IOSR Journal of Dental and Medical Sciences (IOSR-JDMS)
e-ISSN: 2279-0853, p-ISSN: 2279-0861.Volume 21, Issue 2 Ser.8 (February. 2022), PP 32-49
www.iosrjournals.org

"Study Of Prevalence And Fetomaternal Outcome In Rhesus Antigen Negative Pregnancy At Tertiary Care Center In Western Rajasthan "

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Abstract
Background - *The rhesus antigen is an important characteristic of blood cells. It indicates whether the blood of two different people is compatible when mixed – such as the blood of a mother and her baby at birth, blood transfusion etc. Different blood group characteristics may cause problems. The rhesus factor D (Rh D), a protein found on the surface of the red blood cells also referred to as the Rh D antigen. Three pairs of antigenic determinants (Dd, Cc, Ee) are present in Rh-complex. Rh-antigen, that was shared by about 85% and it was discovered in monkey Macacus rhesus (1). People who have Rh antigen, are said to be "Rh-positive" (rhesus positive). And someone who lacks it is "Rh-negative" (rhesus negative).*
Prospective observational study done to know maternal and perinatal outcome in rhesus antigen negative pregnancy at our tertiary care center attached to Dr. SN Medical college, Jodhpur.
METHODS- *This hospital based prospective observational study was conducted at Umaid Hospital, attached to Dr. S. N. Medical College, Jodhpur from April 2020 to November 2020.*
RESULTS- *This prospective observational study included a total of 184 Rh-negative pregnancies.Mean age of all patients was 25.06 ± 4.01 years ranging from 18 – 38 years.Most of patients (97.28%) were fully immunized, 1.63% were partially immunized and 1.63% were un immunized.Most (83.7%) females came from rural area and 60.87% were booked pregnancy. Among 184 patients, 53.26% were literate and 40.73% were illiterate.*
CONCLUSIONS- *Rhesus alloimmunization is a preventable direct cause for perinatal morbidity and mortality. feto maternal outcome was relatively worse in Rh-negative pregnancies, with higher occurrence of Cesarean section, NICU admission, and perinatal mortality. Small number of multigravida females were still not received anti-D, which points towards requirement of improved health education to increase the awareness of the public about this important issue.*

Keywords – *Rh negative , maternal , fetal*

Date of Submission: 03-02-2022 Date of Acceptance: 16-02-2022

I. Introduction

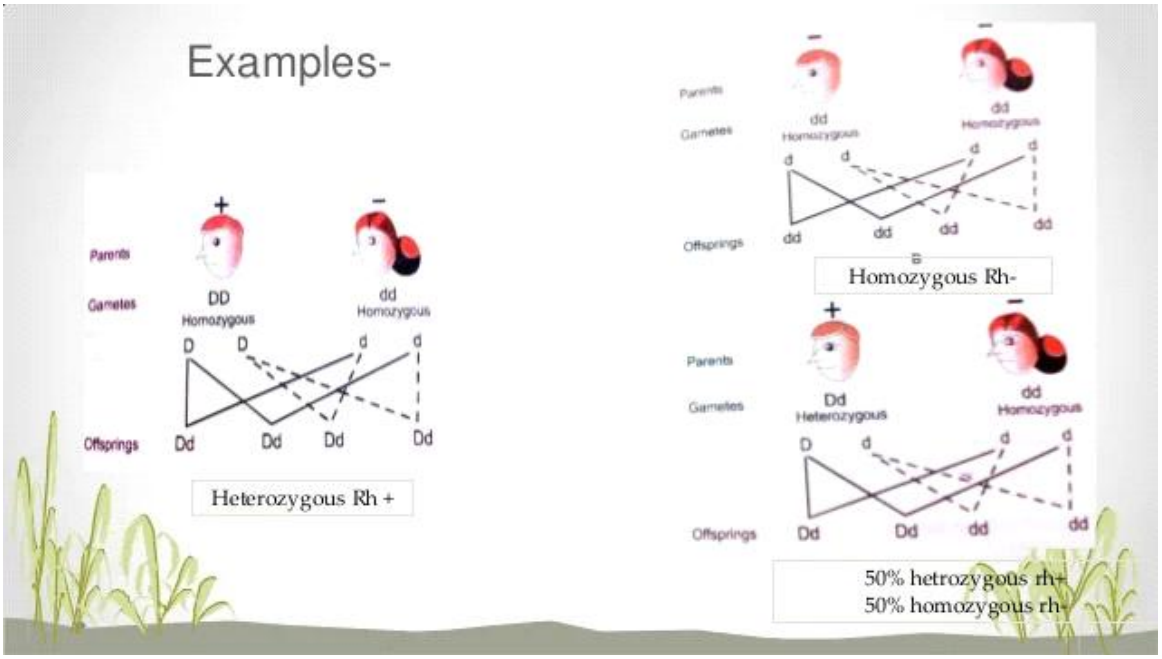
The rhesus antigen is an important characteristic of blood cells. It indicates whether the blood of two different people is compatible when mixed – such as the blood of a mother and her baby at birth, blood transfusion etc. Different blood group characteristics may cause problems. The rhesus factor D (Rh D), a protein found on the surface of the red blood cells also referred to as the Rh D antigen. Three pairs of antigenic determinants (Dd, Cc, Ee) are present in Rh-complex. Rh-antigen, that was shared by about 85% and it was discovered in monkey Macacus rhesus (1). People who have Rh antigen, are said to be "Rh-positive" (rhesus positive). And someone who lacks it is "Rh-negative" (rhesus negative).

In 1900 the A, B, and O type were determined by Karl Landsteiner. Rhesus blood group system was the fourth system to be discovered by Landsteiner and Alexander Swiener in 1937. The genetic loci for Rh antigen are located in short arm of chromosome 1 (2).

Incidence of rhesus negative is roughly 15% of the population in Europe (3). However, this incidence is now on decline worldwide. The proportion of people who are Rh-negative also varies according to race. In India previously, it was thought that it is present only in Parsis, but afterwards it was detected in others also (4). The incidence of Rh-negative blood group is highest among Basques that is 34%. It is 13% among Caucasians, 7% among African-American, and 1% among Americans, Chinese, and other Asiatic peoples (5). In India it varies between 3% and 8% (6,7,8).

Foetus inherits antigenic determinates both from father & mother. If a pregnant woman is Rh-positive, that won't cause any health problems – regardless of whether the baby is Rh-negative or Rh-positive. If a pregnant woman and her husband is rhesus negative, no incompatibility is there. If a pregnant woman is rhesus negative and her husband is rhesus positive, then it poses a risk to mother and baby due to incompatible mating. It follows Mandelian dominant inheritance. If a man carrying D on both sets is called homozygous (DD) seen in 40% cases, while a man with D in only one set is called heterozygous (Dd) seen in 60% cases (9). If a father is homozygous, then all offspring's will be Rh-positive (Dd). If father is heterozygous, then half of offspring will be Rh-positive (Dd) and half will be Rh-negative (dd).

If a woman who is Rh-negative is expecting a baby who is Rh-positive, the mother's blood might produce anti-D antibodies, that not present normally in them, against the baby's rhesus factor. That can happen if some of the baby's blood mixes



with the mother's blood – for instance, following minor injuries to the placenta or umbilical cord during birth. It can also happen during pregnancy, either without any outside influence or as a result of testing such as an amniotic fluid test (amniocentesis). If baby's blood which carries Rh antigen mixes with maternal blood, there is formation of IgM antibody in maternal blood for short period followed by production of IgG anti Rh antibody. This IgM antibody is large in size, so it does not cross the placental barrier. That's why first pregnancy is rarely affected. On subsequent pregnancies degree of sensitization increases and these IgG antibodies pass back to placenta, cross the barrier and reach up to the foetal circulation. These antibodies destroy the foetal red blood

cells causing foetal anaemia. Erythropoiesis has started in liver and spleen. Due to erythropoiesis hepatosplenomegaly occurs in baby. Due to tissue hypoxia and hypoproteinaemia, generalised oedema and hydrops foetalis develops.

AIMS

To know maternal and perinatal outcome in rhesus antigen negative pregnancy at our tertiary care center attached to Dr. SN Medical college, Jodhpur.

OBJECTIVES

- Primary objective- To know the prevalence of rhesus negative pregnancy at our tertiary care center attached to Dr SN Medical college, Jodhpur.
- Secondary objective- To know the maternal and perinatal outcome in Rh-negative pregnancy at our tertiary care center attached to Dr SN Medical college, Jodhpur.

