



EFFECT OF SUPPLEMENTATION WITH BOVINE COLOSTRUM IN RECURRENT PNEUMONIA IN CHILDREN

Paediatrics

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ABSTRACT

Background: Bovine colostrum (BC) is also known as cow milk colostrum, bovine colostrum immune milk, lactobin, LC2N, BCC (bovine colostrum concentrate), hyperimmune milk, early milk, and lactoferrin. At the turn of the 20th century, the use of bovine colostrum was advocated to protect infants against both human and bovine infections [11-14]. This article provides a systematic, critical evaluation of the current state of knowledge in this area.

Aim: To study the effect of supplementation of bovine colostrum in children suffering from recurrent pneumonia in age group from 6 months to 5 years.

Materials and Methods: This is an observational study conducted upon 47 children (n=47) who were attending to outpatient department with history of frequent attacks of cough, fever and breathlessness. Age Group included was 6 months to 5 years. This study was conducted from March, 2017 to Oct, 2018 in a Teaching Hospital in Nizamabad, Telangana State.

Results: After 2 months of supplementation with bovine colostrum in children with recurrent pneumonia 46.81% (n=22) of them had decreased attacks of pneumonia, severity of symptoms and hospital admissions. There is 38.66 % improvement in total number of pneumonia attacks and 46.29 % improvement in hospital admissions with pneumonia. In 53.19 % (n=25) of children the severity of symptoms, number of pneumonia attacks and hospital admissions were almost remain same or no significant change was noted.

Conclusion: Recurrent GI and respiratory infections represent a serious public health problem in developing countries like our country [14,23]. Bovine colostrum is effective in the prophylaxis of recurrent pneumonia as it reduces the number of episodes and the hospitalization due to these infections. Results of this study suggest that bovine colostrum could be provided as a therapeutic option for children with recurrent pneumonia.

KEYWORDS

Recurrent Pneumonia (RP), Bovine Colostrum (BC), Supplementation, Pneumonia Attacks, Hospital Admissions.

INTRODUCTION

Recurrent Pneumonia (RP) is defined as two or more episodes of pneumonia in 12 months or three episodes altogether with radiographic clearance in between^[1,2]. It should be differentiated from persistent pneumonia, which is defined as persistence of symptoms and radiological changes for 6 weeks or more despite treatment^[3]. It is often difficult to determine whether pneumonia is persistent or recurrent, unless there has been a symptom-free interval during which chest radiographs have documented clearing of the pneumonia infiltrations^[5]. Inappropriate or incomplete treatment is considered as a common reason of recurrent or persistent pneumonia. The incidence of recurrent pneumonia in children is unclear^[1].

Prolonged infection e.g. pertussis, mycoplasma, respiratory syncytial virus (RSV) is a common cause of RP in developing countries. Post infective bronchiectasis is also known to follow pertussis, measles and TB^[6]. Bovine colostrum could be provided as a therapeutic as well as preventive option for children with recurrent pneumonia.

Bovine colostrum, the first milk that cows produce after parturition, contains high levels of growth factors and immunomodulatory components^[11]. Some healthy and diseased individuals may gain health benefits by consuming bovine colostrum as a food supplement. Fifty-one eligible studies were identified from the following databases: Medline, Embase, Global Health, the Cochrane Library, and the Cumulative Index to Nursing and Allied Health Literature. Our primary aim is to study the effect of bovine colostrum in children suffering from recurrent pneumonia in age group from 6 months to 5 years.

Review of Literature

There are so many studies regarding bovine colostrum since last four to five decades all over the world including India.

1 S.I.Kehoe, B.M.Jayaroo, A.J.Heinrichs "Survey of Bovine Colostrum Composition and Colostrum Management Practices on Pennsylvania Dairy Farms" in 2008 Colostrum composition and management were surveyed via sample and data collection from 55

