

CONTAMINATION OF WEANING FOODS AND TRANSMISSION OF *E. coli* IN CAUSATION OF INFANTILE DIARRHEA IN LOW INCOME GROUP IN CHANDIGARH

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ABSTRACT

Samples of weaning foods and other sources of contamination, such as water, mother's nails, utensils and swab samples of feeding bottle nipple, mother's teats and child's hands were collected from a total of 100 houses of Low Income Group (LIC) in Chandigarh. A high incidence of E. coli isolation (72.3%) was noticed amongst the collected samples. Seventy nine per cent of storage containers of water exhibited the presence of E. coli. Eighty per cent of the children had diarrhea even when exclusively breastfed. Sixty six per cent children were weaned within 3-6 months; the ratio increasing with increase in the educational qualification of the mother. Eighty out of the total 100 households which had a history of infantile diarrhea exhibited 80.9% E. coli isolation.

Keywords: Weaning food, Breastfeed, Contamination.

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Children of the tropical countries and developing world when being weaned, experience one billion episodes of acute diarrheal diseases annually and 0.5% of these have a fatal outcome(1). Food contamination is believed to be a major source of infection(2). The chances of contamination and cross contamination are high in poor communities due to unsatisfactory environmental conditions, fatuous customs and habits as also prolonged and improper storage of food. The present study was undertaken to gain insight into sources of contamination of child's weaning food as also various modes of transmission of *E. coli* into the child's body and their role in causation of infantile diarrhea.

Material and Methods

Three colonies of a sector were selected for the study on the basis of same income level, that is, total family income less than Rs. 2000 per month constituting Low Income Group (LIG). Subsequently, one hundred houses were randomly chosen for the study. One hundred samples each of weaning food, water, utensils and mother's nails were collected from each of the houses surveyed. The swab samples from bottle nipple were collected from 78 houses where the children were being bottle fed. Subject to the consent of the mother, 21 swab samples of mother's teats and 35 swab samples of child's hands were also obtained. Hence, a total of 534 samples were screened.

The samples were processed within an hour of procurement. All the samples were streaked on MacConkey's agar and the non-mucoid lactose fermenting colonies were picked up and cultures

purified by plate streak method on Eosin Methylene Blue agar. The purified cultures were identified on the basis of colony morphology. Gram staining and specific biochemical tests. Classification of bacteria was done based on Bergey's Manual of Systematic Bacteriology(3).

A questionnaire on the feeding and weaning practices of low income group mothers was prepared and filled in by the interview method.

Results

Breastfeed is the most important and least expensive component of a child's food in the first three to five months of his life—it is the best insurance against a life of malnutrition and illness. In the present study, it was noted that 99% children were breastfed at birth, 95% for the first nine months, 68% till 1 year of age and 1% of children were breastfed even at 2 years. Weaning foods were introduced within 3-6 months among 66% of the children though variation spanned from less than 3 months till

about 12-18 months. Age of weaning in relation to educational qualification of the mother is depicted in *Table I*.

Instances of diarrhea during weaning or when the child was only breastfed are tabulated in *Table II*. *E. coli* isolates from weaning foods and other sources of contamination as water, mother's nails, utensils, feeding bottle nipple, mother's teats and child's hands are given in *Table III*. Overall 72.3% *E. coli* were isolated from a variety of samples.

Drinking water was stored in earthenware, plastic containers or metal utensils. The *E. coli* isolates noted in stored water are shown in *Table IV*; 79% of storage containers were contaminated with *E. coli*.