II. Materials And Method

Study setting: this study was conducted at Umaid Hospital, attached to Dr. S. N. Medical College, Jodhpur.
Study design: Hospital based prospective observational study.
Study duration: from April 2020 to November 2020.
Study population:

- **Inclusion criteria**:

Women between 30 to 36 weeks gestational age based on menstrual dates or earliest ultrasonography, carrying a single live foetus that is confirmed by ultrasonography and having intact membranes that is confirmed by per vaginal examination.

- **Exclusion criteria**:
- Any maternal or foetal condition necessitating immediate delivery.
- Severe anaemia (Hb<7 g/dl ac. to WHO guidelines)

Sample size: Sample size was calculated using the formula for sample size for estimation of

prevalence was $n = \frac{(Z_{1-\alpha/2})^2 \ P\,(1-P)}{E^2}$

Where,

$Z_{1-\alpha/2}$ = Standard normal deviate for 95% confidence interval (taken as 1.96)

P = Expected prevalence of Rh-negative pregnancy (taken as 5% as per reference article Shoujanya at el (29).

E = Absolute allowable error (taken as 1%)

Sample size was calculated to be minimum 1843 subjects, which was rounded off to 2000 antenatal females for Rh status.

III. Observations And Results

Table 1: Prevalence of Rh-negative patients

Rh status	No. of patients	percentage
Rh-positive	1816	90.8%
Rh-negative	184	9.2%
Total	2000	100.00%

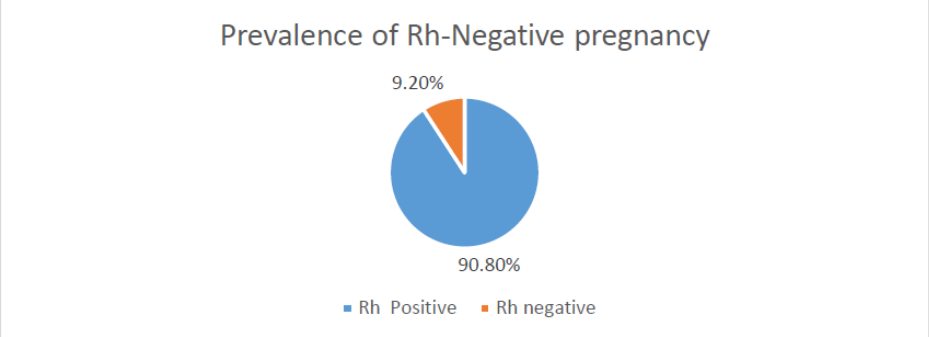


Table 2: Distribution of study participant according to age group

Age group (years)	Frequency	Percent (%)
18-20	17	9.24%
21-25	101	54.89%
26-30	46	25.00%
>30	20	10.87%
Total	**184**	100.00%
mean ± SD	25.06 ± 4.01 years	
median (range)	24.5 (18 - 38 years)	

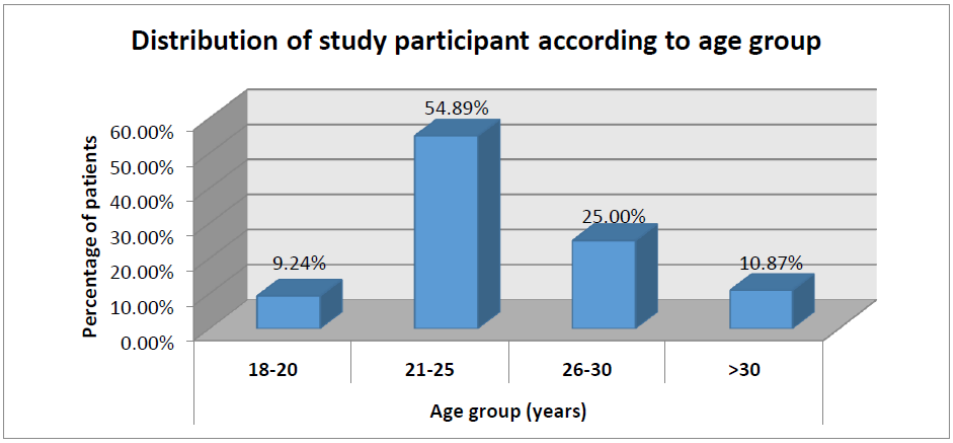


Table 3: Distribution of study participant according to Immunisation Status

Immunisation Status	No. of Patients	Percent (%)
Full immunisation	179	97.28%
Partial immunisation	2	1.09%
Non- immunised	3	1.63%
Total	**184**	**100.00%**

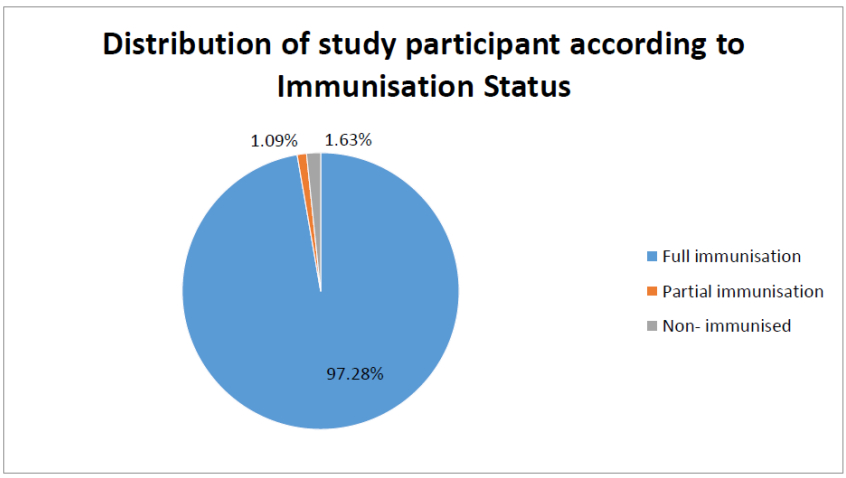


Table 4: Distribution of study participant according to Booking Status

Booking Status	No. of Patients	Percent (%)
Booked	112	60.87%
Un-booked	72	39.13%
Total	184	100.00%

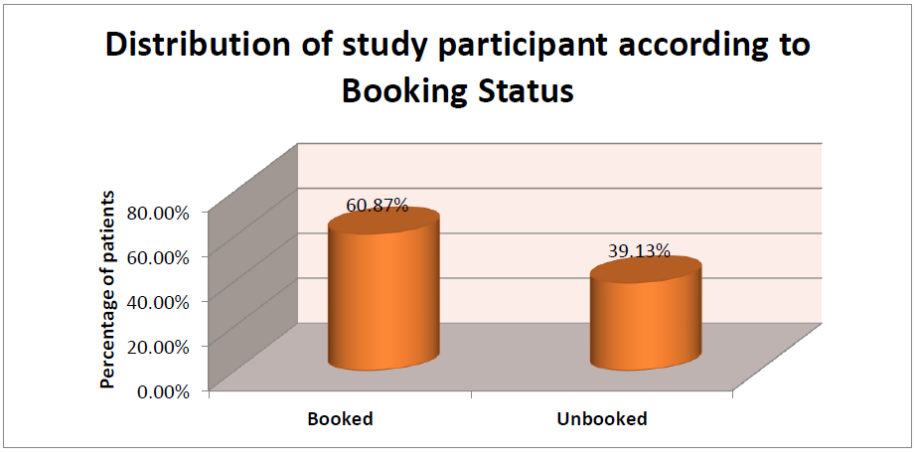


Table 5: Distribution of study participant according to Residential Status

Residential status	No. of Patients	Percent (%)
Rural	154	83.70%
Urban	30	16.30%
Total	184	100.00%

Table 6: Distribution of study participant according to Literacy status

Literacy status	No. of Patients	Percent (%)
Literate	98	53.26
Illiterate	86	46.73
Total	184	100.00%

Table 7: Distribution of study participant according to Gestational Age

Gestational Age (weeks)	No. of Patients	Percent (%)
28-32	11	5.98%
33-36	27	14.67%
37-40	110	59.78%
>40	36	19.57%
Total	**184**	**100.00%**

