

Original Research Article

100% human milk diet: an integral part of nutrition management in NICU: PAN India neonatologist's survey

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ABSTRACT

Background: Exclusive human milk diet (EHMD) benefits preterm infants the most, particularly in neonatal intensive care unit. EHMD is dependent on multiple factors consisting of breastfeeding awareness, availability of pasteurized donor human milk, functioning human milk banks and infrastructure. Neonatal nutritional practice varies considerably in India. The aim of this survey was to understand the implementation and benefits of 100% human milk diet through human milk derived nutritional products in preterm infants from NICU experts' perspective.

Methods: The online survey questionnaire formulated and reviewed by the expert neonatologists was shared with the NICU experts pan India through multiple communication channels and referrals. The survey was constructed on the Google Forms platform, the responses were collected between May 2020 to July 2020.

Results: A total of 100 neonatologists responded to the survey from 79 hospitals and 31 cities across India. All the respondents (100%) opined that EHMD is important for preterm infants, 15% opined that EHMD was ensured to all preterm infants, 80% opined that human milk-based fortifier (HMBF) was safe and well tolerated by premature infants, 17% reported that 51-80% of preterm infants experience feed intolerance issues with bovine milk based fortifiers (BMBF), blood urea nitrogen (49%) was chosen as an optimal biochemical parameter for assessing protein utilization in NICU, 93% opined that post discharge nutritional supplementation is required for preterm infants among which 49% respondents opined that HMBF and human milk 70 calorie sachet would be preferable as post discharge nutritional supplementation.

Conclusions: EHMD unequivocally offers multiple benefits to preterm infants and hence needs to be included in the NICU protocol, availability of human milk derived nutritional products such as HMBF are termed safe and well tolerated and would aid in implementing EHMD in NICUs. Pasteurized donor human milk is vital for ensuring EHMD, thus access to the same needs to be empowered by strengthening the human milk donation and awareness measures.

Keywords: Human milk, Human milk derived fortifier, Preterm infants, Seventy calories human milk, NICU, Neonatologists

INTRODUCTION

Exclusive human milk diet (EHMD) is a crucial factor for optimal growth and overall development of new-born infants and is considered as an effective intervention for

preterm infants in neonatal intensive care unit (NICU). Human milk comprises of both nutritional and innumerable non-nutritional benefits such as reducing the risk of sepsis and mortality in early neonatal period and

chronic diseases such as diabetes, obesity, cardiovascular disorders, and asthma in long run.¹⁻⁶

Safeguarding and supporting the establishment of EHMD and breastfeeding inside the NICU framework is conceivably more vital due to the medical liability of the preterm infants in the NICU.⁶ The NICU experts play an important role in strengthening the provision of EHMD during early hospitalization.⁷ Several research publications on human milk feeding and EHMD have highlighted the immune and gut health benefits to newborn infants.^{8,9} Many research studies have emphasized that feeding donor human milk (DHM) has resulted in a decreased risk of NEC in preterm infants as compared with bovine milk-based feeds including BMBF.^{10,11}

Lately NICU's have been able to create the feeding protocols for preterm infants to provide EHMD with the availability of donor human milk-based feeding options including the human milk-based fortifiers (NeoLact MMF).^{12,13} Occurrence of an episode of NEC or sepsis during the NICU stay would result in prolongation of the hospitalization along with overall costs where EHMD can be a powerful tool to mitigate this.¹⁴ The primary intent of this study was to analyse and comprehend the advantages & significance of 100% human milk diet from the perspective of NICU experts in India.

METHODS

The objective of this study was to understand the enteral feeding practice and benefits of EHMD from a neonatologist's perspective. This survey was performed from May 2020 to July 2020 in India. The survey questionnaire was constructed by the team of researchers under the supervision of expert neonatologists, the research team reviewed the data available on EHMD, preterm enteral feeding protocols, laboratory analysis and perception on donor human milk-based nutritional products for premature infants. Publications available on the same were reviewed from both international and national journals, very few studies were available on the subject matter and the survey questions was prepared based on Froh et al and Sahni et al studies and most of the questions were developed to collect data on the objectives of the study.^{15,16}

Neonatologists, paediatricians managing the NICU and neonatal care physicians were included for the study, all other speciality physicians were excluded from the study. Information about the need and objectives of the survey was presented in detail to the participants before they could take up the survey. Participation in this survey was voluntary and the participants anonymity was maintained. Consent to participate in the survey was implied by participating and submitting the completed survey form.

Survey questionnaire

Survey questionnaire was based on the following subject matter: EHMD in NICU, trophic feeding pattern, safety and efficacy of fortifiers human milk based fortifier (HMBF) and bovine milk based fortifiers (BMBF), feed intolerance and NEC, biochemical tests in NICU, protein biomarker and post-discharge nutrition for preterm infants. The questionnaire was set up on Google forms.

Survey recruitment

Survey was open to all NICU experts and Neonatologists in India. The Google forms online survey link was shared with the target specialists through email and text messages. A request was made to the Neonatal care community to disseminate the survey link with their counterparts and colleagues. Responses were collected through Google forms after which the survey was closed for analysis. Statistical analysis was done using IBM SPSS statistics v21 software.

