ORIGINAL RESEARCH PAPER
VOLUME-6 | ISSUE-7 | JULY-2017 | ISSN No 2277 - 8179 | IF : 4.176 | IC Value : 78.46
INTERNATIONAL JOURNAL OF SCIENTIFIC RESEARCH

COMPARISON OF EFFECTS OF DIFFERENT FEEDING FORMULAS IN VERY LOW BIRTH WEIGHT NEONATES

Pediatrics

Dr Varsha Shah Professor, Department of Pediatrics, SBKS MIRC, Sumandeep Vidyapeeth, Piparia, Vadodara, Gujarat.

Dr Manish Rasania Professor, Department of Pediatrics, SBKS MIRC, Sumandeep Vidyapeeth, Piparia, Vadodara, Gujarat. - Corresponding Author

Dr Aswani H Resident, Department of Pediatrics, SBKS MIRC, Sumandeep Vidyapeeth, Piparia, Vadodara, Gujarat.

Dr Asuthosh singh Rathore Assistant Professor Department of Pediatrics, SBKS MIRC, Sumandeep Vidyapeeth, Piparia, Vadodara, Gujarat.

Dr Unnati Shah Resident, Department of Pediatrics, SBKS MIRC ,Sumandeep Vidyapeeth, Piparia, Vadodara, Gujarat.

ABSTRACT

Objectives : To compare the effects of different feeding formulas in very low birth weight neonates.
Study Design: Prospective Cohort Study
Study Population: Neonatal Intensive care Unit and Post natal ward of Dhiraj Hospital Piperia
Methodology: 51 VLBW babies were divided into three groups by randomization; one group was offered EBM alone, second group was offered EBM with HMF and the third group was offered EBM with Preterm formula milk powder. Out of the total 51 number of Babies between weight 1000 to 1500 gms, 10 babies were offered EBM only and fortification was done in rest 41 number of babies. HMF was used for fortification in 20 babies and preterm formula was used in 21 babies. HMF and preterm formula was used for fortification in VLBW babies once they have reached to 100ml/kg/day of enteral feeds in a concentration of 0.2gram/2.5 ml. The growth pattern was studied till the duration of their hospital stay.
Results: There was no feed intolerance found in unfortified group on EBM. Amongst the fortified group feed intolerance was found in 3(14.28%) babies with HMF and among 7(33.33%) babies with preterm formula milk powder. The weight gain was better amongst the fortified group with 18.4±1.9 grams/day with HMF and 19±1.17 with preterm formula as compared to the unfortified group 14.6±1.5. Thus the weight gain among the fortified group was highly significant with the p value being 0.0001.The increase in the head circumference/week was same in all the three groups and no significant difference was found The increase in the length/week was same in all the three groups and there was no significant difference found in all the three groups.
Conclusions: Weight gain was better amongst those where EBM was fortified with HMF and preterm formula.

KEYWORDS:

milk fortification, Very low birth weight, growth, weight gain, HMF

Introduction:
Feeding of VLBW infants is relatively difficult because of inadequate feeding skills and not be able to breastfeed thus require other methods of feeding such as spoon or gastric tube feeding. They are prone to have significant illnesses in the first few weeks of life. They have higher fluid requirements in the first few days of life due to excessive insensible water loss. They have low body stores at birth, hence require supplementation of various nutrients. Even term LBW infants who are likely to be growth restricted need higher calories for 'catch-up' growth. Gut immaturity leading to feed intolerance is also a significant problem.

Feeding ability depends largely on gestation rather than the birth weight. Intra gastric tube feeding is started in neonates who are VLBW or ELBW with lack of co-ordination between sucking and swallowing. In such patients the immature sucking helps in rapid maturation of their feeding skills and also improves the milk secretion in their mothers ('Non-nutritive sucking').

