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Correlation between Breast Feeding and Respiratory Tract Infections among Children Aged Below Five Years Admitted to Fort Portal Regional Referral Hospital, Kabarole District-Uganda

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ABSTRACT

The study was done to determine the correlation between breast feeding and respiratory tract infections among children aged 5 years and below admitted at Fort Portal Regional Referral Hospital. A descriptive cross-sectional design technique was used in this investigation. To accomplish its goals, the research team used quantitative methodology. This used open-ended and closed-ended questions to investigate the link between respiratory illnesses and breast-feeding among children hospitalized at Fort Portal Regional Referral Hospital. the majority of the 355 breastfeeding children aged 4 years who were studied as mother-child pairs were male 178 (50.1%), had breastfed for more than six months 113 (31.9%), were born after 37 weeks of gestation 336 (94.6%), had received a vitamin D supplement at 6–12 months of age 188 (53%) and had attended daycare in their first two years of life 137 (38.6%), as shown in the study. There is a lower incidence of lower respiratory tract infections in kids under the age of five when breastfeeding exclusively for six months or longer. The results of this study are consistent with the idea that breastfeeding for a prolonged period of time protects against respiratory tract infections even after infanthood, confirming the current WHO guidelines to breastfeed for at least six months.

Keywords: breastfeeding, respiratory tract infections, children, five years

INTRODUCTION

Respiratory tract infections kill about 50 million people worldwide per year and affects infants in both community and health care settings [1, 2]. It is regarded as one of the main public health issues and a primary source of illness and mortality especially in many developing countries [3, 4]. The majority of these illnesses affect the upper respiratory system, with only 5% affecting the lower respiratory tract. URTIs affect the nasal passageways, throat, tonsils, and epiglottis, among other places [5]. Cold nasal discharge comprises dead cells from the nasal mucosa as well as germs. Pseudomonas spp., Streptococcus spp., Proteus spp., Klebsiella spp., Staphylococcus spp., Enterobacter spp., Acinetobacter spp., and Haemophilus influenzae are the most prevalent bacteria identified as causal agents of respiratory tract infections [6].Human milk, on the other hand, is a physiologically active material containing antibacterial, anti-inflammatory, and immunomodulatory chemicals that operate to compensate for the infant's immune system's physiologic immaturity [7-10]. Children who are not nursed have a relative immunodeficiency as compared to those who are breastfed, putting them at a much higher risk of respiratory and other illnesses [11-13]. Furthermore, breastfeeding develops a distinct maternal–infant physiology, involving crucial bacterial and hormonal interactions between the mother and child, as well as pressure gradients of suck and swallow that differ from those seen with bottle feeding [14].

URTIs are more common in Africa than the sickness itself. There is also a significant difference in the occurrence of acute respiratory disease between exclusively breastfed and mainly breastfed children. However, partly breastfed children have a substantially greater frequency, and there is a strong tendency of breastfeeding

patterns on ARI [15]. Thus, for disease (URTI), exclusive breastfeeding is not considerably more protective than predominant breastfeeding, but it is much more protective than partial breastfeeding [16-18]. Similarly, for acute respiratory infections, exclusive breastfeeding is not considerably more protective than predominant nursing, although it is much more protective than partial breastfeeding [19, 20, 21].

In Uganda, research on respiratory infections mostly focus on household awareness and the pharmaceutical therapy of URTIs, particularly ARIs, with medications, [22], cleanliness, and other interventions. Several studies have also found that breastfeeding lowers upper respiratory infections and that their correlation has an impact on bacterial upper respiratory infections in particular [20, 23]. However, there is generally limited data in the study area, that is, at Fort Portal Regional Referral Hospital, Kabarole district, and the Country at large, on the relationship between URTIs and breastfeeding among children, despite the fact that unpublished hospital data shows a continuing trend of URTIs among children. Therefore, the general objective of this study is to determine the correlation between breast feeding and respiratory tract infections among children aged 5 years and below admitted at Fort Portal Regional Referral Hospital.

METHODOLOGY

Study Design

A descriptive cross-sectional design technique was used in this investigation [24]. To accomplish its goals, the research team used quantitative methodology. This used open-ended and closed-ended questions to investigate the link between respiratory illnesses and breast-feeding among children hospitalized at Fort Portal Regional Referral Hospital.

Study setting

Questionnaires were used to achieve the descriptive cross-sectional design technique.

Study population

The study considered breastfeeding mothers nursing children aged 5 years and below admitted at Fort Portal Regional Referral Hospital.

Eligibility criteria

Study inclusion criteria

The study recruited only breastfeeding mothers nursing children aged 5 years and below admitted between February to July 2022 at Fort Portal Regional Referral Hospital.

Study exclusion criteria

- Mother – children pairs that are very ill were not considered for the study.
- Mothers who did not consent to take part in the study.