RESULTS

Demographics

A total of 100 neonatologists responded to the survey from 79 hospitals across 31 cities in India. Data accumulated from the survey was included for analysis.

Importance, feed tolerability and growth of preterm infants receiving 100% human milk diet

All the participants rated that exclusive breastfeeding or using 100% human milk diet is very important for preterm babies in NICU, n=100 (100%). 15% participants opined that all preterm infants in NICU would receive exclusive human milk diet. Safety and efficacy of human milk derived nutrition for preterm infants in NICU has been described in (Figure 1).

Bovine milk-based fortifier usage for preterm infants in NICU

A total 40% of the participants opined that 51-80% of the preterm infants would receive a BMBF in NICU, whereas 17% of the participants opined that more than 80% of the preterm infants would receive BMBF.

Feed intolerance issues with bovine milk-based fortifier in NICU

17% of respondents reported that 51-80% of the preterm infants on BMBF would experience feed intolerance episodes, details are presented in (Table 1).

Table 1: Feed intolerance with BMBF (n=100).

Parameter	Number of participants who reported				
	100%	>80%	51-80%	26 - 50%	10 -25%
Proportion of preterm infants who get feeding issues with BMBF in NICU.	1	4	17	26	51

Table 2: Appropriate feeding volume for starting the fortification (n=100).

Parameter	Number of participants who answered				
	>100	81-100	61-80	40-60	<40
Appropriate feeding volume for starting the fortification in a preterm neonate. (ml/kg/day)	29	21	12	20	18

Table 3: Biochemical tests useful for determining the protein utilization (n=100).

Parameter	Number of participants who reported			
	BUN	Serum albumin	Total proteins	None
Biochemical tests useful for determining the protein utilization in a preterm infant in NICU	49	22	21	8

Table 4: Appropriate post-discharge nutritional support for a preterm infant (n=100).

Parameter	Number of participants who answered					
	Only mother's own milk	Human milk based 70 calorie sachet	Human milk based fortifier	Bovine milk based fortifier	Formula	Animal milk
Appropriate post-discharge nutritional support for a preterm infant	43	18	31	7	1	0

Parameters considered as important risk factors for the development of NEC and feed intolerance in NICU setting

Majority of the respondents (70%) have opined that lack of human milk feeds as the most critical risk factor for the development of NEC in preterm infants, grading of the risk factors by the respondents have been depicted in the (Figure 2).

Appropriate feed volume for initiating fortification in preterm infants

29% of the respondents opined that appropriate feeding volume for starting fortification of breast milk in a preterm infant would be higher than 100 ml/kg/day, results have been described in (Table 2).

A total 72% of the participants have reported to be having a protocol for nutritional management in NICU, while 28% have reported that protocol will be decided on an individual case-to-case basis.

44% of the participants opined that the best intervention is to stop fortification of feeds and continue only EBM

when feeding intolerance occurs due to BMBF, whereas 28% of the respondents opined that the best option would be to shift over to HMBF (Figure 3).

Regular biochemical tests suggested for a preterm infant in NICU

62% of the respondents opined that calcium and sodium are tested at regular intervals and 45% of the respondents opined that blood urea nitrogen (BUN) and alkaline phosphatase (ALP) would be tested at regular intervals (Figure 4).

Biochemical tests ideal for determining the protein utilization in a preterm infant in NICU

49% of the respondents opined that BUN would be ideal for determining protein utilization in a preterm infant (Table 3).

Requirement of additional nutrition support for a preterm infant after being discharged to home

93% of the respondents opined that preterm infants would require additional nutritional support post-discharge.

Appropriate post discharge nutritional support for a preterm infant

Respondents opinions on appropriate post discharge support for preterm infants have been provided in (Table 4).

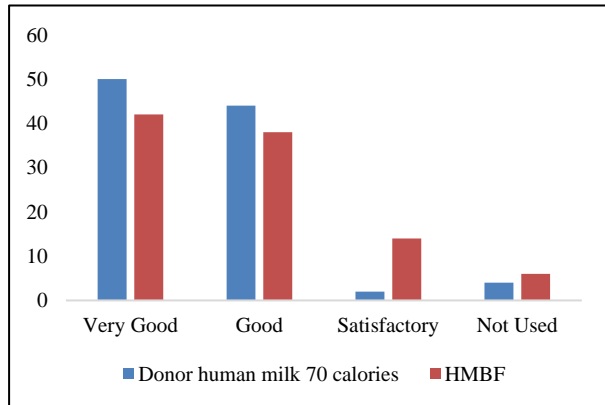


Figure 1: Safety and tolerability of human milk-based nutritional products in preterm infants.