Paladai feeding in LBW infants who are not able to feed directly from the breast. This method of feeding is started when there is good co-ordination between sucking and swallowing and not able to breast feed directly. Neonates who were stable at birth or not having any complication can be started on full enteral feeding from 1st day of life. Feeding can started either on total enteral feeding or on standard feeding regimen as per ideal protocol. Total enteral feeding protocol includes feed were started at rate of 80ml/kg on 1st day and subsequently increased at rate of the 20ml/kg/day subjected to tolerance. In standard feeding protocol includes feed were started at rate of 20ml/kg/day on 1st day of life and increased at rate of 20ml/kg/day. Outcome to be measured includes duration to reach full enteral feeds (180ml/kg/day), feed intolerance, NEC and incidence of sepsis. VLBW neonates who were unstable or who has required IVF after birth should be initiated feeding as soon as they become hemodynamically stable.

Nutrient supplementation can be ensured by one of the following methods:

-By fortification of expressed breast milk with HMF
-By fortification of expressed breast milk with preterm formula

Human milk fortifiers are of great nutritional value to preterm neonates because they supplement the micro and macronutrients lacking in the “mature” milk of mothers with preterm babies, leading to improved growth (1-3)They are designed as a supplement to mother's milk for rapidly growing premature infants. It increases the nutrient content of the milk without compromising its other beneficial effects. Experimental studies have shown that the use of fortified human milk results in net nutrient retention that approaches or is greater than expected intrauterine rates of accretion in pre term infants though there are concerns about the increase in osmolality, clinical studies have not shown any significant adverse effects following fortification of human milk. The Cochrane review on fortification found short term improvement in weight gain, linear and head growth without any increase in adverse effects such as NEC. Preterm VLBW infants on expressed breast milk fortified with HMF do not require any supplementation (except for iron)(4-6) If HMF is not available or parents could not afford fortification with preterm formula is an another option available. Fortify EBM with preterm formula 0.4g per 10ml. Though more economical than fortification by HMF, this method has two major drawback-it is difficult to measure such small amounts of formula powder and the RDA of some minerals and vitamins(e.g. calcium, phosphorus, vitamin D, folic acid) are not even meet after fortification.[2]

Since calcium, phosphorus, and vitamin D intakes are low even after fortification with formula, we supplement these nutrients additionally. Kanya Mukhopadhyay et al, found effect of human milk fortification is appropriate for gestation and small for gestation preterm babies. (7)

Material and Methods

Type of Study - Prospective cohort study. Time span - one and half years. The study was conducted in Neonatal Intensive Care Unit and Postnatal Ward of Dhiraj Hospital. Ethical committee of the institute approved the study. Informed consent was obtained from all parents or guardians of each patient. All live born VLBW infants (birth weight of 1000-1500 gms) with in Dhiraj Hospital was included in the study. Babies with sepsis, birth asphyxia and any other major morbidity was excluded from the study.

The study was conducted in NICU and postnatal ward of Pediatrics department SBKSMIRC for one and half year. All the mothers admitted in the postnatal ward were educated regarding the importance of Exclusive breast feeding and the proper technique of breast feeding was taught to them. weight gain pattern was studied till the duration of their hospital stay. Babies were discharged from the hospital once the adequate weight gain was observed. Follow up of these babies on exclusive breast feeding after one week of discharge from the hospital was done.In the group of babies who didn't showed adequate weight gain were subjected to further investigation like Septic screen, USG brain and other required investigation. In the babies with the positive results having some morbidities were excluded from the study. The group of babies with weight between 1000 to 1500grams in which breast milk was offered by a different modality like spoon feeding or tube feeding due to inadequate sucking and swallowing skills in VLBW babies, they were divided into three groups and by randomization one group was offered EBM alone, second group was offered EBM with HMF and the third group was offered EBM with Preterm formula milk powder. Randomization was done by neonatologist and statistician. HMF sachets (2 grams) were readily available in the market of rupees 17.50/sachet of the company RAPTAKOS, BRETT &CO .LTD. But to prepare sachets of preterm formula milk powder we took help from the pharmacology department as they had an electronic weighing machine which can measure such small amount (0.4gm) of milk powder. Strict aseptic precautions were taken during weighing of preterm formula milk powder. HMF and preterm formula was used for fortification in VLBW babies once they have reached to 100ml/kg/day of enteral feeds in a concentration of 0.4gram/10 ml. As the sachets of HMF are available in 2 grams, feeds were made in advance with 50ml containing one sachet to make it 0.4gram/ml with the shelf life of the sachet being 8 hours and the babies were feed the desired amount from that fortified EBM with HMF. The weight gain pattern was studied till the duration of their hospital stay. Babies with sepsis and other morbidities were included in the study once they were stable with and no interventional therapy was required except IV antibiotics. Regular follow up of VLBW babies till they reach 1800 grams of weight or till one month of age.

