

Bacteriology of feeding bottles

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Abstract

The study was conducted to determine the bacteriological quality of 112 infants' feeding bottles. Samples were collected from the feeding bottles brought by the caregivers of infants in the OPD of Dept. of Pediatrics, Nalanda Medical College and Hospital, Patna from the period of August 2015 to October 2016. The study was selected because it has been observed that more number of babies were found to be sick that were bottle fed than breast fed infants presenting in the OPD, also bottle fed infants had multiple OPD visits compared to breast fed infants. The coliform group of bacteria, like E.Coli,⁴ Enterobacter spp., Klebsiella spp., Citrobacter spp.; enteric pathogens such as enteropathogenic E.Coli, Salmonella, Shigella spp., S. aureus, and Bacillus cereus; fungus like Candida were isolated in the significant colony count of 10⁴ colonies/ml or more from inoculation of swab samples of feeding bottles or nipples in the appropriate culture media. Not only the milk, but the process of storage and milk preparation itself contributes to the growth of bacteria. Contamination due to improper cleaning, disinfection and handling of feeding bottles as well as repeatedly feeding of the milk kept in the feeding bottle over prolonged period of time has been observed to cause infections in bottle fed infants. In the results shown, high level of bacteriological contamination of milk is apparent which is caused due to the incorrect dilution, improper storage, inadequate cooking and poor hygiene. Nursing mothers should be taught on the proper handling of feeding utensils and emphasize on the superior quality of breast milk. To reduce the diarrheal diseases in infants, well controlled community based, longitudinal studies are recommended.

Keywords: Feeding bottle, Bacterial contamination, Diarrheal illness, Recurrent illness.

Introduction

Many studies, over the years, indicate that the infants' morbidity and mortality are influenced by the mode of infant feeding practices. In the developing countries, bottle feeding is more risky with low sanitation and nutrition. In spite of multi-pronged strategies to discourage the practice by various Govt. and non Govt. organizations, suboptimal hygiene and poor sanitation in communities of Bihar pose high risk of bacterial infection in bottle fed infants. Lower educational standard of mothers and caregivers¹ along with false beliefs about the beneficial effect of cow's milk and formula milk substitutes, contributes to the continuation of these practices by the mothers prevalent in the society.² Because of the financial constraints and taboos prevailing in the society, over diluted feeds are often given to the babies that leads to under-nutrition and growth faltering. Infants who are not breastfed exhibit a higher incidence and severity of diarrheal illnesses, demonstrating the connection between infant feeding practices and the risk of diarrhea.³

Aim

1. To ascertain the incidence of significant infections in bottle fed infants leading to both increased number of outdoor visits and indoor admissions for serious illnesses.
2. To recognize the culprit organism, so as to help in management and re-establish the menace of baby feeders.

Materials and Methods

The study was conducted to know the prevalence and types of pathogenic bacterial flora of the feeding bottles. Mothers in the waiting room were asked to provide a 10ml sample of milk from the bottle they were using to feed their infants. All the feeding bottles were selected independent of the age of the baby, duration of bottle feeding and claimed level of hygiene and educational background of caregivers, after taking informed verbal consent of the parents after explaining the nature and intent of investigation. Each child's weight, age and history of illness in the preceding month were recorded. Samples were selected by "systematic selection" method to reduce probability of bias. All the selected "in-use" feeding bottles of the patients presenting with either gastrointestinal complaints or symptoms of URTI with poor health or poor weight gain were sent for sampling. Samples were collected from bottle as well as inner surface of the nipples and were subjected to bacterial incubation in various culture mediums including blood agar Mac-Conkey's agar and Sabouraud medium for fungal culture. Fresh isolates identified using routine biochemical tests and subjected to susceptibility testing by disc diffusion assay as per CLSI guidelines. Aerobic quantitative culture was done by plate count of serial dilution on nutrient agar. In anaerobic medium, the "standard roll method" was used in semi-solid medium after growth in CO₂ incubator at 37°C. Representative colonies were picked for bacterial characterization by sugar fermentation. Pathogenic characterization was not done of the E.Coli. Experiments were done to see the

effect of time lag between sampling and arrival at the lab in the field of study.

Result

Of the total of 112 bottles subjected to bacteriological culture, 97 (87%) bottles were found to be infected with bacteria (bacterial load of more than accepted level of 2×10^4 CFU/ml of bottle contents). 11 out of 112 bottles (12%) had bacterial isolate of less than the cutoff value of 104CFU/ml. 5 out of 112 bottles did not yield any bacterial isolate.

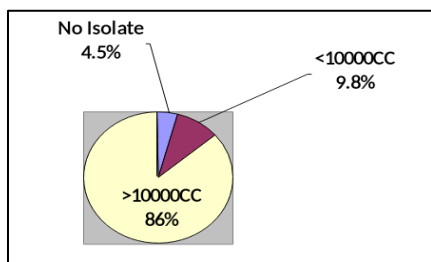


Fig. 1: Incidence of colony count on sample of baby feeder

A formula milk or animal milk fed child with a feeding bottle and living in unhygienic conditions is between 6 and 25 times more likely to die of diarrhoea and 4 times more likely to die of pneumonia than a breastfed child.⁵ Infection with enterobacter sakazakii can cause illness in all age groups, infants are believed to be at greatest risk of infection and such infections are under reported.⁶

Table 1:

Organism	No of Cases	%
E.Coli	32	32.9%
E.Sakazakii	26	26.8%
Enterobacteriaceae	14	14.4%
Klebsiella spp	7	7.2%
Candida	6	6.6%
Staphylococci	5	5.2%
Strepto. faecalis	3	3.09%
Pseudomonas spp	3	3.09%
Total	97	

The organism most commonly isolated was E.coli at 32.9%, E.sakazakii at 26.8%. Enterobacteria was responsible was 14% of cases followed by Klebsiella spp, Candida albicans and Staphylococci spp. In our study we concluded that E.coli and E.Sakazakii are important causative pathogens in bottle fed infants and this is in accordance with the study conducted by Redmond, E. C.

Discussion

In spite of repeated advice to the mothers about the importance of breast feeding many a times, the mothers either stops breast feeding due to one pretext or the

other or tend to use top (bottle) feeding in the wrong notion of inadequate supply of breast milk. The assumption that if the mother is sick, she may transfer the disease to the baby is another important concept which the illiterate mothers were found to have. Apart from that, infant formula milk advertisement and advice by relatives often leads the unsuspecting illiterate mothers to use formula/cause milk in the false belief of extra health benefits of the babies. The vicious cycle of drawbacks of over diluted formula milk superimposed with contamination of the feeding bottle/utensils sets in resulting in under nutrition, repeated infections in the babies. Multiple logistic regression analysis indicated that the probability of a milk sample being positive for bacterial contamination was higher by 20 times when unclean utensils were used, by 3 times if mothers hands were dirty and by 2.8 times if the mothers were illiterate. The odds of contamination by pathogens was 25.7 times higher if the feeding utensils were dirty.⁸ of the bacterial isolates in the present study E.Coli outnumbered all other bacteria followed by E.Sakazaki, enterobacteriaceae etc. In our study, we also found one case of fungal infection (candida) which was an unusual finding.

Conclusion

In the present study, it was observed that 87% of feeding bottles were found to be infected with different coliform and other bacterias. In one case a fungal infection was also isolated. All the children in the study were found to be either malnourished or having repeated illnesses leading to multiple out door visits and/or hospital admissions. It is concluded that bottle feeding is a health hazard to the babies and more aggressive infant and young child feeding counseling strategy has to be adopted to improve the mortality and morbidity of the infants.

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