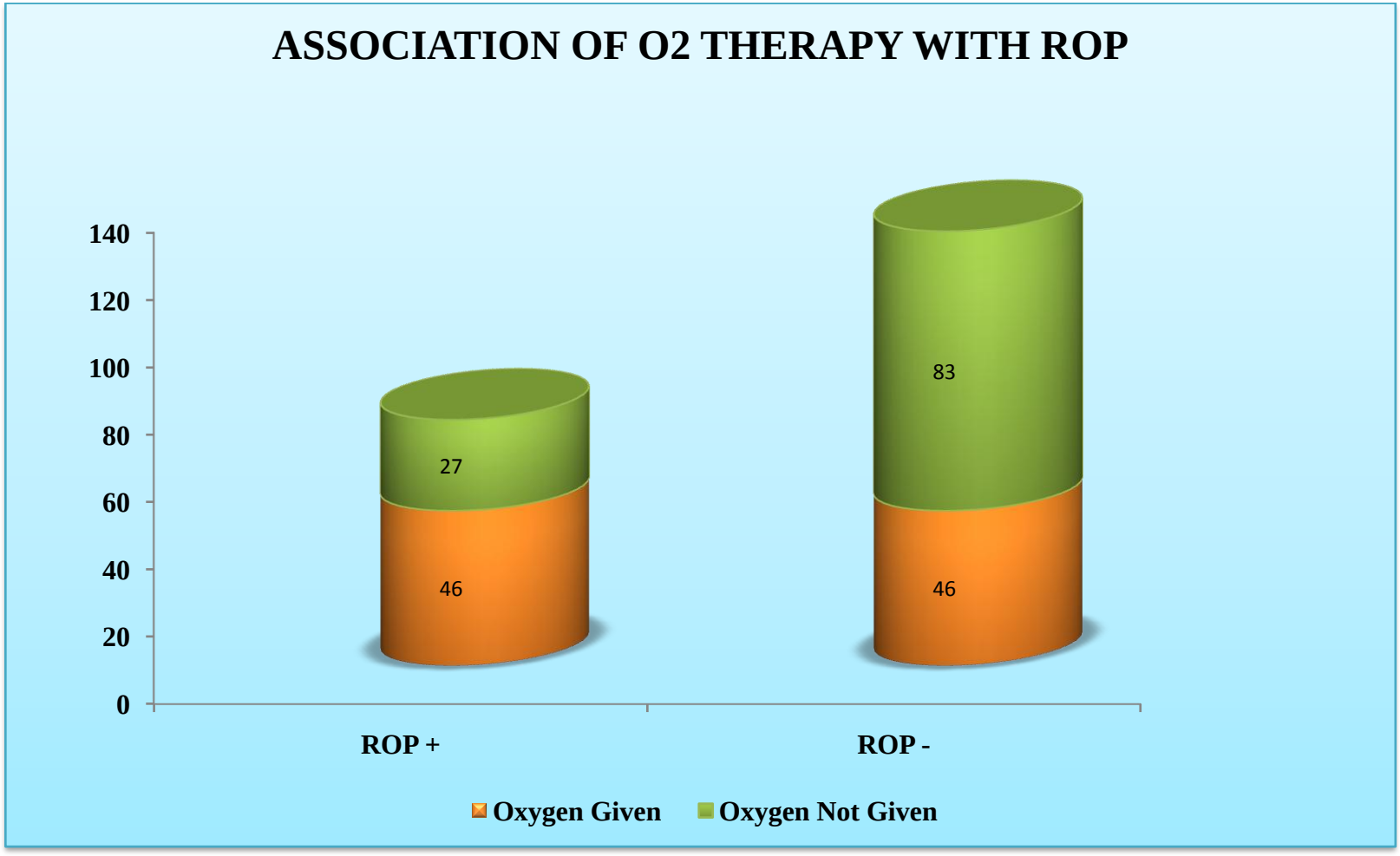


ASSOCIATION OF O2 THERAPY WITH ROP

		O2 Therapy		Total
		Yes	No	
Group ROP_Yes	Count	46	27	73
	% within group	63.0%	37.0%	100%
ROP No	Count	46	83	129
	% within Group	35.7%	64.3%	100%
Total	Count	92	110	202
		45.5%	54.5%	100%

P=0.000

FIGURE : 16 ASSOCIATION OF O2 THERAPY WITH ROP



ASSOCIATION OF CPAP WITH ROP

		CPAP		Total
		Yes	No	
Group ROP_Yes	Count	22	51	73
	% within group	30.1%	69.9%	100%
ROP No	Count	33	96	129
	% within Group	25.6%	74.4%	100%
Total	Count	55	147	202
		27.2%	72.8%	100%