HMF and preterm formula milk powder were added according to the standard guidelines and the babies were closely monitored for weight gain under the supervision of the neonatologist.

Results

This was a prospective study conducted over a period of 18 months enrolled and table 1 specifies the data about the number of babies admitted to postnatal ward and NICU. Out of the total number 51 VLBW babies admitted in NICU 10(20%) babies were offered only EBM. Of the rest 41 babies, HMF was used for fortification of EBM in 20(39%) babies and preterm formula was used in 21(41%) babies. Out of the total 51 VLBW 41(80%) were with weight >1250 grams and 10(20%) were with weight <1250grams. 32(63%) babies were AGA and 19(37%) were SGA.

Out of the total 51 number of Babies between weight 1000 to 1500 gms, 10 babies were offered EBM only and fortification was done in rest 41 number of babies.HMF was used for fortification in 20 babies and preterm formula was used in 21 babies. There was no feed intolerance found in unfortified group on EBM. Amongst the fortified group feed intolerance was found in 3(14.28%) babies with HMF and among 7(33.33%) babies with preterm formula milk powder. These babies with feed intolerance were shifted to EBM and fortification of EBM was stopped.

The weight gain was better amongst the fortified group with 18.4±1.9 grams/day with HMF and 19±1.17 with preterm formula as compared to the unfortified group 14.6±1.5. Thus the weight gain among the fortified group was highly significant with the p value being 0.0001.

The increase in the head circumference/week was same in all the three groups and no significant difference was found. In group who was offered EBM growth in HC/week was 0.50±0.05,in the second group with EBM plus HMF it was 0.52±0.05 and in the third group the growth was 0.5±0.03. The increase in the length/week was same in all the three groups and there was no significant difference found in all the three groups. All the biochemical parameters (serum sodium, potassium, calcium) were within normal limits during study among the fortified group.

Discussion

Similar to the pattern of weight gain of our study; Study by Kanya Mukhopadhyay et al.(7) has done a prospective study in which fortification (n = 85, birth weight 1202 g, gestation 30.8 wk) resulted in better growth in preterm VLBW babies as compared to control group (n=81, birth weight 1259 g, gestation 31.3 wk). Weight gain (15.1and 12.9 g/kg/d, P <0.001), length (1.04 and 0.86 cm/week, P = 0.017) and HC (0.83 and 0.75cm/week, P<0.001) increased significantly in fortified group. Preterm VLBW babies showed better growth with human milk fortification.

Geeta Gathwala et al.(8) has done a similar study and concluded that using the new fortifier not only provides all the advantages of breast milk but also provides higher amounts of proteins and calcium necessary for sustaining growth and achieving intra-uterine accretion rates in the preterm neonates and is well tolerated. One more study in which 108 infants were feed with>50 ml/kg/day of human milk (HMF, n=62) or exclusively PF (n = 46). Gestational age, birth weight, length at birth and head circumference, and distribution among feeding regimes were similar between the groups. Infants feed HMF had an earlier discharge (73 ± 19 vs. 88 ± 47 days) despite slower rates of gain in their weight (22 ± 7 vs. 26 ± 6 g/kg/day), increase in length (0.8 ± 0.3 vs. 1.0 ±0.3 cm/week) than infants who were feed PF. The incidence of NEC and LOS were less in the HMF group and there were no differences in any measure of feeding tolerance between groups. Fat and absorption of the energy were less and phosphorus, zinc, and copper absorption were high in group HMF vs. PF. Human milk promotes an improved host defense and gastrointestinal function as compared to formula feeding. The benefits of improved health (less sepsis and NEC) associated with the feeding of HMF outweighed the slower rate of growth observed, suggesting that the feeding of HMF should be actively promoted in preterm babies.

