



ISSN NO. 2320-5407

Journal Homepage: - www.journalijar.com

INTERNATIONAL JOURNAL OF ADVANCED RESEARCH (IJAR)

Article DOI:10.21474/IJAR01/16558
DOI URL: <http://dx.doi.org/10.21474/IJAR01/16558>



RESEARCH ARTICLE

IMPACT OF DONOR MILK ON CLINICAL PARAMETERS STUDIED AMONG VERY LOW BIRTH WEIGHT INFANTS OF AN NICU OF A TERTIARY TEACHING HOSPITAL

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Manuscript Info

Manuscript History

Received: 30 January 2023

Final Accepted: 28 February 2023

Published: March 2023

Abstract

Background: Low birth weight infants account for 27% of total live births in India. India has a large burden of Very Low Birth Weight (VLBW) infants, i.e. those who are <1500 g, account for about 5% of all live births(1) and their nutritional rehabilitation is major concern. But every infant is unable to benefit from mother's own milk because of maternal illness, death or lactation failure. This is when pasteurised donor human milk (PDHM) helps these VLBW infants who are unable to get their own mother's milk. Hence, understanding the impact of donor milk on various clinical parameters affecting a VLBW infant is important.

Aim: To study the impact of donor milk on clinical parameters studied among VLBW infants of an NICU of a tertiary teaching hospital.

Methods: Ours is a retrospective observational study over a period of 10 months in an NICU of a tertiary teaching hospital. 119 infants were enrolled. The data was collected from case records of these infants. Appropriate test of significance was applied to get the results.

Results: In our study, the average length of NICU stay was 5.1 days lesser and overall weight centiles on discharge for donor milk given babies was higher than those who were not given donor milk. There was no significant association of donor's milk with respiratory distress syndrome ($p=0.08$), duration of mechanical ventilation for >96 hours ($p=0.58$), bronchopulmonary dysplasia($p=0.55$), intra ventricular hemorrhage ($p=0.50$) and sepsis ($p=0.68$).

Conclusion: By seeing the beneficial effects of donor milk on weight and overall hospitalization duration, promoting milk donation in postnatal wards and establishment of community human milk banks we can improve quality of health care and nutrition to VLBW infants and thus decrease infant mortality rate.

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Introduction:-

With the advent of better neonatal care and feeding practices, survival of low birth weight and sick neonates have increased. One of the major advances have been the establishment of human milk bank in health centers across the world, supplementing human milk which is the best form of nutrition for baby in the form of pasteurised donor human

milk (PDHM) taken from healthy postpartum mothers who have enough for their own child needs and for donation. The WHO and United Nations International Children's Emergency Fund (UNICEF) has recommended the use of PDHM as the first alternative when mother's milk is not available, particularly for preterm and LBW infants (2). A myriad studies demonstrate the positive effects of donor human milk on vulnerable infants as compared with formula milk, such as reduced risk of sepsis and necrotizing enterocolitis, greater feeding tolerance, reduced length of NICU stay, and substantial cost saving for resource-strapped public health systems (3),(4),(5).

Aim:-

We aim to study the impact of donor milk on clinical parameters related to Very Low BirthWeight (VLBW) infants of an NICU of a tertiary teaching hospital

Objectives:-

1. To assess the impact of donor milk and formula milk on clinical parameters related to Very Low Birth Weight infants of an NICU of a tertiary teaching hospital.
2. To assess the association between donor milk and formula milk on clinical outcomes related to Very Low Birth Weight infants of an NICU of a tertiary teaching hospital.

Materials And Methods:-**Study design-**

This was a hospital based retrospective observational study.

Study site-

Conducted in NICU of a tertiary teaching hospital from January to October 2022.

Sample size-

119 VLBW infants of NICU of a tertiary teaching hospital formed the study.

Inclusion criteria-

- 1.VLBW infants weighing 1000-1500g.
2. VLBW infants who were given human donor milk.
3. VLBW infants who were not given donor milk (formula milk given).

Exclusion criteria-

- 1.Infants<1000g and >1500g.
- 2.VLBW infants who were restricted for feeding (NPO).
- 3.Gastrointestinal congenital anomalies like omphalocele, tracheoesophageal fistula, gastroschisis, congenital diaphragmatic hernia.