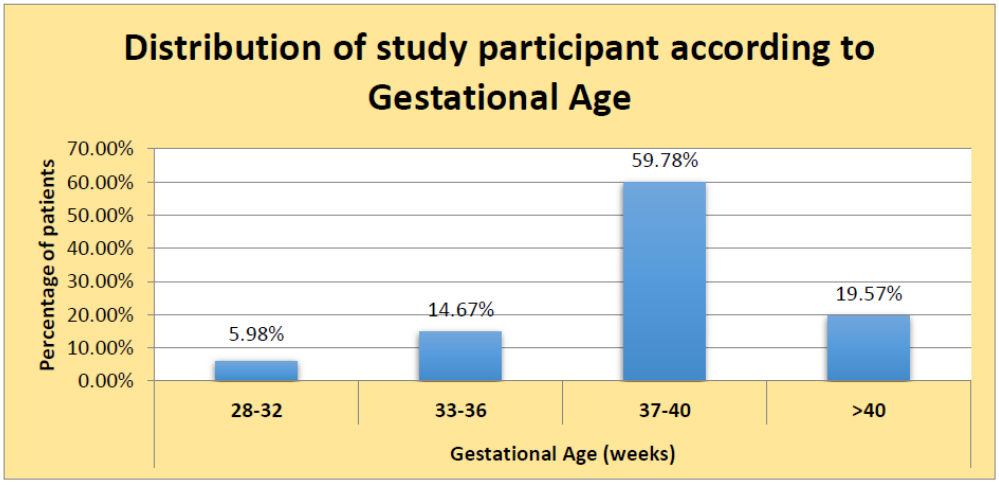


Table 8: Distribution of study participant according to gravidity

Gravidity	No. of Patients	% Total
Primigravida	67	36.41%
2nd gravida	67	36.41%
3rd gravida	27	14.67%
4th gravida	15	8.15%
multi gravida	8	4.35%
total	**184**	**100.00%**

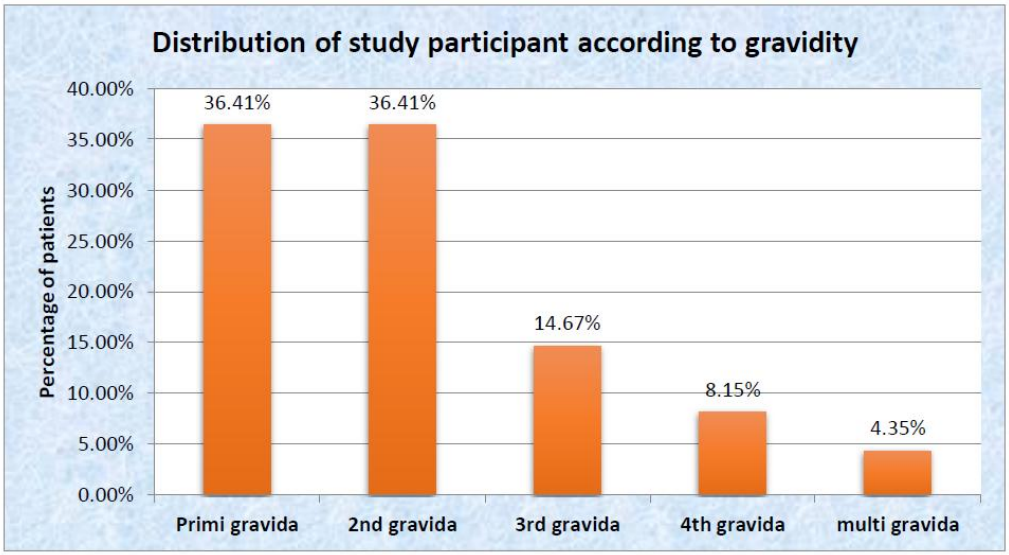


Table 9: Distribution of study participants according to fetomaternal blood mixing

Fetomaternalblood mixing	No. of Patients	Percent (%)
Threatened abortion	17	9.23%
APH (Abruption)	1	0.50%
Blood transfusion	12	6.52%
Total	30	16.25%

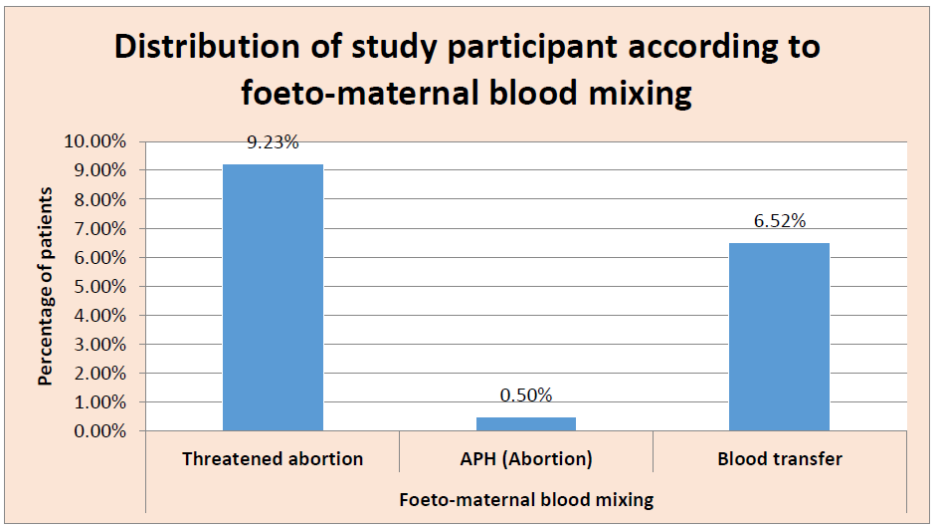


Table 10: Distribution of study participant according to Associated conditions

Associated Conditions	No. of Patients	Percent (%)
HDOP	20	10.86%
Hypothyroidism	5	2.71%
Anaemia	15	8.15%
oligohydramnios	12	6.52%
polyhydramnios	4	2.17%
GDM	2	1.08%
Total	58	31.49%

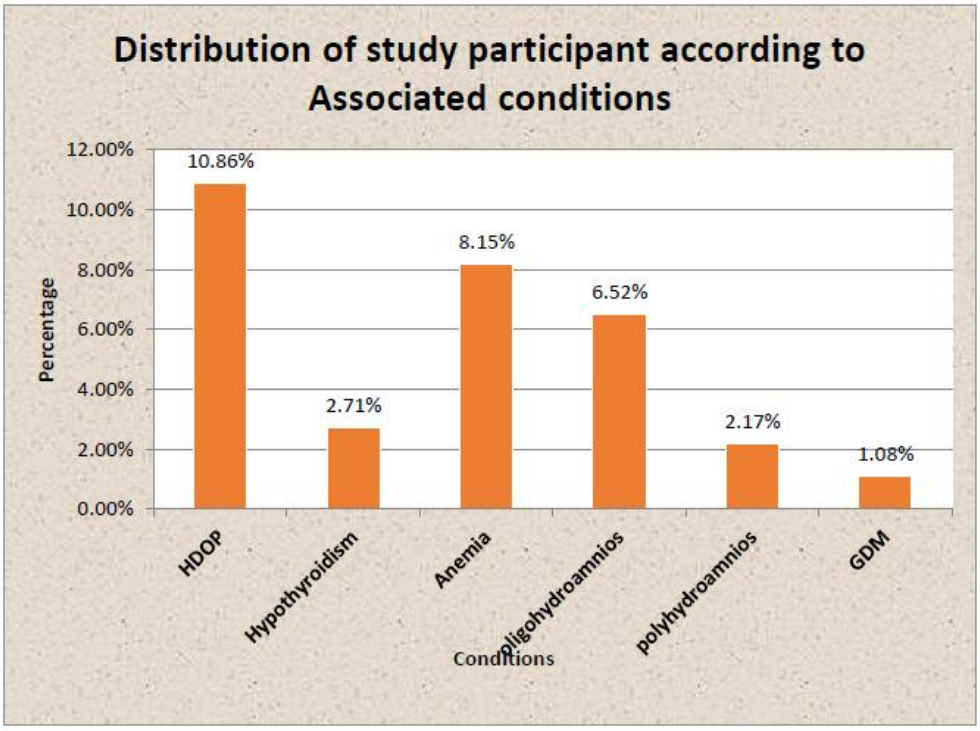


Table 11: Distribution of study participant according to Blood group of mothers

Blood Group of Mother	No. of Patients	Percent (%)
B negative	68	36.96%
A negative	44	23.91%
O negative	54	29.35%
AB negative	18	9.78%
Total	184	100.00%