dairy farms in Pennsylvania. Colostrum samples were analyzed for fat, protein, lactose, total solids, ash, Ig, lactoferrin, water- and fat-soluble vitamins, and minerals. Mean percentages of fat, protein, and lactose in colostrum were 6.7, 14.9, and 2.5, respectively. Concentrations of IgG₁, IgG₂, IgA, IgM, and lactoferrin were 35.0, 6.0, 1.7, 4.3, and 0.8 mg/mL, respectively. Mean concentrations of fat-soluble vitamins, including retinol, tocopherol, and β -carotene, were 4.9, 2.9, and 0.7 μ g/g, respectively. Mean concentrations of water-soluble vitamins were 0.34, 0.90, 4.55, 0.60, 0.15, 0.21, and 0.04 μ g/mL for niacin, thiamine, riboflavin, vitamin B₁₂, pyridoxal, pyridoxamine, and pyridoxine, respectively. Mean concentrations (mg/kg) of selected minerals in colostrum were also determined (Ca 4,716; P 4,452; Mg 733; Na 1,058; K 2,845; Zn 38; Fe 5.3; Cu 0.3; S 2,595; and Mn 0.1). The findings of this study revealed that the mean concentrations of most nutrients in colostrum have increased when compared with values previously reported. Results also showed that management practices have improved over time, particularly with regard to colostrum storage and feeding. Additionally, they observed that herd size influenced colostrum management and quality. It can be inferred, based on these findings, that although improvements have been made with regard to colostrum management and quality, there is still a need to educate producers on issues related to storage and timely feeding of colostrum to increase passive transfer and decrease the rate of calf morbidity and mortality.

2. Khaled Saad, *et.al* in 2016 in South Valley University, Egypt in their study "Effects of bovine colostrum on recurrent respiratory tract infections and diarrhea in children" One hundred sixty children (aged 1–6 years) having recurrent episodes of URTI or diarrhea received BC for 4 weeks. The number of episodes of URTI, diarrhea, and frequency of hospitalization required for URTI and diarrhea occurring during the study period were assessed at weeks 8 and 24. The aim of this study was to evaluate the efficacy and tolerability of BC administration in preventing recurrent upper respiratory tract infections (URTIs) and diarrhea in children. From a total number of 160 children, 81 patients (50.63%) were males. The mean age (\pm SD) was 3.65 (\pm 2.01) years. The mean (\pm SD) total number of infections was significantly decreased after BC therapy from 8.6 \pm 5.1 at baseline to 5.5 \pm 1.2 after 2

months ($P < 0.001$) and to 5.7 ± 1.6 after 6 months ($P < 0.001$). The mean (\pm SD) total number of URTI ($P < 0.0001$), number of episodes of diarrhea ($P < 0.001$), and number of hospital admissions ($P < 0.001$) were significantly decreased after BC therapy.

3. "Breast Feeding-A Boon or Bane for New Borns" Indian Journal of Trauma and Emergency Pediatrics Volume 8 Number 2, May - August 2016 DOI: <http://dx.doi.org/10.21088/ijtep.2348.9987.8216.17> Ambreen Jamali, Fahad Ahmad, S. Nikhil Gupta, Naveen Gupta, Shivani Gupta Review Article Abstract While breastfeeding is nearly universal and it is first immunization for the baby. Health professionals recommend that breastfeeding begin within the first hour of a baby's life and it be allowed as often and as much as the baby wants. It helps to improve immunity and to address mortality and morbidity related to major problems e.g. malnutrition, neonatal infections, diarrhea, jaundice and pneumonia etc.

4. AG Saini, P Singhi - Childhoods in India, 2017 "The journey of paediatrics from Vedic to neoteric" – The importance of breast milk has been dealt extensively in ancient child care literature. There is little or no mention of feeding of colostrum to the newborn soon after birth. Ayurveda describes use of bovine colostrums from domesticated cows for both medicinal and spiritual purposes. Special bovine colostrum-based Indian sweets Ginna or *Asjumu*, *Posu* or *Kharvasin* were prepared from the first day's thick cow milk after calving in different regions of India. By the late 18th century, Western medicine took interest in the medicinal properties of colostrums and it began to be prescribed for many conditions including enhancement of immune system (Ogra & Ogra 1978). Interestingly, prior to development of penicillin and other artificial antibiotics in the 20th century, colostrum was commonly used for treatment of bacterial infections and years later, science now tells us that colostrum is full of beneficial substances (Gephart & Weller, 2014). The nutritional composition of colostrum has led to its recognition as 'ancient food for modern times' and it is considered as a 'nutraceutical' because of its role in the maintenance of integrity of mucosa, permeability, local and systemic immunity and improvement of athletic performance (Gothai & Patel, 2013).