Data Source-

Case records of 119 VLBW infants were used. Children who were given donor human milk were studied as one group and those who were given formula feed were studied as another group. For both groups, mother's own milk could not be adequately available for various reasons. Donor milk source was human milk bank attached to the NICU. Data regarding the demographic profile of mothers and VLBW infants was collected and analysed. Neonatal parameters, namely intraventricular hemorrhage (IVH), sepsis, respiratory distress syndrome (RDS), assisted ventilation, bronchopulmonary dysplasia, mean hour of start of feed and time to reach full feeds of those who were given donor milk were compared with those who received formula milk and association was seen.

Statistical analysis-

Statistical analysis was done using python and excel software. T test for continuous variables and p value and chi square test for categorical variables were used. Comparison of the mean values was done using Wilcoxon Rank sum test (since the data is not normally distributed).

Results:-

Parameter	Donor milk given	Formula milk given
n	55	64
Mean gestational age at birth(weeks)	31.3 ± 0.8	30.9 ± 0.6
Mean gestational age at discharge(weeks)	35.0 ± 0.4	35.4 ± 0.5
Mean weight on admission(grams)	1218.7 ± 54.6	1219.2 ± 45.9
Mean weight on discharge(grams)	1457.0 ± 37.4	1467.5 ± 39.8
Mean weight on admission centile	21.0 ± 9.1	26.1 ± 6.6
Mean weight on discharge centile	3.3 ± 3.7	2.5 ± 1.2
Duration of tolerating full enteral feeds	15.9 ± 3.0	15.2 ± 2.3

Gender wise distribution- 53% male, 47% females
 46% (n=55) were given donor milk and rest 54% (n=64) formula milk out of 119 total cases.

Effect Of Donor Milk On Weight

Weight Centile Difference at discharge

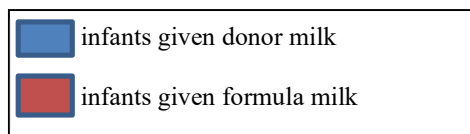
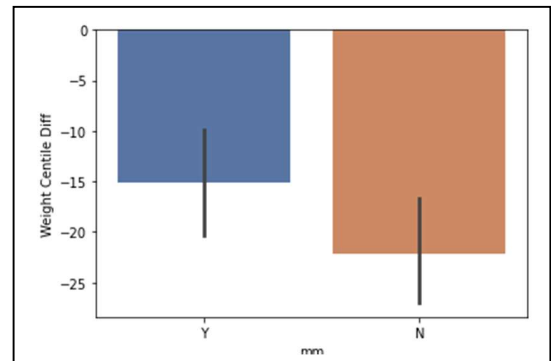
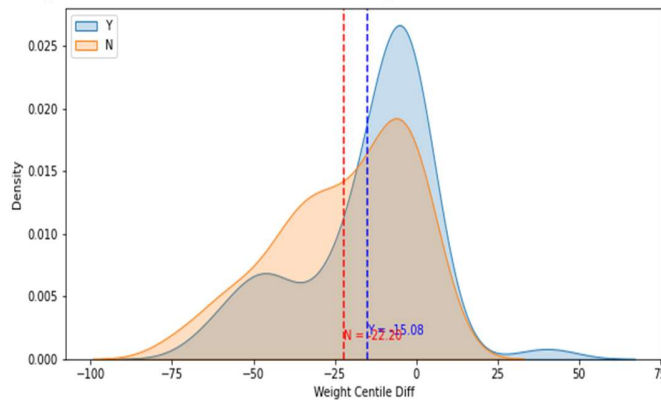
Y mean: -15.08 [donor milk given]

N mean: -22.20 [formula milk given]

Relative difference between Y and N = -32.08%

2 Sample t-test pvalue: 0.06

Weight centiles were higher in babies given donor milk by 32% than those who were given formula milk. Drop in weight centiles was lesser in infants given donor milk as shown in bar diagram.



