

Faecal Contamination of Feeding Bottles Contents, Among Artificially Fed Children

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Abstract:

This study was carried out to investigate the bacterial contamination of feeding bottles contents in artificially fed children presenting with diarrhoea at the Paediatric outpatient clinic in Khartoum Hospital.

Methods: Hundred bottle fed infants presenting with diarrhoea were included in the study. Specimens were collected from the contents of the feeding bottles and the faeces of children.

Results: Hundred and ten bacterial species were isolated from the contents. *E. coli* was the commonest isolate [33 (30%)]. Different other bacterial species were also isolated with very high count (1×10^6 - $> 15 \times 10^5$ /ml). Twenty one enteric pathogens were isolated from the stool specimens [Enteropathogenic *E. coli* (7) and *Shigella species* (14)]. The antibiotic sensitivity of the *E. coli* and *Shigella species* showed high resistance to co-trimoxazole (57.5%, 53.3% respectively) and to co-amoxiclav (85% - 53.3% respectively).

Conclusion: Awareness to the hazards of the feeding bottles among the community should be raised and breast feeding should be encouraged.

Key words: diarrhea, enteric pathogens, *E. coli*.

Breast feeding is a biological and cultural system, specifically meant to preserve and maintain human race¹. Women milk is a perfect food for babies. It has the right amount of body building proteins required for the growth of children. It has plenty of energy giving carbohydrates, fats, vitamins, minerals and water². The nutritional and immunological characteristics of human milk are considered vital resources in promoting healthy growth and development of infants^{3, 4}. In many countries artificial feeding is still practiced today in both large cities among wealthier population and in rural areas⁵. In industrial populations the prevalence of breast feeding is going down. Few mothers continue breast feeding towards or beyond 12 months. Complementary bottle feeding is used instead of breast feeding⁶.

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In developing countries and crises affected areas, health risks associated with bottle feeding are dramatically increasing due to poor hygiene, crowding and limited safe water supplies⁷. Globally, most of the deaths related to artificial feeding, are due to diarrhoeal illness. The mortality risk for artificially fed infants is several times higher than breast fed babies⁸. Reports of deaths in young children, in many of the developing countries are attributable to failure of breast feeding^{9- 11}. Diarrhoeal incidence among bottle fed children may be influenced by bacterial contamination during food handling, preparation, storage and poor food hygiene practices^{12- 14}.

Methodology:

This study was conducted in Khartoum State. The infants included in the study were bottle fed and suffering from diarrhoea. Hundred infants were included in the study. Twenty ml of the content of the feeding bottles was collected in sterile disposable plastic container. Stool samples were also collected from the children. The specimens of the feeding bottles were diluted

in sterile physiological saline (1/10, 1/100, 1/1000). All original and diluted samples were cultured on blood agar, Mc Conkey agar and nutrient agar plates. The stool samples were cultured on Mc Conkey agar, xylose lysine de-oxycholate (XLD) agar and selenite F broth. All inoculated media were incubated at 37 °C. After an overnight incubation, the growth was examined and identified using staining methods, biochemical testing and serological tests, whenever indicated. Antimicrobial sensitivity testing was done for the isolated enteric pathogens using modified Kirby – Bauer method¹⁵. The antibiotics used were cephalixin (30 µg), nalidixic acid (30 µg), gentamicin (10 µg), co-trimoxazole (25 µg) and co-amoxiclav (38 µg).

Results:

Different types of contents were noticed in the feeding bottles (45 water with sugar, 33 juices and 22 milk). High bacterial counts were detected in all types of contents (table 1).

Table 1: Relationship between bottle contents and the bacterial count.

RBC	Bottle Content		
	Milk	Juice	WWS
1 – 1X10 ⁶	7	3	3
1.1 – 5X10 ⁶	5	11	20
5.1 – 10X10 ⁶	3	11	14
-15X10 ⁶	1	5	5
>15X10 ⁶	6	3	3

RBC= Range of Bacterial Count.

WWS= Water with Sugar.

Table 2: The antibiotic susceptibility of the isolated enteric pathogens.

Antibiotic	<i>E. coli</i> (40)		<i>Shig. spp.</i> (15)	
	Sensitive	Resistant	Sensitive	Resistant
Cephalexin	18 (45%)	22 (55%)	15 (100%)	--
Co-trimoxazole	17 (42.5%)	23 (57.5%)	7 (46.7%)	8 (53.3%)
Gentamicin	38 (95%)	2 (5%)	9 (60.7%)	6 (40%)
Nalidixic acid	32 (80%)	8 (20%)	14 (93.3%)	1 (6.7%)
Co-amoxiclav	6 (15%)	34 (85%)	7 (46.7%)	8 (53.3%)

The total bacterial isolates from the contents of the bottles were 110. Some of the specimens yielded more than one bacterial species. The types of the bacteria isolated were as follows: *E. coli* 33 (30%), *Strep. Faecalis* 19 (17.3%), *Enterobacter spp.* 16 (14.5%), *Cedacae davisae* 9 (8.2%), *Klebsiella spp.* 7 (6.4%), *Staph. Aureus* 7 (6.4%), *Candida spp.* 6 (5.5%), *Proteus spp.* 4 (3.6%), *Pseudomonas spp.* 3 (2.7%), *Citrobacter spp.* 3 (2.7%), *S. Cholerae suis* 2 (1.8%) and *Shigella flexeri* 1 (0.9%).

The enteric pathogens isolated from the stool specimens were: Enteropathogenic *E. coli* (7), *Shigella flexeneri* (9), *Shigella dysentriae* (3), *Shigella boydii* (1) and *Shigella sonnei* (1).

The antibiotic susceptibility of *E. coli* isolates and *Shigella spp.* showed moderate

resistance to co-trimoxazole and co-amoxiclav, (table 2).

Discussion:

Bottle feeding plays a major role in diarrhoeal diseases and malnutrition in young children. It is rather difficult to prevent bacterial contaminations of the feeding bottle contents during preparation and handling. Poor hygiene practices further exaggerate the problem. The samples tested in this study were derived from both bottles content and the stool from the infected infants. *E. coli* (30%), was the commonest isolate from the bottles content. It is the common known indicator of fecal contamination of water supplies. Its presence indicates unsafe water for consumption by human beings¹⁶. Enteropathogenic *E. coli* and *Shigella spp.* were isolated from the stool of the targeted

infants, proving that fecal contamination of the bottles content plays a major role in the exposure to enteric pathogens. Similar results were reported from Saudi Arabia, Bengal, South Africa, Netherland and Brazil where Enteropathogenic *E. coli* and *Shigella spp.* were found to be the commonest cause of diarrhoea in children¹⁷⁻²¹. Antibiotic sensitivity of the isolated enteric pathogens revealed resistance to the commonly used antibiotics in accordance to other findings^{22, 23}. The exposure of the children to bacterial strains carrying resistance to the commonly used antibiotics will lead to the colonization by such organisms. This will divert the prescriptions towards more potent and expensive antibiotics in the future.

Conclusion:

In conclusion, bottle feeding has a negative impact on infants' health by enhancing the spread of enteric pathogens causing diarrhoeal diseases. Health education of the public should be adopted to increase the awareness of the danger of feeding bottles and to encourage breast feeding as the natural safe procedure.

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