

## Original Articles

# Protective Effect of Breast Milk Against Urinary Tract Infection

B FALAKAFLAKI, A AHMADIAFSHAR

### Abstract

**Objective:** Human milk provides protection against infections. Protection against gastrointestinal and respiratory infections and otitis media is well documented. Protection against urinary tract infection is less recognised. The aim of this study was to assess the possible protective effect of breast feeding against urinary tract infection in children. **Methods:** In this prospective case-control study, cases were 50 infants with documented urinary tract infection during the first year of life and controls consisted of 50 healthy children less than 1 year. The children according to the type of feeding were categorised into three groups: breast feeding, formula feeding, mixed feeding. **Results:** Breast fed infants had significantly a lower risk of urinary tract infection (UTI) than formula fed and mix feeding infants (OR=0.1 95%CI, 0.027-0.329 and OR=0.33 95%CI, 0.124-0.866 respectively). Mix-fed infants had a decreased risk of UTI than formula-fed infants (OR=0.3 95%CI, 0.091-0.92). A longer duration of breast feeding gave a lower risk of UTI (OR=0.29 95%CI, 0.121-0.714). **Conclusion:** On the basis of this data, breast feeding has a protective effect against urinary tract infection.

### Key words

Breast milk; Feeding; Urinary tract infection

### Introduction

Many factors are involved in infants' health; one of the most important of them may be the kind of early feeding.<sup>1</sup> Human milk is specific for the needs of the human infant for optimal growth of brain and body.<sup>2</sup> Breast milk contains hormones, growth factors, cytokines, cells, etc., and offers

many advantages over formula.<sup>3</sup> Recent evidence suggest that breastfeeding provides protection against infections. Protection against gastrointestinal and respiratory infections and otitis media is well documented. Protection against urinary tract infection (UTI) is less recognised.<sup>2</sup>

UTI is the second most common bacterial infection in children after those of the respiratory tract.<sup>4</sup> By the age of seven 8.4% of girls and 1.7% of boys will have suffered at least one episode.<sup>5</sup> The incidence of UTI in children is highest during 1st year of life.<sup>6</sup> UTIs are important in view of their acute morbidity and long-term risk of renal scarring.<sup>4</sup> UTI is usually an ascending infection caused by bacteria derived from stools. Since the bacterial composition of stools is dependent on the diet, it is likely that the risk of UTI will change with changes in the diet.<sup>7</sup>

Limited data are available on the effects of nutrition on UTI in children.<sup>7</sup> The objective of this study was to assess the possible protective effect of breast feeding against UTI in children.

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## Methods

This prospective case-control study was conducted from February 2004 to July 2005 to study the possible protective effect of breastfeeding against UTI in children.

Case patients were 50 infants with documented UTI during the first year of life, admitted consecutively in pediatric ward of Valiasr Hospital in Zanjan (a city in northwest of Iran). UTI was defined as any bacterial growth in urine obtained by suprapubic aspiration, the growth of  $>10^4$  Colony-Forming Units (CFUs) per mL for single pathogen in specimens obtained by transurethral catheterisation, or the growth of  $>10^5$  CFUs/mL of a single species in two consecutive urine obtained by bag in a symptomatic infant.

The control group consisted of 50 healthy children less than 1 year, visited for routine check up in a well-baby clinic. In apparently healthy infants with no history of previous UTI, urinalysis and urine culture were taken. If the results were negative for UTI they were considered as control group. Control infants were matched for age and gender and included simultaneously for each case during the first days after diagnosis. We tried to select control group from a similar population of children that would be admitted to the study hospital.

We matched or taken into consideration all of predisposing factors for UTI, such as constipation, poor perineal hygiene, type and number of nappies, circumcision, socioeconomic status. The characteristics of two groups were showed in Table 1. Low birth weight infants were excluded from the study.

The children according to the type of feeding were categorised into three groups: breast feeding (exclusively breast feeding for 4-6 months period and thereafter continuing breast feeding with complementary feeding), formula feeding (feeding with formula, no breast feeding), mixed feeding (both breast milk and formula feeding). The initiation time and type of solid/semi-solid food in cases and controls were similar.

Information including the age, sex, feeding type and duration of breast feeding were recorded.

The analysis was performed using SPSS (version 11.5). Chi-square test or fisher's exact test were used. We have calculated odd ratios (OR) and its 95% confidence intervals. Statistical significance was defined as P-value  $<0.05$ .

## Results

In total, 100 children (46 boys, 54 girls) aged 0-12 months (mean age  $8.9 \pm 3.2$  months) were included in the analysis. Cases were fifty infants (21 boys, 29 girls) with documented UTI (mean age  $8.7 \pm 3.3$  months). Fifty healthy infants (25 male, 25 female) served as controls (mean age  $9.1 \pm 2.9$  months). Cases and controls were similar, with no statistically significant differences in age and sex (Table 1). The initiation time of complementary feeding\* was between 4-6 months in both case and control groups.