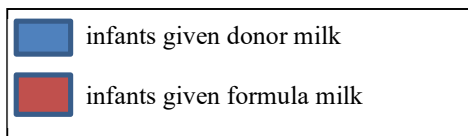
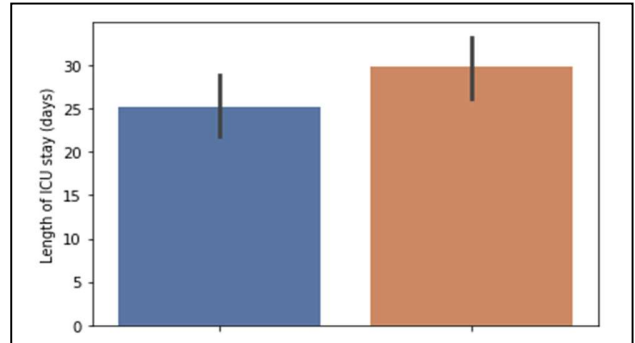
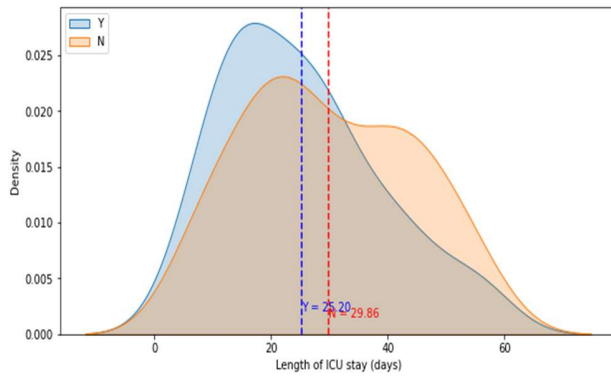
Length Of Nicu Stay (DAYS)

Y mean: 25.20 [donor milk given]

N mean: 29.86 [formula milk given]

Relative difference between Y and N = -15.60%

Length of NICU stay was 5.1 days lesser for infants given donor milk.

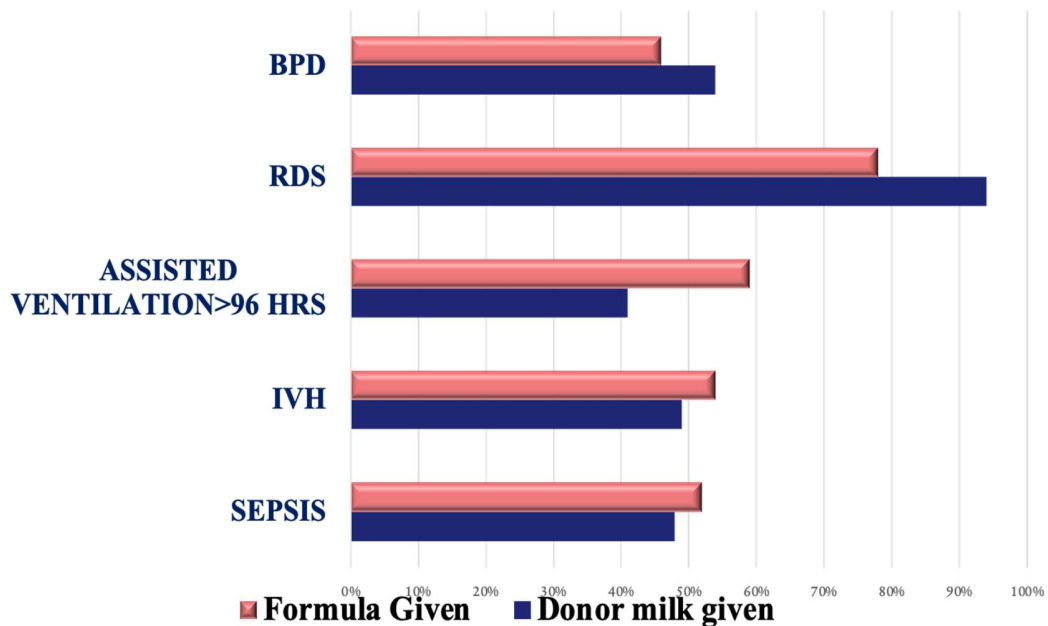


Although there was a significant decrease in duration of NICU stay, there was no significant association between hour of starting the feed and duration of tolerating full feeds with the feeding practices.

Other Parameters And Their Association With Donor Milk

OTHER CLINICAL PARAMETERS

STUDIED $p > 0.05$ (insignificant)



There was no significant association of donor's milk with sepsis($p=0.68$), RDS($p=0.08$), assisted mechanical ventilation for >96 hours($p=0.75$), bronchopulmonary dysplasia($p=0.55$), IVH($p=0.17$).