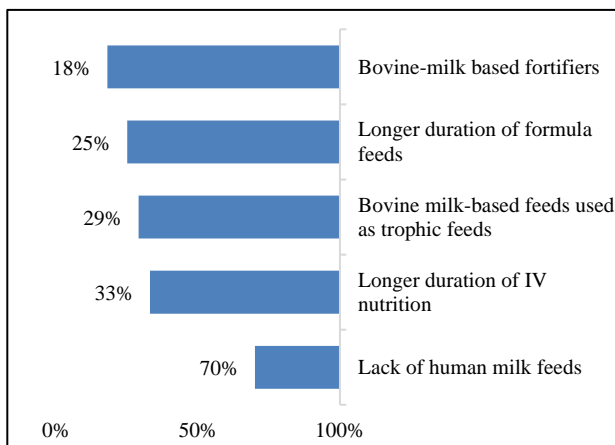


Figure 2: Important risk factors for the development of NEC and feed intolerance in preterm infants.

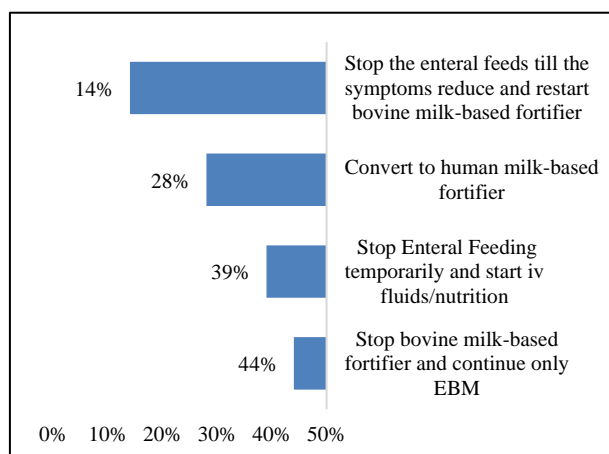


Figure 3: Best intervention when a preterm infant on BMBF develops feeding intolerance.

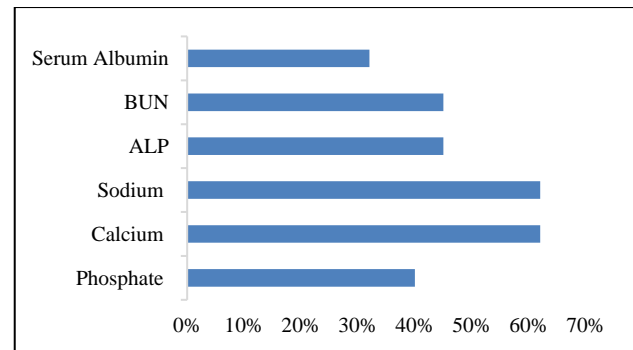


Figure 4: Biochemical tests suggested for a preterm infant.

DISCUSSION

Implementation of exclusive human milk diet in NICU would provide several benefits to the preterm infant and is also recommended by various international and national health organizations. This survey attempted to analyse the benefits and scope of human milk feeding for preterm infants from a neonatologist's perspective. This survey had participation from almost all the states in India and thus paints a truly national view.

In this survey only 15% of the participants opined that all preterm infants in the NICU units were on EHMD, which may be due to the low numbers of human milk banks, availability of donor human milk, costs, and other reasons. A recent survey conducted on human milk banks in India established that 63% milk banks reported higher demand and lower supply of donor human milk.¹⁷ Majority (94% and 80%) of the neonatologists opined that the donor human milk based nutritional products PHBM (94%) and HMBF (80%) is safe and has good tolerability in preterm infants in the present survey.

In current survey 17% of the participants reported that 51-80% of preterm infants on BMBF experience feed intolerance issues. Human milk consists of 60% of whey proteins and 40% of casein. Whereas bovine milk consists of meagre whey proteins (18%) and higher proportions of casein protein (80%), which when ingested results in the formation of a firm coagulum, which may increase the risk of feed intolerance.^{18,19}

In the present study the neonatologists opined that lack of human milk, longer duration of formula feeds were use of formula feeds as trophic feeds and BMBF as the risk factors for NEC and feed intolerance episodes for preterm infants in NICU.

Although there is no clear consensus on the feed volume for starting fortification, we could observe that a majority (71%) of the neonatologists favour the early fortification (<100 ml/kg/day), research studies have established the possible benefits of early fortification to the preterm infants such as reduced hospitalization and overall costs. Halkar MP, et al. observed that early fortification

initiation (<55 ml/kg/day) with HMBF resulted in an early discharge from the NICU (5-10 days). Larger controlled studies are necessary to confirm the benefits of early fortification.¹³

Calcium and sodium were the most regularly tested biochemical parameters in preterm infants during their NICU stay, BUN was considered as the most appropriate biochemical marker for quantifying the protein utilization in preterm infants, which has also been reiterated in multiple research publications.²⁰

Majority of the participants (93%) opined that post-discharge nutritional supplement is important for preterm infants. Human milk-based nutritional products including HMBF and 70 calorie sachets were considered as optimal options for post-discharge supplementation by 49% of the participants. The present study has limitations with the sample size and number of hospitals represented and hence a larger survey with greater sample size would be required to provide comprehensive insights into maintenance of EHMD in NICU's.

CONCLUSION

Results from the present study sheds light on the importance of EHMD for preterm infants in NICU. Most neonatologists suggest that human milk derived nutritional products including HMBF are safe and efficacious; utilization of human milk-based products would also help in implementation of EHMD in NICU. Further research is needed to confirm and expand these findings with a larger sample size.

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