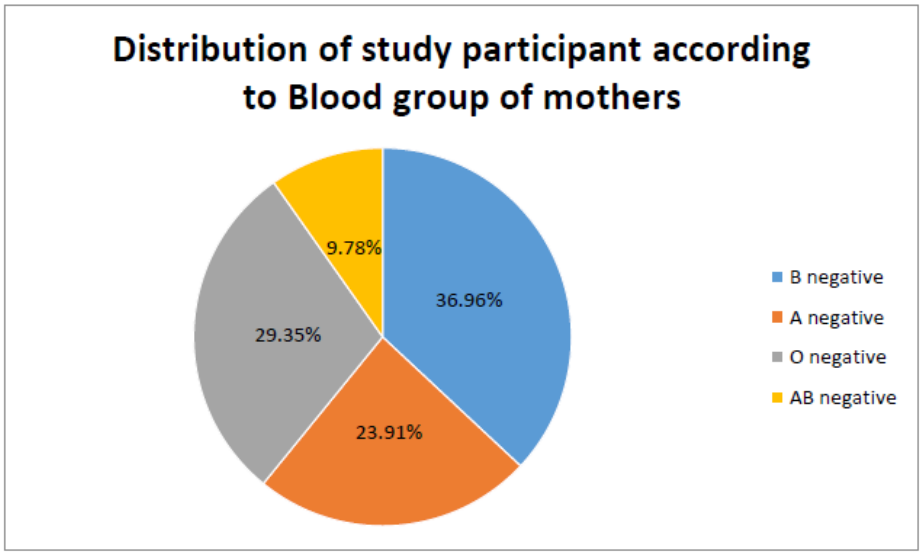


Table 12: Distribution of study participant according to Father's blood group

Husband's Blood Group	No. of Patients	Percent (%)
Not known	18	9.78%
A positive	25	13.59%
B positive	73	39.67%
O positive	54	29.35%
AB positive	14	7.61%
Total	**184**	**100.00%**

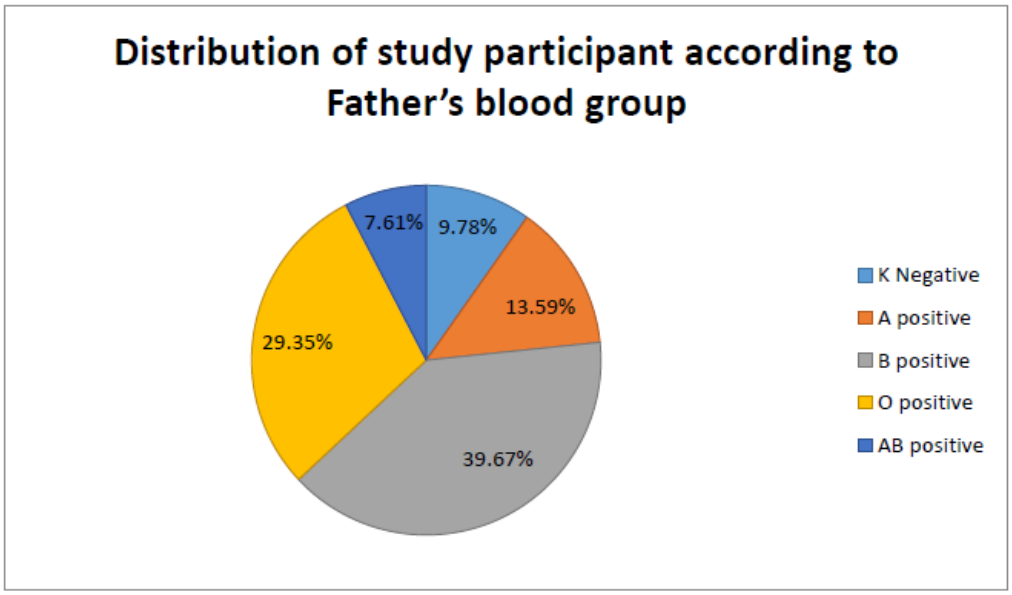


Table 13: Distribution of study participant according to baby's blood group

Baby's Blood Group	No. of Patients	Percent (%)
A+	31	16.85%
B+	74	40.22%
O+	39	21.20%

AB+	17	9.24%
A-	8	4.35%
B-	9	4.89%
O-	4	2.17%
AB-	2	1.09%
Total	184	100.00%

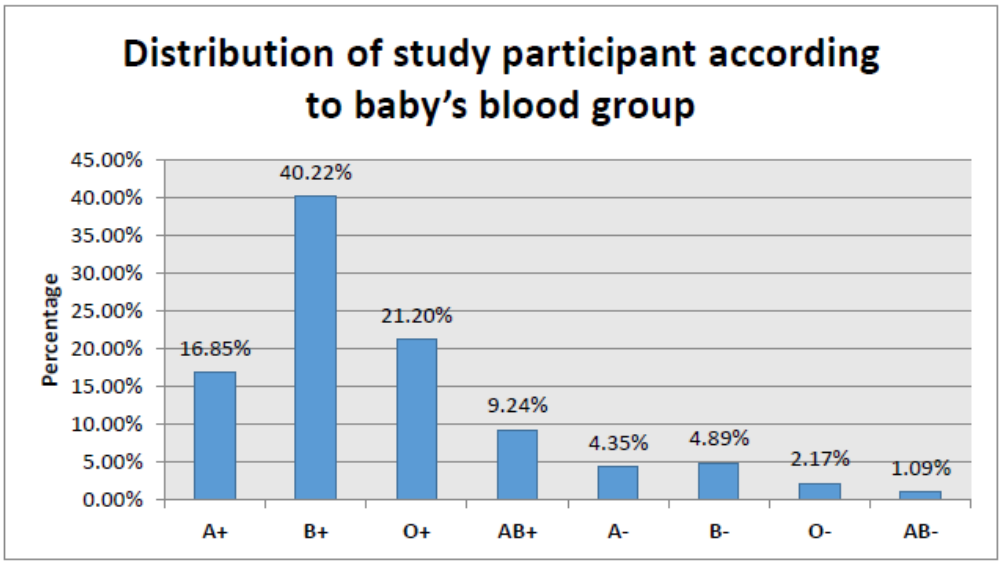


Table 14: Distribution of study participant according to Prophylactic Antenatal anti-D

Prophylactic Antenatal anti-D	No. of Patients	Percent (%)
Anti-D Taken	125	67.93%
Not Taken	59	32.07%
Total	184	100.00%

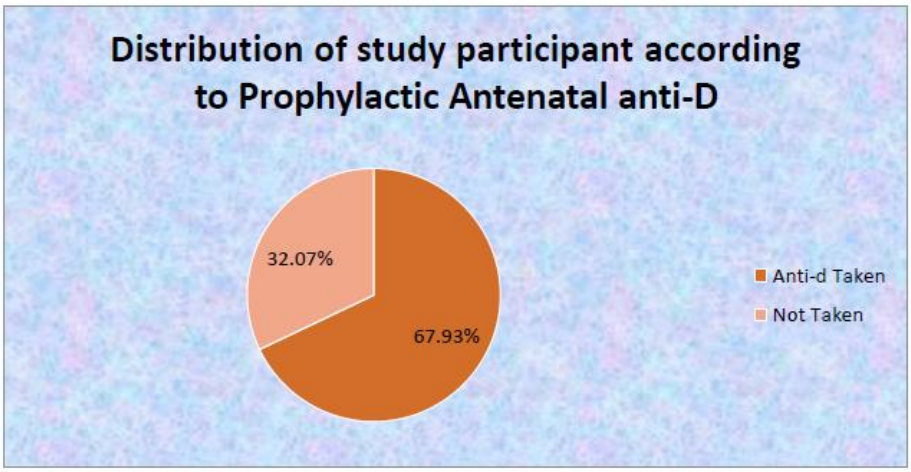


Table 15: Distribution of study participant according to H/O anti-D after previous delivery

H/O anti-D after previous delivery	No. of Patients	Percent (%)
Taken	116	92.1%
Not taken	10	7.9%
Total	126	100%

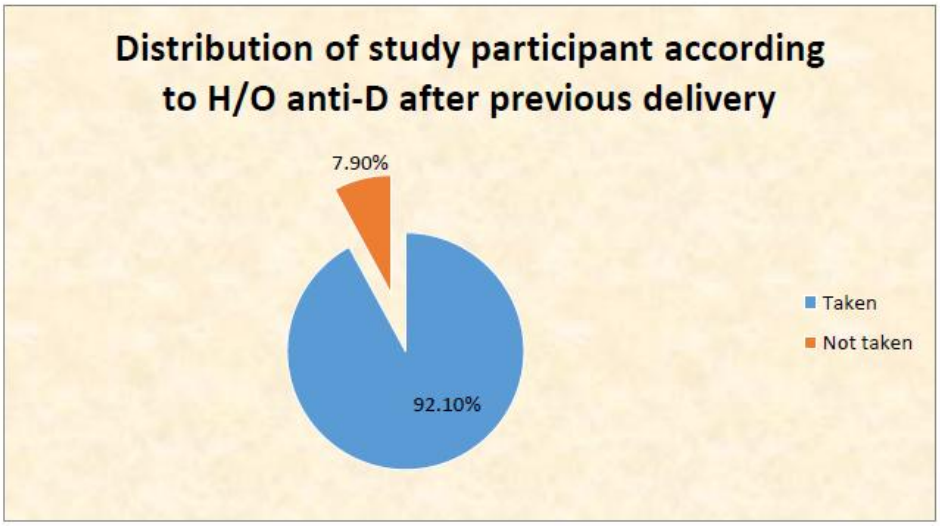


Table 16: Distribution of study participant according to H/O anti-D after abortion