Studies were heterogeneous with regard to populations, outcomes, and methodological quality, as judged by the Jadad assessment tool. Many studies used surrogate markers to study the effects of bovine colostrum. Studies suggesting clinical benefits of colostrum supplementation were generally of poor methodological quality, and results could not be confirmed by other investigators. Bovine colostrum may provide gastrointestinal and immunological benefits, but further studies are required before recommendations can be made for clinical application.

MATERIALS AND METHODS

This is an observational study conducted upon 47 children ($n=47$) who were attending to outpatient department with history of frequent attacks of cough, fever and breathlessness. Age Group included was 6 months to 5 years. This study was conducted from March, 2017 to Oct, 2018 in a Teaching Hospital in Nizamabad, Telangana State.

Children below 6 months and above 5 years and individuals who were under treatment with antibiotics or anti asthmatics and general medical conditions like seizure disorder, diabetes, were excluded from the study. Before commencing the study the institutional Ethics Committee clearance was taken. Informed consent from the parent or guardian of each and every child enrolled in this study was obtained.

Funding:

Funds were offered by companies of drugs and commercial products, for investigations, drugs distribution, supplementation with bovine colostrum and transportation required for children included in this study throughout the study period.

Study Procedure:

Diagnosis of recurrent pneumonia was made according to IAP guidelines. Once the diagnosis was made initially the child was given antibiotic therapy and when the symptoms subside bovine colostrum was given as supplement for 2 months. This supplement was selected by the team of doctors which includes Pediatrician, Microbiologist, Nutritional Medical Officer, Professor of Pharmacology and Professor of Preventive and Social Medicine. This supplement was a commercial product containing the bovine colostrum extract which is powder form and supplied to the children.

The dose of the bovine colostrum supplementation is adjusted to the age and body weight of the child i.e. 0.5 to 1 gr in 1 spoon of milk twice in a day for 2 months. The same child was followed up to another 3 months. The number of pneumonia attacks and hospital admissions before the supplementation with bovine colostrum and after the supplementation were noted in all the children.

One Nutritional Counselor was there to guide the parents how to supplement this product and to look after the children under follow up. Parents / Guardians and other family members were given counseling and education regarding pneumonia, breast feeding and advantages of colostrum. Local ANMs and other health workers were also advised to follow up the children under study and to refer to the hospital whenever required.

RESULTS

After careful follow up of all the 47 children under study [Table.1] the results of this study show 46.81% ($n=22$) of children after 2 months of supplementation with bovine colostrum had decreased attacks of pneumonia, severity of symptoms and hospital admissions. 53.19% ($n=25$) of children were didn't improve even after supplementation with bovine colostrum and the severity of symptoms, number of pneumonia attacks and hospital admissions were almost remain same or no significant change was noted. [Fig.1]

Table.1 Effect of Bovine Colostrum Supplementation

S. No.	Supplementation Effect	Percentage
1	Improvement	46.81% ($n=22$)
2	No Improvement	53.19% ($n=25$)
3	Total	$n=47$

Effect of Bovine Colostrum Supplementation

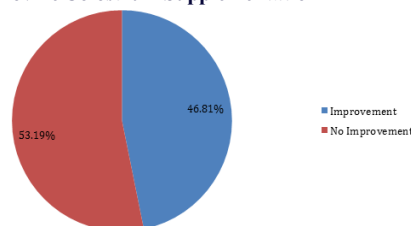


Fig.1

Children who were improved with supplementation with bovine colostrum were ($n=22$) analyzed again in view of total number of pneumonia attacks and total number of hospital admissions after supplementation with bovine colostrum including the period of follow up and compared to the period before supplementation. [Table.2]

Table.2 Comparison Before & After Supplementation ($n=22$)

S.No.	Analyzed Data	Before Supplementation	After Supplementation
1	Total number of pneumonia attacks	75	46
2	Total number of hospital admissions	54	29

This analysis was done after taking careful history before commencement of the study. Once the supplementation with bovine colostrum is started children who improved were separated and analyzed for total number of pneumonia attacks and total number of hospital admissions before and after supplementation with bovine colostrum.