Type of feeding in cases and controls are showed in Table 2. Of total 100 infants, 34% (n=34) were breast feeding, 24% (n=24) formula feeding, and 42% (n=42) mixed feeding.

Breast fed infants had significantly a lower risk of UTI than formula fed infants ( $P=0.00$ ,  $OR=0.1$  95%CI, 0.027-0.329). In addition breast feeding gave a lower risk of UTI compared with mix-feeding ( $P=0.034$ ,  $OR=0.33$  95%CI, 0.124-0.866). Mix-fed infants had a decreased risk of UTI than formula-fed infants ( $P=0.038$ ,  $OR=0.3$  95%CI, 0.091-0.92).

A longer duration of breast feeding gave a lower risk of UTI. Mean duration of breast feeding in cases was  $3 \pm 1.5$  months and mean duration of breast feeding in controls was  $8.5 \pm 2$  months. Duration of more than 6 months were accompanied with decreased risk of UTI compared to duration lower than 6 months (Table 3) ( $P=0.01$ ,  $OR=0.29$  95%CI 0.121-0.714).

Note: \*complementary feeding: Solid foods and liquids other than breast milk or formula.

## Discussion

In the present study breast fed infants had a lower risk of UTI than formula and mix-fed infants. Mix feeding accompanied with decreased risk of UTI compared to formula feeding. The longer the duration of breast feeding, the lower risk of UTI.

In a retrospective analysis of 145 children with UTI within the first 120 days of life, it is suggested breast feeding could be a protective factor against UTI.<sup>8</sup> The results of several case-control studies supported the hypothesis that breast feeding protect infants against UTI.<sup>9-11</sup> One study in Iran revealed significant association between breast feeding

**Table 1** Characteristics of two groups

Variables		Case group (n=50)	Control group (n=50)
Sex	Female	29	25
	Male	21	25
Age	≤ 6 months	1	1
	> 6 months	49	49
Circumcised (male)	Yes	18	21
	No	3	4
Hx of previous UTI	Yes	2	0
	No	48	50
Constipation	Yes	3	1
	No	47	49
Mean diaper change/day		6	6

Hx=history UTI=urinary tract infection

**Table 2** Type of feeding in cases and controls

	Breast feeding n (%)	Formula feeding n (%)	Mix feeding n (%)
Case	9 (26.5)	19 (79.2)	22 (52.4)
Control	25 (73.5)	5 (20.8)	20 (46.6)
<b>Total</b>	<b>34</b>	<b>24</b>	<b>42</b>

**Table 3** Duration of breast feeding in cases and controls

	Case n (%)	Control n (%)
≤6 months	23 (69.7)	10 (30.3)
>6 months	27 (40.3)	40 (59.7)
P=0.01, OR= 0.29 95%CI, 0.121-0.714		

and lower prevalence of UTI in icteric neonates. In this study positive urine culture was significantly more frequent in formula-fed infants than in breast-fed infants (38.7% vs. 3%).<sup>12</sup>

The results of our study which are in agreement with those obtained elsewhere emphasize that breast milk is a part of the natural defense against UTI. The difference in UTI risk between breast-fed and formula-fed infants is suggested to be due to the immunologic factors of the breast milk.

Measurement of secretory IgA (sIgA) in the urine of children with UTI showed highly elevated levels of sIgA. Urinary sIgA, an immunoglobulin synthesised locally in mucosal surface is an important immunological defense in preventing bacterial adherence to periurethral epithelia and uroepithelia.<sup>13</sup>

It is reported breast feeding was associated with higher levels of sIgA and IgA than bottle feeding. Acute UTI resulted in raised sIgA and IgA compared with controls. Urinary sIgA and IgA may be important for the reduced

incidence of UTI in breast-fed infants.<sup>14</sup>

Milk oligosaccharides can act as soluble receptors that block bacterial adhesion to the different epithelia. In one study human milk oligosaccharides showed a strong inhibitory capacity.<sup>15</sup> The oligosaccharide content of breast milk and urine from nursing mothers were very similar, and the pattern of oligosaccharides excreted by infants is also strongly correlated with that of breast milk. The oligosaccharides cause inhibition of bacterial adhesion, suggesting that breast feeding may have a protective effect on UTI in both mother and infant.<sup>16</sup>

Although we made every effort to select controls from a similar population of children that would be admitted to our hospital, a potential limitation of our study is the possibility of some unrecognised bias in the method of control selection. Also as it was ethically not possible to subject the control group to imaging studies (VUCG, DMSA), it is possible that the cases had more underlying renal abnormalities than did the controls.

## Conclusion

On the basis of this data, breast feeding has a protective effect against urinary tract infection, and a longer duration of breast feeding give a lower risk of UTI.

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