According to the Cochrane review on "Multicomponent fortified human milk for promoting growth in preterm infants" supplementation of human milk with multi-component fortifiers is associated with short-term increases in weight gain, linear and head growth.[9] There are insufficient data to evaluate long term neuro-developmental and growth outcomes, although there appears to be no effect on growth beyond one year of life. The issues of concern in developing countries are higher prevalence of infections, a greater risk of contamination and high fortifier costs.

Conclusion

Though fortification of EBM with preterm formula is recommended in "AIIMS Protocol Of NICU".Our study supplements the protocol. Outcome of our study supports that weight gain was better amongst those where EBM was fortified with HMF and preterm formula. Majority of (92%) babies had satisfactory outcome on follow up and only one baby was readmitted, no feed intolerance was found. Fortification with preterm formula is a quite cheaper option as compared to HMF, is of great value for lower income population.

Table 1:Baseline Characteristics, Growth and Biochemical events amongst three groups

	EBM	EBM+HMF	EBM+ Preterm formula
No of patients(n)	10	20	21
Birth weight (grams)	1495±25.49*	1328±141.69	1403±105.58
Gestation (weeks)	33.1±1.52	32.58±2.31	33.14±2.17
Oral feeds started (day of life)	1.5±0.849	2.64±1.99	1.85±0.94

Weight at enrollment (grams)	1425±46.96	1221.76±153.34	1318.57±117
Enrolled (day of life)	3.3±1.76	7.7±5.14	5.07±1.26
Feed intolerance, n(%)	0	3(14.28%)	7(33.33%)
Weight gain (grams/day)	14.6±1.5	18.4±1.9	19±1.17
HC(cms/week)	0.5±0.05	0.52±0.05	0.5±0.03
Length (cms/week)	0.78±0.1	0.79±0.1	0.8±0.1
Biochemical events	none	none	None
PDA (n)	1	1	5
Late onset Sepsis (n)	2	5	1
NEC(n)	0	0	1
IVH (n)	0	0	0
Hospital stay(days)	10.6±5.68	23.47±15.35	15.78±4.66
Discharge	10	19	21
DAMA	0	1	0
Died	0	0	0

Values are mean ± SD. HC- Head Circumference, PDA- Patent Ductus Arteriosus, NEC- Necrotizing Enterocloitis, IVH – Intraventricular Hemorrhage, DAMA- Discharge Against Medical Advise.

Abbreviations:

VLBW- Very Low Birth Weight
NEC-Necrotising Enterocolitis
HMF-Human Milk Fortifier,
HMF-Fortified Human Milk
EBM-Expressed Breast Milk,
PF-Preterm Formula
HC- Head Circumference
PDA- Patent Ductus Arteriosus,
NEC- Necrotizing Enterocloitis
IVH – Intraventricular Hemorrhage,

REFERENCES:

1. Singh M. Textbook of Care of newborn. Seventh Edition. Feeding and nutrition. April 2010:168-199.
2. Agarwa R, Deorari A, K Paul V. Feeding of low Birth weight Infants.AIIMS protocols in neonatology. First edition 2015.138-159.
3. Mehta S. To study knowledge,Attitude and practices of breast feeding mothers. European Journal of Pharmaceutical and medical research. Ejpmr,2016,3(2),372-374.
4. Chandrasekaran A. Feeding of Low Birth weight Neonates.Indian Journal of practical Paediatrics. 2016;18(1):21
5. Cloherty JP. The High risk newborn. Manual of neonatal care. Seventh edition.pg.74-90.
6. Ghai. O.P. Text book of Essential Peadiatrics. 6th edition. Delhi; Dr. O.P. Ghai; 2005. 147-151.
7. Mukhopadhyay K, Narnag A, Mahajan R. Effect of human milk fortification in appropriate for gestation and small for gestation preterm babies: a randomized controlled trial. IndianPediatr2007; 44: 286-290.
8. Gathwalaa G, Kumar C, Shaw P, Rajesh Batra R. Effect of fortification of breast milk on the growth of preterm neonates.Eastern Journal of Medicine 17 (2012) 30-35.
9. Kuschel CA, Harding JE. Multicomponent fortified human milk for promoting growth in preterm infants. Cochrane Database of Systematic Reviews 2003, Issue 3. Art. No.: DOI:10.1002/14651858.CD000343.pub2.