Comparison Before & After Supplementation ($n=22$)

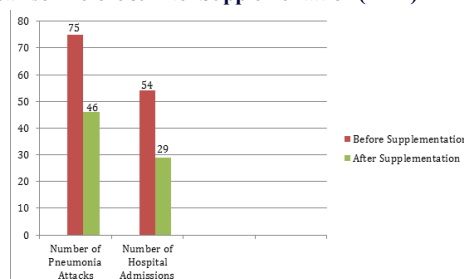


Fig.2

Among the children who were shown improvement after supplementation with bovine colostrum (n=22), there were 75 pneumonia attacks and 54 hospital admissions in total before supplementation. After supplementation the total number of pneumonias and hospital admissions were decreased i.e. 46 and 29 respectively. [Fig.2]

It indicates there is 38.66 % improvement in total number of pneumonia attacks and 46.29 % improvement in hospital admissions with pneumonia. [Fig.3]

Improvement with Bovine Colostrum Supplementation (n=22)

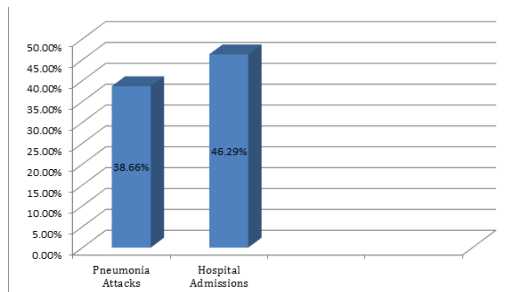


Fig.3

Improvement in the sense of decrease in the number of pneumonia attacks or decrease in the number of hospital admissions with pneumonia, which shows more in hospital admissions. i.e. With the supplementation of bovine colostrum the rate of hospital admission was decreased more than the rate of pneumonia attacks. Admissions for other reasons like diarrhea and dehydration were excluded.

DISCUSSION

Our study was conducted on the children who were attending to outpatient department suffering from recurrent pneumonia. We selected the children who were fit into the diagnosis of recurrent pneumonia (n=47) according to IAP guidelines. Other children those who were not fit were excluded from the study.

The present study shows there is improvement with the supplementation of bovine colostrum in children suffering from recurrent pneumonia in the sense of decreasing the number of pneumonia attacks as well as the number of hospital admissions. This study is comparable with other studies.

S.I.Kehoe, B.M.Jayaroo, A.J.Heinrichs "Survey of Bovine Colostrum Composition and Colostrum Management Practices on Pennsylvania Dairy Farms" in 2008 Colostrum composition and management were surveyed via sample and data collection from 55 dairy farms in Pennsylvania. Results showed that management practices have improved over time, particularly with regard to colostrum storage and feeding. Additionally, they observed that herd size influenced colostrum management and quality. The study suggest to storage and timely feeding of colostrum to increase passive transfer and decrease the rate of calf morbidity and mortality. Similarly our study shows there is 38.66% improvement in total number of pneumonia attacks and 46.29% improvement in hospital admissions with pneumonia.

Khaled Saad, *et.al* in 2016 in South Valley University, Egypt in their study "Effects of bovine colostrum on recurrent respiratory tract infections and diarrhea in children" One hundred sixty children (aged 1–6 years) having recurrent episodes of URTI or diarrhea received BC for 4 weeks. The mean (\pm SD) total number of URTI ($P < 0.0001$), number of episodes of diarrhea ($P < 0.001$), and number of hospital admissions ($P < 0.001$) were significantly decreased after BC therapy. In our study among the children who were shown improvement after supplementation with bovine colostrum (n=22), there were 75 pneumonia attacks and 54 hospital admissions in total before supplementation. After supplementation the total number of pneumonias and hospital admissions were decreased i.e. 46 and 29 respectively.

"Breast Feeding-A Boon or Bane for New Borns" Indian Journal of Trauma and Emergency Pediatrics Volume 8 Number 2, May - August 2016 DOI: <http://dx.doi.org/10.21088/ijtep.2348.9987.8216.17> Ambreen Jamali, Fahad Ahmad, S. Nikhil Gupta, Naveen Gupta, Shivani Gupta. This review article proves the importance of colostrum.

It helps to improve immunity and to address mortality and morbidity related to major problems e.g. malnutrition, neonatal infections, diarrhea, jaundice and pneumonia etc. similarly the results of our study show 46.81% (n=22) of children after 2 months of supplementation with bovine colostrum had decreased attacks of pneumonia, severity of symptoms and hospital admissions.