P=0.485

ASSOCIAITON OF VENTILATOR WITH ROP

		Group Ventilator		Total
		Yes	No	
Group ROP_Yes	Count	9	64	73
	% within group	12.3%	87.7%	100%
ROP No	Count	14	115	129
	% within Group	10.9%	89.1%	100%
Total	Count	23	179	202
		11.4%	88.6%	100%

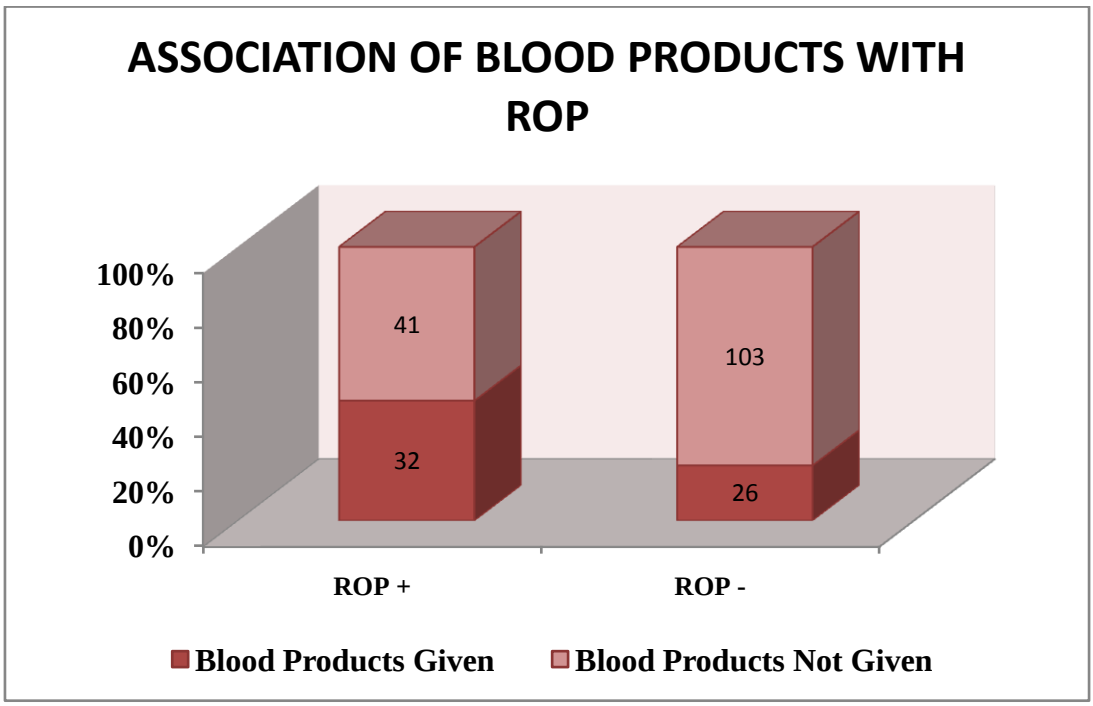
P=0.751

ASSOCIATION OF BLOOD PRODUCTS WITH ROP

		Blood Products		Total
		Yes	No	
Group ROP_Yes	Count	32	41	73
	% within group	43.8%	56.2%	100%
ROP No	Count	26	103	129
	% within Group	20.2%	79.8%	100%
Total	Count	58	144	202
		28.7%	71.3%	100%

P=0.000

FIGURE : 17 ASSOCIATION OF BLOOD PRODUCTS WITH RO



DISCUSSION

DISCUSSION

We screened all the babies admitted in our newborn wards with birth weight <1500gm and/or gestational age <34 weeks. The study conducted by Swarna Rekha et al[12] also had same screening criteria which showed an incidence of ROP as 46%. In our study the incidence was 36.1%. The incidence of ROP in various studies in India varies from 20% to 60.2%.

The incidence of ROP in the west had been reported as 53% - 88.5% in <1000g babies. In our study it was 77.7% which was comparable to the previous studies. The incidence of ROP in <1500g babies was found to be 34.9-60.1% in western studies. In our study we found the incidence was about 49.2% which seems to follow a similar pattern.

Incidence of ROP has been reported as 82.5% in babies <28 weeks and in our study it was 75% which is somewhat lower than the previous studies. The incidence of ROP in 28 – 30 weeks group found to be 27% in the previous study. But in our study the incidence seems to be higher than the previous one (64%).