"Finger feeding" was noted to be the most common method of feeding in 67% of cases and the remaining 33% mothers used a spoon to feed their children. The concept of sterilization of feeding bottle was lacking in LIG houses though 33%

TABLE I—Age of Weaning in Relation to Educational Qualification of the Mother

Educational qualification	No.	Age of weaning				Did not breastfeed
		<3 mo	3-6 mo	6-12 mo	12-18 mo	
Illiterate	46	4 (8.7)	25 (54.4)	15 (32.6)	2 (4.3)	-
Under-matriculate	28	1 (3.6)	20 (71.4)	6 (21.4)	-	1 (3.6)
Matriculate	17	1 (5.9)	13 (76.5)	3 (17.6)	-	-
Senior-secondary	5	-	4 (80)	1 (20)	-	-
College educated	4	-	4 (100)	-	-	-
Total	100	6	66	25	2	1

Figures in parenthesis indicate percentage.

TABLE II—Instances of Diarrhea During Breastfeeding Alone and During Weaning

Status	Before weaning	After weaning	
	Exclusive breastfeeding	Weaning with breastfeeding	Weaning without breastfeeding
Diarrhea	80	51	29
No diarrhea	20	15	5
Total	100	66	34

TABLE III—*E. coli* Isolation from Various Samples Collected

Sample	No. of samples collected	<i>E. coli</i> isolated	% isolation
Weaning food	100	56	56
Water	100	79	79
Mother's nails	100	79	79
Utensils	100	66	66
Feeding bottle	78	56	71.8
Mother's teats	21	19	90.5
Child's hands	35	31	88.6
Total	534	386	72.4

mothers did boil the feeding bottle and nipple, once in the morning. The duration of boiling lasted till the appearance of first bubbles of steamed water. Subsequently, in 20% of the cases, bottles were left in the water until needed.

Regarding introduction of weaning foods, 78% mothers gave a part of elder's daily meals and 14% made special meals for the child whereas the remaining 8% made special weaning foods separately, only if the child demanded.

It was also noticed that 44% mothers

TABLE IV—Means of Storage of Water and *E. coli* Isolation

Sample	No. of samples collected	<i>E. coli</i> isolated	% isolation
Earthenware	37	30	81.1
Metal utensils	21	16	76.2
Plastic containers	42	33	78.6
Total	100	79	79

did not reheat the food before serving to the child if it was cooked in advance; but 46% mothers made it lukewarm, the duration of heating ranging from 2-3 minutes and a meagre 10% boiled the food for 5-7 minutes before feeding it to children.

A high *E. coli* isolation of the order of 80.9% was observed in 80 of the 100 households where the infants had a diarrheal history and a significant correlation was found between the same. Nevertheless, 38.5% *E. coli* isolation was observed in 18 households without any history of infantile diarrhea. Merely 2 houses were observed without any history of infantile diarrhea and *E. coli* isolation.

Discussion

The prime necessity of providing hygienic and nutritious weaning food lies with the mother and education has an impact on early and hygienic weaning. As noted in this study, the percentage of mothers weaning their children at the appropriate age of 3-6 months increased in consonance with educational qualification.

The maximum incidence of diarrhea has been reported during the weaning phase(4). The presence of *E. coli* in almost all types of weaning food samples has also been reported(5). A high incidence of *E. coli* isolation from other sources of contamination as noted in this study may also have contributed to the diarrhea associated with weaning; especially so with 91.5% *E. coli* isolation from mother's teats. Eighty per cent children suffered diarrhea even when exclusively breastfed. This may be due to the lack of knowledge of mothers with respect to wearing clean clothes or cleaning the teats before feeding. Unhygienic storage of food and water and subsequently inappropriate heat treatment rendered to the foodstuffs before feeding supports the multiplication of bacteria. Further, "finger feeding" results in transfer of causative organisms from mother's hands to child's hands, utensils, her own teats and ultimately into child's body thereby reverberating

cross contamination from one source to another. So, personal hygiene is of utmost importance in prevention of diarrhea.

Although the literacy rate of Chandigarh where the study was conducted is 78.6% (UT Administration, 1991 census); still the knowledge about sanitation and hygiene eludes the mothers in low income group families. This is compounded by the insanitary environmental conditions prevailing in such communities.

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