AG Saini, P Singhi - *Childhoods in India*, 2017 "The journey of paediatrics from Vedic to neoteric"- The nutritional composition of colostrum has led to its recognition as 'ancient food for modern times' and it is considered as a 'nutraceutical' because of its role in the maintenance of integrity of mucosa, permeability, local and systemic immunity and improvement of athletic performance (Gothai & Patel, 2013). This was proven in our study. With the supplementation of bovine colostrum the rate of hospital admission and the rate of pneumonia attacks were decreased in children suffering from recurrent pneumonia.

Merits and Demerits:

This study was done under the guidance of Pediatrician, Microbiologist, Nutritional Medical Officer, Professor of Pharmacology and Professor of Preventive and Social Medicine. The diagnosis of recurrent pneumonia was done according to IAP guidelines. Before confirming diagnosis child is examined carefully and necessary investigations like CBP, CRP, CUE, Chest-X-Ray, ultra sound scanning, CT scan Chest if necessary were done. Team approach was there and One Nutritional Counselor was there to guide the parents how to supplement this product and to look after the children under follow up. Parents / Guardians and other family members were given counseling and education regarding pneumonia, breast feeding and advantages of colostrum. Local ANMs and other health workers were also advised to follow up the children under study and to refer to the hospital whenever required. Calculations and data analysis were done by experienced Statistical Officer.

However, this study was conducted in children, who were attending to our hospital. Thus our findings may not represent the exact picture in the population. In our study 53.19 % (n=25) of children were didn't improve even after supplementation with bovine colostrum and the severity of symptoms, number of pneumonia attacks and hospital admissions were almost remain same or no significant change was noted. This indicates there are other factors influencing the disease pattern like nutrition, socio-economical status, and environmental conditions etc.

Recommendations:

Colostrum is the first milk produced by mammals for their young ones. This transfers the passive immunity gained by the mother to the baby. The bovine colostrum (BC) can be obtained in large quantity and has properties similar to human colostrum. It has been used for various disorders of the body. It has properties to stimulate immune system, contains growth factors and many bioactive substances needed for the body to combat with wear and tear^[12,13].

Respiratory and diarrheal diseases are major causes of morbidity and mortality in developing countries^[14,23]. The BC has been used for various gastrointestinal disorders, respiratory tract infection, rheumatoid arthritis, healing injured tissues of body etc. There are not much double blind placebo-controlled trials to prove its efficacy, though a lot of experience about its good effects in various disorders is available in the literature. The dosage and duration of therapy need to be worked up. The BC has potential to treat as well to prevent certain diseases in the body. In future this will prove to be a very useful product to treat and control diseases in a natural way^[30,31]. Further studies and research will be needed.

CONCLUSION

Recurrent Pneumonia in children is an illness that consists of repeated or frequent episodes of pneumonia. It is a concerning and potentially dangerous condition in children. Children may need to be hospitalized for more intense treatment. We conducted a study on children suffering from recurrent pneumonia by supplementing bovine colostrum along with other treatment modalities.

Colostrum is the fluid produced by mammary glands during the first 2 to 4 days after birth, before milk is produced. It is a rich natural source of nutrients, antibodies, and growth factors for the newborn^[11]. Bovine colostrum is collected from dairy cows shortly after calving.

Our study is an observational study conducted upon 47 children (n=47) who were attending to outpatient department with recurrent pneumonia. Age Group included was 6 months to 5 years. We used a commercial product as supplementation which is in powdered form containing bovine colostrum. The results of this study show 46.81% (n=22) of children after 2 months of supplementation with bovine colostrum had decreased attacks of pneumonia, severity of symptoms and hospital admissions. With the supplementation of bovine colostrum the rate of pneumonia attacks was decreased 38.66 % and the rate of hospital admission decreased 46.29 % in children suffering from recurrent pneumonia.

The use of colostrum for both medicinal and spiritual purposes has been noted in the traditional Ayurvedic medical system and among the ancient Hindu rishis (spiritual leaders) of India. Albert Sabin isolated antipolio antibodies in bovine colostrum in the 1950s and the first experiments with hyperimmune colostrum were conducted in the 1960s. Prior to the advent of sulfa drugs and other antibiotics, colostrum was used to boost defense against immune diseases. Finally this study suggests that bovine colostrum can be used as supplementation in recurrent pneumonia in children for better results.

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