H/o Anti-D after abortion	No. of Patients	Percent (%)
Taken	14	56.00%
Not taken	11	44.00%
Total	25	100.00%

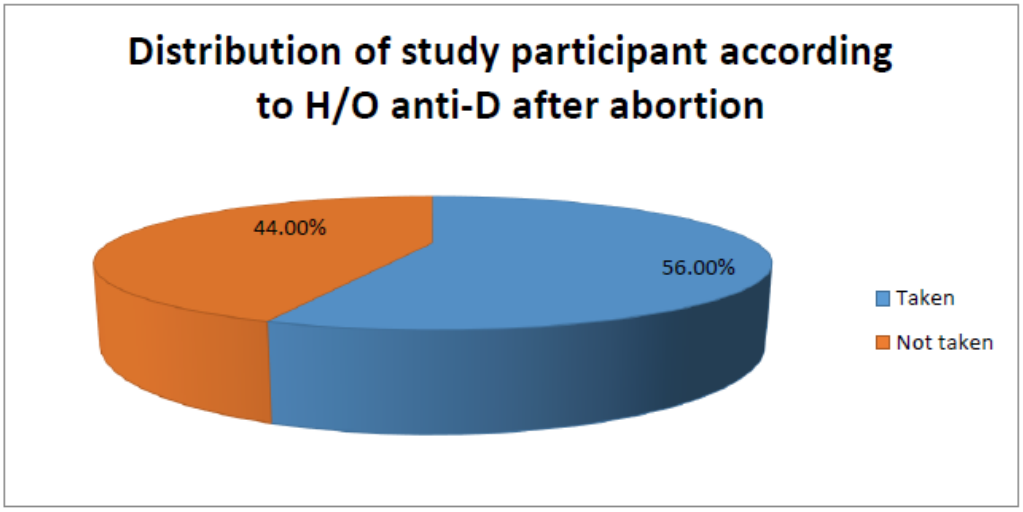


Table 17: Distribution of study participant according to Rh antibody titre

Rh Anti Body Titre	No. of Patients	Percent (%)
Negative	171	92.93%
Positive	13	7.06%
Total	184	100.00%

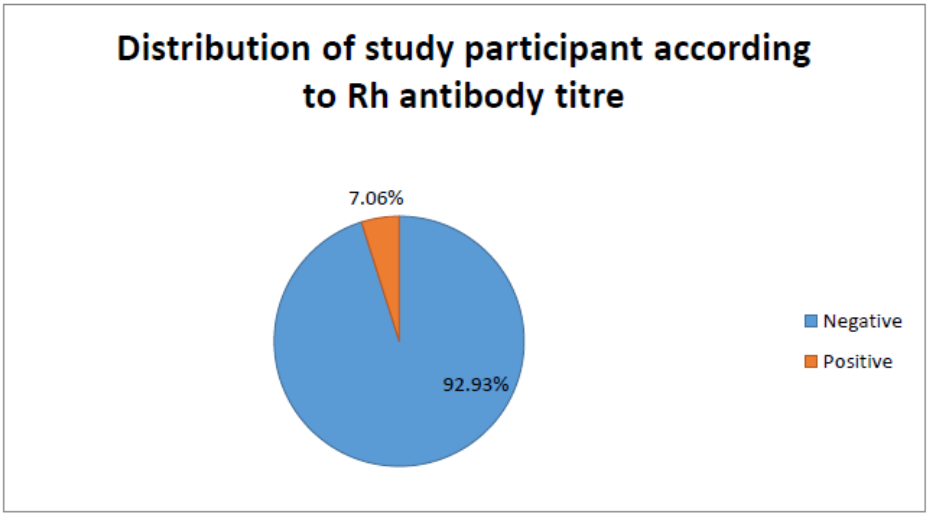


Table 18: Distribution of study participant according to mode of delivery

Mode of Delivery	No. of Patients	Percent (%)
Vaginal	110	59.78%
LSCS	74	40.22%
Total	184	100.00%

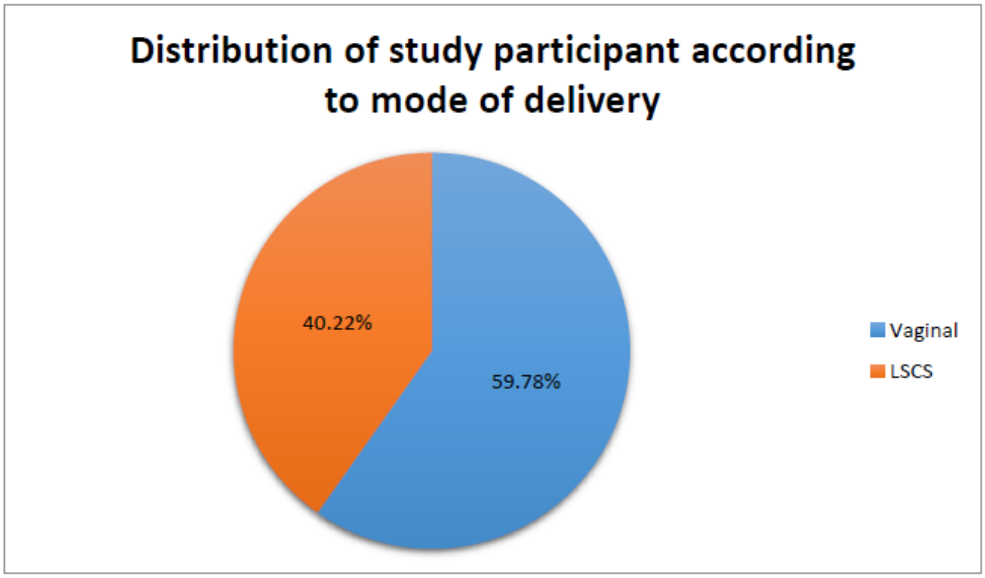


Table 19: Distribution of study participant according to neonatal outcome

Neonatal Outcome	No. of Patients	Percent (%)
Healthy	143	77.72%
NICU Admission	34	18.48%
IUD	6	3.26%
Hydrops Foetalis	1	0.54%
Total	184	100.00%

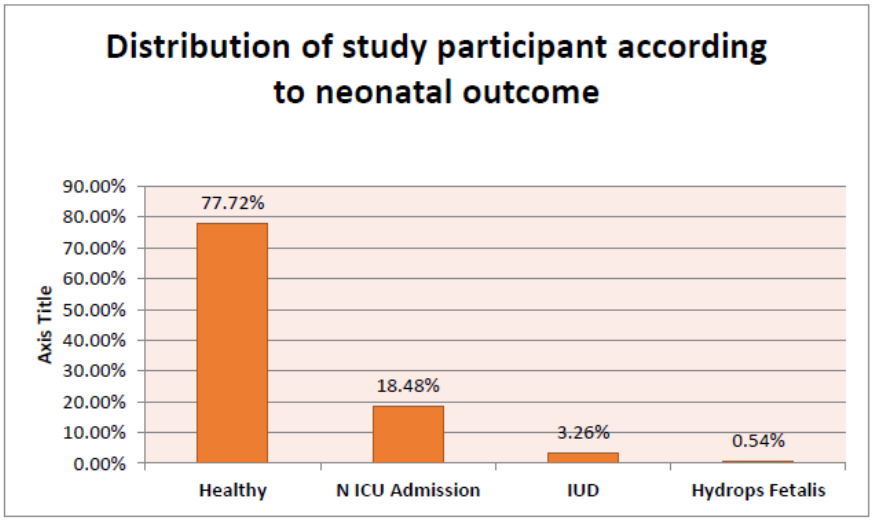


Table 20: Distribution of study participant according to neonatal morbidity and mortality

	No. of Patients	Percent of 184 (%)
Hyperbilirubinemia	24	13.04%
Foetal anaemia	6	3.26%
Respiratory Distress	8	4.35%
LBW	6	3.26%
Expired	3	1.63%
Total	47	25.54%