There were varying screening criteria described by different authors for ROP screening. Maheswari et al[10] screened the babies with birth weight ≤1500g and / or gestational 35 week. Vinekar et al[16] suggested that larger birth weight and gestationally older infants in India were more likely to develop ROP compared to their counterparts in western countries. Jalat et al (14) suggested that infants with birth weight <2000g gestational age <37 weeks should also be screened.

Many risk factors were found to be predisposing to the development of ROP. Of which oxygen therapy, anemia, use of blood products, septicemia, apnea and RDS were important risk factors. In our study lower birth weight, lesser gestational age, apnea, RDS, oxygen therapy, sepsis, use of blood products, neonatal hyperbilirubinemia were found to be significant risk factors. Vinekar et al[13,] found that septicemia was a significant risk factor. Aggarwal et al[10] found that apnea, clinical sepsis and male sex were significant risk factors.

Ng et al[18],and Connolly, et al[19] have found that long term structural and functional outcome using laser photocoagulation yielded favorable results. Laser therapy does not need the use of general anaesthesia and has milder complications.

In our study, 38 infants with ROP required laser photocoagulation. Of which 36 infants (94.7%) had regression of ROP after laser photo coagulation which showed good results with laser therapy.

As ROP is essentially asymptomatic in earlier stages, carefully timed retinal examination of at risk infants for ROP by an ophthalmologist experienced in retinal examination in infants is required to minimize the risk of loss of vision in these infants.

SUMMARY

SUMMARY

ROP is a preventable cause of blindness and vision related morbidity. As there are improvement in neonatal health care facilities and Neonatal Intensive Care Units, the survival of more and more VLBW & ELBW babies are increasing who are at risk for developing ROP. So the incidence of ROP is in increasing trend all over the world. More over no good epidemiological data on ROP in Tamil Nadu is available.

Hence we conducted a prospective study to determine the incidence, risk factors, clinical outcome of laser therapy among the newborn babies with birth weight <1500gm, and /or gestational <34 weeks admitted in our newborn wards. Total of 202 newborns were included in this study, among them 73 developed ROP. The overall incidence of ROP was found to be 36.1%. We also found that lesser gestational age, lower birth weight, RDS, apnea, NNH, oxygen therapy, use of blood products were found to be significant risk factors. Efficacy of laser photo coagulation was 94.7%. 36 out of 38 infants treated with laser showed regression ROP.

In our study we found that the following risk factors are significantly associated with the development of ROP.

1. Gestational age
2. Birth weight .
3. RDS
4. Apnea
5. NNH
6. O2 Therapy
7. Use of Blood Products

LIMITATIONS OF THE STUDY

LIMITATIONS OF THE STUDY:

In our study, the screening population were obtained from an extramural centre only. The intramural sample and sample were not included. So the comparison between intramural and extramural population could not be obtained.

Since the oxygen blender was not available, the fio2 concentrations at which level, the maximum risk for development of ROP could not be obtained.

As the arterial blood gas analysis was not available consistently, the association of acidosis with ROP as a risk factor could not be identified.

CONCLUSION

CONCLUSION

In our study, we conclude that the incidence of ROP was 36.1% . The risk factors for the development of ROP were also similar to those mentioned in earlier studies like prematurity, oxygenation, sepsis, respiratory distress. Proper screening of at risk babies found to be cost effective in preventing from the development of ROP.

We recommed that intial assessment for screening of ROP to be done as early as at least 4 weeks post natal age or 34-35 weeks postconceptional age and these babies are to be followed till term gestation.

Laser photocoagulation found to be a safer therapeutic procedure with good outcome and milder complications.

Larger birth weight babies and gestationally more older babies may also develop ROP. So, the criteria for ROP screening should be extended to the larger birth weight babies upto 1.8 kg and older gestational age babies upto 36 weeks especially those with risk factors like sepsis, apnea, RDS and those who need blood transfusion.

It seems that prevention of premature and deliveries and judicious use of oxygen are found to be the main step for prophylaxis of ROP.

BIBLIOGRAPHY

1. Phelps DL retionapathy of Prematurity: An estimate of vision loss in the United States-1979. Paediatrics 1981;67;405-12.
2. Gibson DL, Sheps SB, et al. Retinopathy of prematurity induced blindness: birthweight specific survival and the new epidemic.Paediatrics 1990; 86:405-12
3. Charan R, Dogra MR, Gupta A , narang, A The incidence of retinopathy of prematurity in a neonatal care unit. Indian J ophthalmol 1995; 43: 123-6.
4. Terry TL. Extreme prematurity and fibroblastic overgrowth of persistent vascular sheath behind each crystalline lens: I preliminary report. Am J ophthalmol 1942;25:203-4.
5. Eichenbaum JW. In :Eichenbaum JW, Mamelok AE, Mittl RN, Orellana J (ed), The oxygen era in treatment of retinopathy of prematurity Chicago yearbook medical publishers Inc. 1990; pp:30