Discussion:-

Mother's milk is the best milk, a universally known fact. The following table lists the components of human breast milk and function of each of them which help in growth of a healthy infant (6):

Component	Function
1. Cells	
● Macrophages	Protects against infection by T cell activation
● Stem cells	Helps in repair and regeneration
2. Cytokines	
● IL 6	Activates B cell , proinflammatory
● IL 8	Recruits neutrophils , proinflammatory
● IL 10	Induces antibody production
● IFN γ	proinflammatory
● TGF β	anti-inflammatory
● TNF α	proinflammatory
3. Immunoglobulins	
● IgA	Protects against infection
● IgG	Antimicrobial, phagocytosis, anti-inflammatory
● IgM	Agglutination, activates complement system
4. Growth factors	
● Epidermal growth factor (EGF)	Helps in proliferation and maturation of cells
● Neuronal growth factor (NGF)	Helps in neuronal growth
● Vascular endothelial growth factor (VEGF)	Helps in angiogenesis and tissue repair
● Heparin binding growth factor (HB-GF)	Protects from hypoxia and ischemia
● Insulin like growth factor (IGF)	Stimulates growth and development
5. Antimicrobial	
● Lactoferrin	Antibacterial, acute phase reactant
● Lactadherin	Antiviral, induces phagocytosis of apoptotic cells
6. Hormones	
● Calcitonin	Stimulates intestinal growth
● Adiponectin	Regulates Infant weight and Body mass index , anti-inflammatory action
● Leptin, Ghrelin	Regulates energy conversion and appetite
7. Mucins and oligosaccharides	
● MUC 1 and 4	Antiviral, antibacterial
● Gangliosides	Development of the brain
● Glycosaminoglycans	Protects against infection

In our study, the average length of NICU stay was 25.2 days for infants given donor milk and 30.3 days for those who were given formula milk – duration of stay being 5.1 days (15.6%) lesser for babies given donor milk. These differences in health outcomes can be explained, in part, by specific and innate immune factors present in human milk as listed above which are absent in formula milk. Similar reduction in length of NICU stay was observed in a study conducted by Lingyu Fang, Meili Zhang et al, in China (7). Therefore, the use of donor milk might reduce hospitalization costs. The study conducted by Kalliopi Dritsakou et al also found that babies who were given human milk had shorter NICU stay and lesser hospitalisation costs (8). UNICEF has declared that healthcare providers as well as governments may be able to reduce the medical costs of insurance programmes by promoting human breast milk (9).

On discharge, weight centiles were higher in babies given donor milk by 32% than those who were given formula milk. This can be explained as human milk contains certain growth factors and hormones that are absent in formula milk which help in better weight gain. Moreover there are studies stating the metabolic problems that develop in future

in infants who are formula fed (10). Hence, by helping in adequate weight gain, human donor milk is a better alternative to mother's own milk. We also observed that there was overall drop in weight centiles on discharge. But this overall drop in weight centiles was lower in babies who were given donor milk in our study.

There was no significant association of donor's milk with sepsis ($p=0.68$), RDS ($p=0.08$), assisted mechanical ventilation for >96 hours ($p=0.75$), bronchopulmonary dysplasia ($p=0.55$), IVH ($p=0.17$). This can be explained by various other factors associated with a VLBW infant in an NICU like prematurity, baby handling and sterility of an NICU, medications used while management, antepartum maternal and fetal risk factors which lead to development of following complications irrespective of feeding practices. (11)(12)(13)

By decreasing NICU stay with a better weight gain, donor milk can help in decreasing morbidity and mortality in admitted VLBW infants (14). There are only 57 milk banks in India, which are insufficient to meet needs for huge number of preterm and VLBW infants born every day (15). We need to bridge this gap by promoting milk donation in hospitals and community.

Limitations

Our research also had some limitations. The study was retrospective observational in nature and had small sample size of only 119 subjects. So validity of result can be affected by confounders. Moreover, long term effect of donor milk on VLBW infants on growth and development was beyond the scope of our study.

Conclusion:-

The two most striking impacts of administering donor milk to VLBW infants seen in this study were better weight gain profiles and an overall reduction in the duration of hospitalization. Therefore, promoting milk donation in postnatal wards to strengthen existing human milk banks and establishment of community human milk banks can become the future of improving nutrition and quality of health care of VLBW infants and thus decrease infant mortality rate.

Acknowledgement:-

The author would like to thank all the researchers for their valuable time and efforts. They would also like to thank all the medical staff of the neonatal intensive care unit of Paediatrics department of Sassoon hospital, Pune.

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