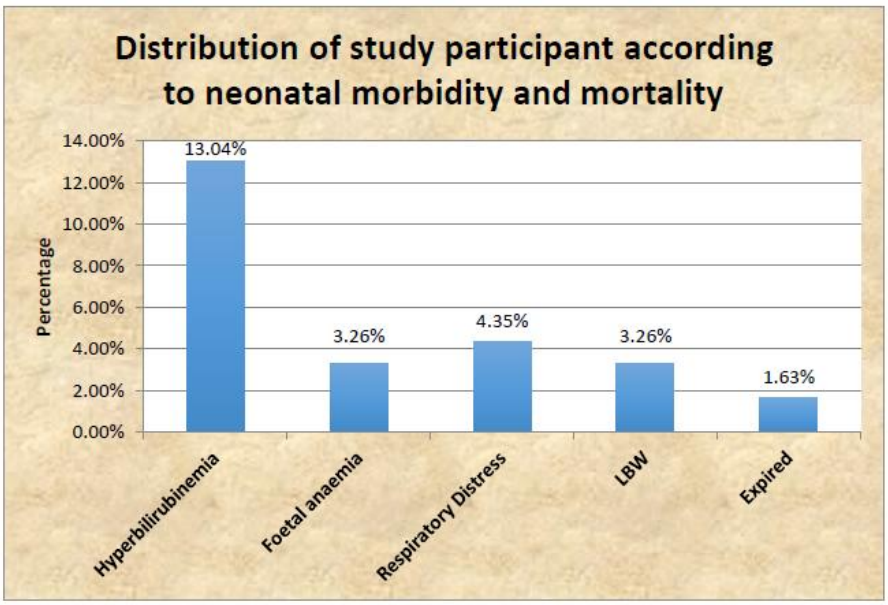
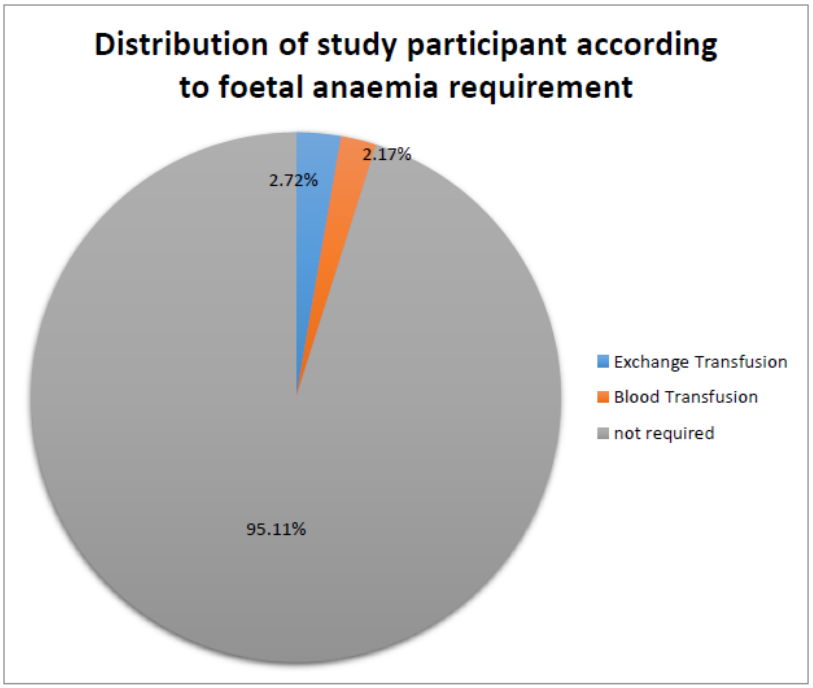


Table 21: Distribution of study participant according to foetal anaemia requirement

Foetal Anaemia Requirement	No. of Patients	Percent of 184 (%)
Exchange Transfusion	5	2.72%
Blood Transfusion	4	2.17%
Total	9	4.89%



IV. Discussion

One of the major, preventable causes of perinatal mortality and morbidity is Rhesus antigen negative pregnancy. It accounts for 97% of haemolytic disease of the new-borns. While the prevention of Rh alloimmunization is the responsibility of all health care workers, the management of allo-immunized pregnancies requires specialized care. The present study is done to study prevalence and feto-maternal outcome in Rhesus antigen negative pregnancy at a Tertiary Care Centre in Western Rajasthan.

According to **table no 1**, it was found that among 2000 random antenatal patients, there were 184 Rh-negative patients. According to this finding, prevalence of Rh-negative pregnancies at our centre is 9.2%. This prevalence is different from other studies that were conducted previously. According to **Shoujanya Pinapothu et al** (29) prevalence of Rh-negative pregnancy was 4.6% in 2018-2019 and 1.8% in 2008-2009. This study is near similar to **Nagamuthu et al** (37) in which prevalence of Rh-negative was 4.29%, according to **Okeke TC et a**l (32) prevalence was 4.5%, according to **Gorle Rama Devi, et al** (38) prevalence of Rh-negative was 4.26% and according to **Jamila Khatun and Ruly Begum, et al** (30) prevalence of Rh-negative pregnancy was 2.83%. According to **Singh A et al** (39) and **Mondal B et al (42)** prevalence of Rh-negative pregnancy was 1.43% and 2.3% respectively. according to these studies it is found that prevalence of Rh-negative pregnancies has been increased in recent decades because proper antenatal check-ups and blood grouping have been increased.

Table no 2 shows age wise distribution of study participants. In present study it was observed that among 184 patients, most (54.8%) patient belonged to age group of 21-25 years, followed by age group 26-30 (25%). Only 17 (9.24%) patients were aged 18-20 years, while only 20 (10.87%) were aged >30 years. Mean age of all patients was 25.06 ± 4.01 years ranging from 18 – 38 years. In a Similar **Shradha et al** (27) reported 44% of patients to be in age group of 20-25 years, while 38% in age group 26- 30 years. Supporting this finding**, Sippy Agarwal et al** (2) also observed that among 125 patients 42.4% patients belonged to 23-26 years, 34.4% patients were belonged to age group 18-22 years, 18.4% patients were belonged to age group 27-30 years and 7.2% patients were belonged to more than 30 years of age. **Shoujanya et al (29)** observed that, 41.5% patients were of age group 23-26 years, 33.5% patients belonged to age group 27-30 years, 20.4% patients were of age group 18-22 years and 4.6% patients were after 30 years of age. In yet another similar study**, Jamila Khatun et al (30)** found that most of the patients were belonged to age group 21-30 years of age group (62), 22% were below 20 years and 16% were between 31-36 years of age. **Eleje et al (35)** found that mean age of Rh-negative patients were 30.4±5 years (22-40 years). **Dr Uma Jain et al (36)** found that the most common age group was 21-25 years (62.5%). Similarly, **Raghad Mubarak Aljuhaysh et al (41)** observed that 47.8% of participants were aged between 20-24 years old, 27.4% were aged 25-30 and 15.7% were aged between 31-40 years old. Findings of these studies indicates that Rh iso immunization is mostly presented in younger females.

Table no 3 shows distribution of study participants according to their immunization status. In our study, we find that among 184 Rh-negative patients, 97.28% patients were fully immunized, 1.63% were

partially immunized, had taken one dose tetanus toxoid and only 1.09% Rh-negative patients were un immunized. This study shows that maximum patients are immunized, this is due to improved antenatal services at primary health care centres, subcentres and remote areas.

Table no 4 shows distribution of study participants according to their booking status at our centre. Among the 184 patients, 112 (60.87%) were booked pregnancy, while 72 (39.13%) were un-booked. Supporting this finding**, Eleje et al (35)** also found that 70.8% (63) patients were booked. This indicates improving maternal and child health care in the study area and country as a whole. Contrary to this finding**, Dr Uma Jain et al (36)** found that most of them were unbooked (65.90%). Unbooked patients were in **Alakananda et al** (34), **Aljuhaysh RM et al** (41) and **Joseph et al** (1) were 60%, 55% and 74% respectively. This difference could be because of this study being conducted in a relatively health backward area of western India and also calls for improved antenatal care in many parts.

Table no 5 shows distribution of study participants according to their residential status. In the present study, among 184 Rh-negative patients, 154 (83.7%) females came from rural area while 30 (16.3%) came from urban area. **Dr Uma Jain et al (36)** found that most of the females were from Rural area (72.72%). **Eleje et al (35)** found that 62.7% were from lower social class. Our study is conducted at tertiary care centre of western Rajasthan where most of patients come from rural areas.

Table no 6 shows distribution of Rh-negative patients according to their literacy status. Out of the 184 study participants 98 (53.26%) patients were literate while remaining 86 (46.73%) were illiterate. **Eleje et al (35)** found that among 89 Rh-negative patients, 52.8% had secondary level of education. These findings point toward need for further improvement in literacy status of females, as it has been known to impact heath seeking behaviours, apart from other general benefits. **Raghad Mubarak Aljuhaysh et al (41)** observed that about two thirds of the studied population was highly educated, 19.5% reached secondary school while 5.8% were illiterate, this higher incidence of literacy could be due to different study population.