6. Chaudry S et al, Retinopathy of prematurity in atertiary care centre – incidence, risk factors and outcome.Indian pediatr. 2009 Mar;46(3):219-24. Epub 2009 Jan 1.
7. Dr.Santhosh Mahapatra et al Incidence of ROP at neonatal intensive care units (NICUs) at tertiary care centres of Orissa AIOC 2008 Proceedings.
8. Padmani karna et al Retinopathy of prematurity and risk factors a prospective cohort study. BMC Paediatrics 2005, 5: 18doi:10.1186/1471-2431-5-18.
9. May may choo et al Retinopathy of prematurity in extremely low birth weight infants in Malaysia.doi 10.1016/j.jaapos.2009.06.008
10. Maheswari R et al Incidence and risk factors of retinopathy of prematurity in a tertiary new born unit in New Delhi. Natl Med J India 1996; 92:211-214.

11. AHA Abdel Hakeem, GB Mohamed, MF Othman Retinopathy of prematurity: A study of incidence and risk factors in NICU of Al-Minya University Journal of Clinical Neonatology, Year 2012, Volume 1, Issue 2 [p. 76-81]
12. Swarna Rekha et al retinopathy of prematurity: Incidence and risk factors.Indian Pediatr 1996:33:999-1003.
13. Mojgan Bayat-Mokhtari et al Incidence and Risk Factors of Retinopathy of Prematurity among Preterm Infants inShiraz/Iran Iran J Pediatr Sep 2010; Vol 20 (No 3), Pp: 303-307.
14. A.A. Binkhathlan et al Retinopathy of prematurity in Saudi Arabia: incidence, risk factors, and the applicability of current screening criteria. Br J Ophthalmol 2008 Feb;92(2):167-9
15. Mostafa Feghhi et al Incidence of retinopathy of prematurity and risk factors in south western region of Iran. Middle east Afr J Ophthalmol 2012 Jan-Mar; 19(1): 101-106

16. Vinekar A et al Retinopathy of prematurity in Asian Indian babies weighing greater than 1250 gms at birth ten year data froma tertiary care centre in a developing country.
17. Jalali et al. programme planning and screening strategy in retinopathy of prematurity. Indian J ophthalmol 2003;51:89-99
18. Ng EY et al A comparison of laser photocoagulation with cryotherapy for threshold retinopathy of prematurity at 10 years part 1: visual function and structural outcome. Ophthalmology 2002;109;928-934
19. Connolly BP et al A comparison of laser photocoagulation with cryotherapy for threshold retinopathy oif prematurity at 10 years Part 2: Refractive outcome Ophthalmology 2002;109: 936-941.
20. Nelson's Textbook of Pediatrics 19th edition 2174-2176.

ANNEXURE

PROFORMA FOR THE STUDY

NAME: AGE: SEX:

DATE OF EXAMINATION:

ROLL NO:

BIRTH WEIGHT:

GESTATIONAL AGE:

POST CONCEPTIONAL AGE:

ADDRESS:

TELEPHONE NO:

FATHER'S NAME:

MOTHER'S NAME:

NEO-NATAL RISK FACTORS

ANEMIA:

SEPSIS

RDS:

APNEA OF PREMATURITY:

HYPERBILIRUBINEMIA:

TREATMENT DETAILS

OXYGEN THERAPY:

CPAP:

VENTILATOR THERAPY:

BLOOD COMPONENTS:

PHOTOTHERAPY:

ABBREVIATION

AGA	=	appropriate for gestational age
CPAP	=	continuous positive airway pressure
ELBW	=	extremely low birth weight
ICROP	=	international classification of retinopathy of prematurity
NNH	=	neonatal hyperbilirubinaemia
O2	=	oxygen
RDS	=	respiratory distress syndrome
ROP	=	retinopathy of prematurity
SGA	=	small for gestational age
VEGF	=	vascular endothelial growth factor
VLBW	=	very low birth weight

MASTER CHART

s.no	gest.age	sex	birthwt	anemia	sepsis	resp.dist.	apnea	NNH	O2therapy	CPAP	ventilator	bloodproducts
1	3	1	2	2	1	2	2	1	2	2	2	2
2	3	2	2	2	2	2	2	2	2	2	2	2
3	3	2	2	1	1	2	2	1	1	1	2	1
4	3	1	2	1	2	1	2	1	1	1	2	2
5	3	2	2	2	1	1	2	1	1	2	2	1
6	3	2	3	2	2	2	2	1	2	2	2	2
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