Table no 7 shows distribution of study participants according to their gestational age. Among the 184 Rh-negative patients most of the participants delivered in gestational age group of 37-40 weeks (59.78%). Among preterm births, 27 (14.67%) delivered in 33-36 weeks gestation, while 11 (5.98%) delivered before 32 weeks gestation. Nearly one fifth (19.57%) females delivered beyond 40 weeks gestation. In a similar study, **Tripathi R et al (28)** found that out of 55 Rh-negative females, only 8% patients had preterm delivery, 92% babies delivered at term, 8% were premature babies and only 2% were post term delivered babies. **HaripriyaChintada et al (33)** observed that 86% patients delivered between 37-40 weeks, 4.9% patients delivered before 37 weeks and 9.05% delivered after 40 weeks. This variation in incidence of preterm delivery could be due to different study area among these studies. **Shoujanya et al (29)** observed that in 2008-2009, 56.8% patients delivered between 35-37 weeks, 26.1% patients delivered after 40 weeks, 14.7% patients delivered between 31-34 weeks and 2.2% Rh-negative mothers delivered between 31-34 weeks. While in 2018-2019, 63% Rh-negative mothers delivered at term between 38-40 weeks, 17.7% delivered between 35-37 weeks, 15.7% patients delivered after 40 weeks, 2.8% mothers delivered between 31-34 weeks and 0.8% patients delivered before 30 weeks. These findings indicate improvement in care of Rh-negative pregnancy, thereby decreasing incidence of preterm births over the decade.

Table no 8 shows distribution of study participants according to their gravidity. Present study findings revealed that out of 184 patients, 67 (36.41%) were primigravida and 67 (36.41%) females were 2nd gravida, 27 (14.67%) patients were 3rd gravid, while 15 (8.15%) females were 4th gravida. Only 8 (4.35%) patients were multi-gravida. Supporting this finding**, Shradha et al** (27) found that 42% patients were primigravida, 24% were second gravida, 14.7% were third gravida, 9.3% were forth gravida and 4.1% were gravida four onwards. In another similar study, **Sippy Agarwal et al** (2) observed that 38.4% were primigravida, 33.6% were second gravida, 20% were third gravida and 8% were multigravida. **Shoujanya et al (29)** also observed that, 50.3% patients were primigravida, 38.3% were second gravida, 7.8% patients were third gravida and 3.6% Rh-negative patients were multigravida. In yet another similar study, **Haripriya Chintada et al (33)** observed that out of 243 Rh-negative mothers, 136 patients were primigravida and 107 were multigravida. **Dr. Alakananda and colleagues (34)** also reported that 40% patients were primigravida, 35% were second gravida and 25% Rh-negative patients were multigravida. **Dr Uma Jain et al (36)** also reported that most of the patient were Primigravida (42.4%). This finding is in concordance with the age of females and risk of Rh iso-immunization in 2nd pregnancy.

Table no 9 shows distribution of study participants according to feto-maternal haemorrhages in utero. It was found that among 184 patients, most of chances of blood mixing occur in early pregnancy due to threatened abortion (9.23%). In 6.52% patients, blood mixing occurs due to blood transfusion in pregnancy and in 0.50% patients, blood mixing occurs due to antepartum haemorrhage (abruptio placentae).

Table no 10 shows distribution of study participants according to associated medical and obstetric conditions. Most observed associated condition among 184 patients in present study was HDOP amounting 20 patients (10.86%), followed by anaemia (8.15%). Oligohydramnios (6.52%) and polyhydramnios (2.17%),

Hypothyroidism (2.71%) and GDM (1.08%) were other associated conditions. **Tripathi R et al (28)** found that out of 55 Rh-negative mothers, 8 mothers had preeclampsia/PIH, 3 mothers had abruptio placentae, 2 had oligohydramnios and one mother had polyhydramnios. This prevalence of various associated condition is almost as expected for normal pregnancies. **Jamila Khatun et al (30)** found that occurrence of complications associated with current pregnancy is different in primigravida and multigravida. Anaemia was found in 56% multigravida patients and in 26% primigravida. Oedema was found in 34% multigravida and in 22% primigravida. Antepartum haemorrhage only associated with multigravida that was only 2%. Hydramnios with congenital anomalies were found in 2% primigravida and 2% multigravida. IUD was seen in 4% multigravida and 2% primigravida. According to this study, it was concluded that associated conditions were more in multigravida than primigravida.

Table no 11 shows distribution of study participants according to mother's blood group. In our study most of Rh-negative mothers having blood group B negative. Out of 184 patients 68 (36.96%) were B negative blood group, 54 (29.35%) were O negative, 44 (23.91%) were A negative blood group and 18 (9.78%) were AB negative blood group. **Shradha et al** (27) found that 36% mothers were O negative, 30% were B negative, 28% were A negative and only 4% were AB negative. Similar to present study findings **Sippy Agarwal et al** (2) observed that most of patients were of B negative blood group. Among 125 patients 48% were B negative, 29.6% were O negative, 15.2% were A negative and 7.2% were A negative. **Shoujanya et al (29)** observed that in 2018-2019, 43% patients were O negative, 27.6% were B negative, 23.6% were A negative and 5.5% patients were AB negative. In 2008-2009, 46.5% patients were O negative, 31.8% were B negative, 18.4% patients were A negative and 3.6% AB negative. **Jamila Khatun et al (30)** observed that 36% patients were B negative, 30% were A negative, 24% were O negative and 10% were AB negative. **Emem Abasi Bassey et al (31)** found that majority of Rh-negative patients were O negative that were 60.78%, 22.68% were A negative, 14.4% were B negative and 1.7% were AB negative. **Okeke TC et al (32)** found that among Rh-negative, O negative was highest that was 64.5%. 20.2% were A negative, 12.1% were B negative and 3.2% were AB negative. **Dr Uma Jain et al (36)** found that the most common blood group Rh-negative was O-negative (53.40%). **Raghad Mubarak Aljuhaysh et al (41)** observed that blood group A was found in 39% of mothers (30% were Rh-positive and 9% were negative), 33.8% had blood group O (27.7% positive and 6.1% Rh-negative), 16.6% had blood group B (12.8% Rh-positive and 3.8% Rh-negative) and only 10.5% had blood group AB (6.4% Rh-positive and 4.1% Rh-negative). **Emem Abasi Bassey et al (31)** found that majority of pregnant women with Rhesus D-negative were of blood group O; 382 (60.78%), followed by group A; 142 (22.58%), and blood group B was 94 (14.49%). **Kanko et al** (42) found maximum patients having O negative (38.1%) blood group and A negative were 28.5%. Slight variation in blood group can be expected for varying populations, however most studies reported B negative and O negative to be the most common blood groups.

Table no 12 shows distribution of study participants according to husband's blood group. While taking into account the husband blood group, most of the patient's husband had B positive blood group (39.67%), followed by O positive (29.35%), A positive (13.59%) and AB positive (7.61%). In 18 (9.78%) patients, husband's blood group were not known. **Shradha et al** (27) however found that 39.3% husband's blood group was not known (these all were un booked patients). Husband's blood group of 18.6% were A positive, 18.6% were O positive, 16.6% were B positive and only 6.6% were AB negative. **Raghad Mubarak Aljuhaysh et al (41)** observed that regarding father's blood groups; 36.7% had blood group A, 28.9% were blood group O, 19.2% blood group B and 15.2% with blood group AB. These variations in husband blood group are expected with diversified population in these studies. **Jamila Khatun et al (30)** observed that 90% patients had positive husband's blood group. 32% were B positive, 30% were O positive, 24% were A positive and 12% patients were AB positive.

Table no 13 shows distribution of study participants according to their baby's blood group. Most common blood group among delivered babies was B positive blood group (40.22%), followed by O positive (21.20%), A positive blood group (16.85%), AB positive blood group (9.24%). Other less common blood group among delivered babies were B negative blood group (4.89%), A negative blood group (4.35%), O negative (2.17%) and AB negative (1.09%). **Haripriya Chintada et al (33)** found that out of 243 neonates, 29.3% were Rh-negative, 43.2% were O positive, 15.2% were B positive, 8.6% were A positive and 3.7% AB positive. **Shradha et al (27)** observed that 26% babies were of A positive, 26% were B positive, 24% were O positive, 8% were AB positive and 16% were of Rh-negative blood group. These negative blood group babies were free from complications. **Jamila Khatun et al (30)** observed that maximum babies delivered to Rh-negative patients were B positive (30.62%). 24.49% were O positive, 20.40% were A positive, 6.12% were AB positive and 18.36% babies delivered to Rh-negative patients having negative blood group.

Table no 14 shows distribution of study participants according to their history of prophylactic antenatal anti-D. Prophylactic Antenatal Anti-D was taken by 125 patients (67.93%) among 184 study participants, while 59 patients (32.07%) had not received the prophylactic antenatal anti-D. Contrarily **Shradha et al** (27) found that only 34% mothers had received Inj.Anti-D in previous pregnancies and 54% did not receive

anti-D. Also **HaripriyaChintada et al (33)** observed that out of 243 patients, only 51 patients had taken antenatal anti-D. **Dr. Alakananda and colleagues (34)** found that 65% patients had not taken antenatal anti-D due to unawareness, 30% patients had received anti-D and 5% Rh-negative patients were iso-immunized and had not taken antenatal anti-D. **Raghad Mubarak Aljuhayash et al(41)** observed that 22.2% Rh-negative patients had not taken antenatal anti-D and 23.3% Rh-negative patients had received prophylactic antenatal anti-D. This higher rate of anti-D in our study could be due to increasing awareness among these females as well as improved antenatal screening among pregnant females.

Table no 15 shows distribution of study participants according to their history of receiving anti-D after previous pregnancy in multigravida. Out of 126 females with gravida 2 or more, 116 (92.1%) females had history of taking anti-D after previous delivery. Only 10 patients (7.9%) did not take anti-D after previous delivery. **Raghad Mubarak Aljuhayash et al (41)** observed that 20.5% Rh-negative patients had not received anti-D after previous delivery or abortion and 24.6% patients had received anti-D after previous delivery or abortion. In **Shradha et al (27)** 34% patients had received anti-D after previous delivery and 54% patients did not receive anti-D after previous delivery due to cost factor, lack of awareness and home delivery.

Table no 15 shows distribution of study participants according to history of anti-D after previous abortion. Among the 25 study participants with history of abortion, 14 (56%) gave history of anti-D after previous abortion, while 11 (44%) patients did not give any history of anti-D after previous abortion. This decline in receiving anti-D after abortion occurs due to spontaneous abortion occurs at home in many patients, so these patients did not visit to hospital and did not receive anti-D after abortion. **Raghad Mubarak Aljuhayash et al (41)** observed that 20.5% Rh-negative patients had not received anti-D after previous delivery or abortion and 24.6% patients had received anti-D after previous delivery or abortion.

Table no 17 shows distribution of study participants according to their Rh antibody titer. Among the 184 patients, Rh antibody titre was negative in 171 (92.93%) patients and was positive in only 13 (7.06%) patients. **Okeke TC et al (32)** found that among 282 Rh-negative women, only 2 (0.7%) had antibody titre positive and 99.3% had negative titre. But 12 (4.3%) Rh-negative patients developed antibody titre during the course of pregnancy. **Emem Abasi Bassey et al (31)** found that out of the 629 Rhesus negative women, 7 (1.11%) had positive Rh D antibodies at the time of the booking visit while 622 (98.9%) were negative for antibodies. **Devi G R et al (38)** found 4% ICT positive patients and in **Agrawal et al (2)** observed that only 5% Rh-negative patients had antibody present in their blood. This indicates that Rh antibody titre may not be useful for determining course of prophylactic interventions among these females.

Table no 18 shows distribution of study participants according to their mode of delivery. Out of 184 females, most (59.78%) were delivered through NVD while LSCS was done in 74 (40.22%) patients. **Shradha et al** (27) found that 37.3% mothers were delivered by normal vaginal delivery, 31.3% were by emergency c-section, 16.7% by elective c-section and 2% by instrumental delivery. **Sippy Agarwal et al** (2) similarly observed that among 125 patients 52.5% patients were delivered by normal vaginal delivery and 42.7% by c-section. **Tripathi R et al (24)** found that 66% mothers delivered by normal vaginal delivery, 22% by caesarean delivery and only 4% delivered by forceps delivery. **Jamila Khatun et al (30)** observed that 2% patients had spontaneous abortions, 32% had vaginal deliveries and 58% went through caesarean section. **Eleje et al (35)** found that among 89 Rh-negative patients, 26 patients delivered by caesarean section. **Dr Uma Jain et al (36)** found that most of the patients delivered normally, only (28.40%) patients delivered by LSCS. These findings indicate that incidence of LSCS is slightly higher in these cases as compared to overall pregnancies. **Shoujanya et al (29)** observed that in 2008-09, 59.1% patients delivered by vaginal route, 31.8% by caesarean section and 9.1% by instrumental delivery. While in 2018-2019, 48.4% patients delivered by normal vaginal delivery, 44.1% Rh-negative patients delivered by caesarean section and 7.6% delivered by instrumental delivery. A new study conducted by **Sreelatha et al (43),** found that 56.4% patients delivered by normal vaginal delivery and 43.5% by caesarean section. This indicates that over time caesarean section has gained importance even in Rh-negative pregnancies than normal vaginal delivery.

Table no 19 shows distribution of study participants according to their neonatal outcome. Out of the 184 subjects, most (77.72%) had healthy new-born delivered. NICU admission of baby was needed in 34 (18.48%) patients. Intra uterine death occurred in 6 (3.26%) cases, while hydrops foetalis was observed in 1 (0.54%) patient. **Shradha et al** (27) found that 94% were live births, 2.7% had intrauterine deaths, 3.3% had early neonatal deaths and 4 babies required exchange transfusions. **Sippy Agarwal et al** (2) similarly observed that 89.6% patients delivered heathy baby, 3.2% patients delivered IUD, 4.8% babies went to NICU and 2.4% babies had neonatal death. **Shoujanya et al (29)** observed that in 2018-19, 92.9% babies were heathy at the time of delivery, 5.1% had NICU admissions for anaemia and hyperbilirubinemia, 1.3% were IUD and 0.64% had perinatal mortality. In 2008-09, 86.6% babies were healthy, 7.8% had NICU admissions, 3.3% were IUD and 2.24% had perinatal mortality. **Jamila Khatun et al (30)** observed that 76% babies were heathy at the time of delivery, 10% babies had jaundice and 4% had neonatal death. **Dr Uma Jain et al (36)** found that 96.59% of Neonates were live born. 2.27% were fresh still born and 1.13% were macerated still born.

Table no 20 shows distribution of study participants according to neonatal morbidity. Most common neonatal morbidity was found to be neonatal jaundice (13.04%) among new-born of study participants. Other less common neonatal morbidity was respiratory distress (4.35%), foetal anaemia (3.26%), Low Birth Weight (3.26%). Neonatal death was observed in 3 (1.63%) cases. **Tripathi R et al (28)** found that 25% babies had neonatal anaemia and 12.72% babies had neonatal hyperbilirubinemia. **Haripriya Chintada et al (33)** found that among 172 neonates, 170 babies had no anaemia and only 2 had mild anaemia. Among 172 neonates, 143 developed neonatal jaundice. **Dr. Alakananda and colleagues (34)** observed that 55% neonates developed jaundice, 40% had NICU admissions, 3% neonates developed anaemia and 2% had hydrops foetalis. **Eleje et al (35)** observed that about neonatal outcome, 21.3% neonates developed jaundice and 15.7% had perinatal death. **Dr Uma Jain et al (36)** found that the most common cause of admission was neonatal jaundice (66.66%). Finding of all these studies support expected hyperbilirubinemia and anaemia due to haemolysis caused by Rh incompatibility.

Table no 21 shows distribution of neonates having anaemia according to their requirements of blood transfusion or exchange transfusion. Exchange transfusion was required in 5 (2.72%) patients out of 184 patients while 4 (2.17%) neonates needed blood transfusion. **Shradha et al** (27) found that 4 babies required exchange transfusions. These interventions have proved beneficial in many new-borns. **Jamila Khatun et al (30)** observed that 2 patients who had antibody titre positive (1:8), whose babies required exchange transfusion once, 2 neonates whose mother's antibody titre was 1:16, required exchange transfusion twice, one neonate whose mother's antibody titre was 1:32, required exchange transfusion twice and 2 neonates whose mother's Rh antibody titre was 1:64, required exchange transfusion 3 times and died neonatally.

V. Conclusion

Rhesus alloimmunization is a preventable direct cause for perinatal morbidity and mortality. feto maternal outcome was relatively worse in Rh-negative pregnancies, with higher occurrence of Cesarean section, NICU admission, and perinatal mortality. Small number of multigravida females were still not received anti-D, which points towards requirement of improved health education to increase the awareness of the public about this important issue. Peripheral health workers, who are 1st point of ANC care for most pregnancies also need to educated Rhesus negative women on the need for antenatal and postpartum immuno-prophylaxis. Availability of better facilities and relatively better final outcome indicates toward sensitizing women for management of pregnancies at tertiary health facilities.

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