Sample size determination

Sample size for objective 1 (level of breastfeeding)

The sample size was determined using the (Daniel, 2009) formula.

$$S = \frac{Z^2{}_{\propto/2} \times P(1-P)}{\delta^2}$$

Where;

S=the sample size
Z=1.96 at 95% confidence interval.
δ=5% Margin of error
P= 90% of children attending Fort Portal Regional Referral Hospital acute pediatric unit are breastfed frequently (Hospital Records, 2019)

Therefore the sample size was; 130 mother-child pairs

Sample size for objective 2 (Prevalence of respiratory tract infections among children attending acute pediatric unit at Fort Portal Regional Referral Hospital

The sample size was determined using the (Daniel, 2009) formula.

$$S = \frac{Z^2{}_{\propto/2} \times P(1-P)}{\delta^2}$$

Where;

S=the sample size
Z=1.96 at 95% confidence interval.
δ=5% Margin of error

P= 30% of children present with common bacterial respiratory tract infections in Fort Portal Regional Referral Hospital.
Therefore the sample size was;

$$\frac{(1.96)^2 X\ (0.3)(1-0.3)}{(0.05)^2} = 322.6944$$

S= 322.6944

Sampling Techniques

The study applied convenient sampling method were admitted mother –children pairs were recruited as and when they were got from the study site until the desired sample size was realised.

Data collection

A pretested questionnaire and a checklist were used to collect data. To enhance and ease the data collecting procedure, the researcher and two assistants explained the questionnaires to the respondent(s). The researcher will train the assistants and pretest the questionnaire at Kampala International University Teaching Hospital to assure quality control.

Data Management and analysis

Descriptive statistics: The correctness and completeness of the questionnaire tools were be reviewed, and the data was coded and put into Epi info version 7, then exported to SPSS version 22.0 for analysis. The frequencies and percentages of the variables were summarized using graphs and tables.

Univariate analysis: Frequencies, percentages of the respondent's characteristics were produced. At a descriptive level, these variables were compared between the entire study samples. This was done using Pearson's Chi-square statistic. Statistical significance was considered to be *p*-value < 0.05. Unadjusted odds ratios with their corresponding 95% CI were reported; a variable was considered significant in this analysis if it had a p<0.05.

Multivariate analysis: All factors with p-value <0.1 were considered in the multivariate analysis which were performed to control confounding. Assumptions for use of multiple logistic regressions, e.g., the absence of multicollinearity among the independent variables, were explored. The goodness-of-fit test was performed on the final model to assess its quality. The factors in the final multivariate model were then reported together with their adjusted odds ratios and 95% confidence intervals. A variable was considered significant in this analysis if it had a p<0.05.

Ethical considerations

The Faculty of Clinical Medicine and Dentistry at Kampala International University's Western Campus was sought to grant ethical approval, and an introduction letter was sent to get authorization for data collection at Fort Portal Regional Referral Hospital. Before being enrolled in the study, the participants were asked to give written and verbal agreement [25].

RESULTS

The 355 breastfeeding mothers who participated in the study at Fort Portal Regional Referral Hospital had a mean age of 31.1 2.6 years, a majority of them had breastfed their children for more than six months (113), had at least a primary education (187), lived on less than one US dollar per day (216), were married or cohabiting with a partner (258), and had used alcohol (258) in the past month (60.8%).

Table 1: Maternal characteristics and breast-feeding duration of mothers at Fort Portal Regional Referral Hospital

Characteristics	Breastfeeding duration							
	Never		**< 3 months**		**3–6 months**		**>6 months**	
n = 355	**n = 60 (16.9%)**		**n = 107 (30.1%)**		**n = 75 (21.1%)**		**n =113 (31.9%)**	
	Number—% or mean ± SD		**Number—% or mean ± SD**		**Number—% or mean ± SD**		**Number—% or mean ± SD**	
Maternal characteristics								4.8
Maternal age—Mean (SD)	30.7	5.1	30.3	4.9	31.5	4.6	31.8	
Educational level – n (%)								15.4
No formal	16	26.7	26	24.3	09	11.8	17	
Primary	33	55.0	59	55.1	39	52.1	56	49.2
≥ Secondary	11	18.3	22	20.6	27	36.1	40	35.4
Household income per month – n (%)				59.8				58.5
<300,000 Shs	34	56.7	64		52	69.3	66	
>300,000 Shs	26	43.3	43	40.2	23	30.7	47	41.5
Marital status – n (%)								9.2
No partner	7	11.6	11	10.3	6	8.0	10	
Married/ Living together	53	88.4	96	89.7	69	92.0	103	90.8
Maternal BMI before pregnancy (kg/m2)—mean (SD)	23.9	4.3	23.9	4.4	23.1	3.6	23.1	3.6
Alcohol use during pregnancy – n (%)				44.8				43.1
Never	31	51.6	48		25	33.3	49	
Drank alcohol during pregnancy	29	48.3	59	55.1	50	66.7	64	56.9
Parity – n (%)				65.4				55.4
0	32	53.3	70		47	62.7	63	
1	28	46.7	37	34.6	28	37.3	50	44.6
Caesarean section – n (%)				85.1				89.2
No	50	83.3	91		65	86.7	101	
Yes	10	16.7	16	14.9	10	13.3	12	10.8

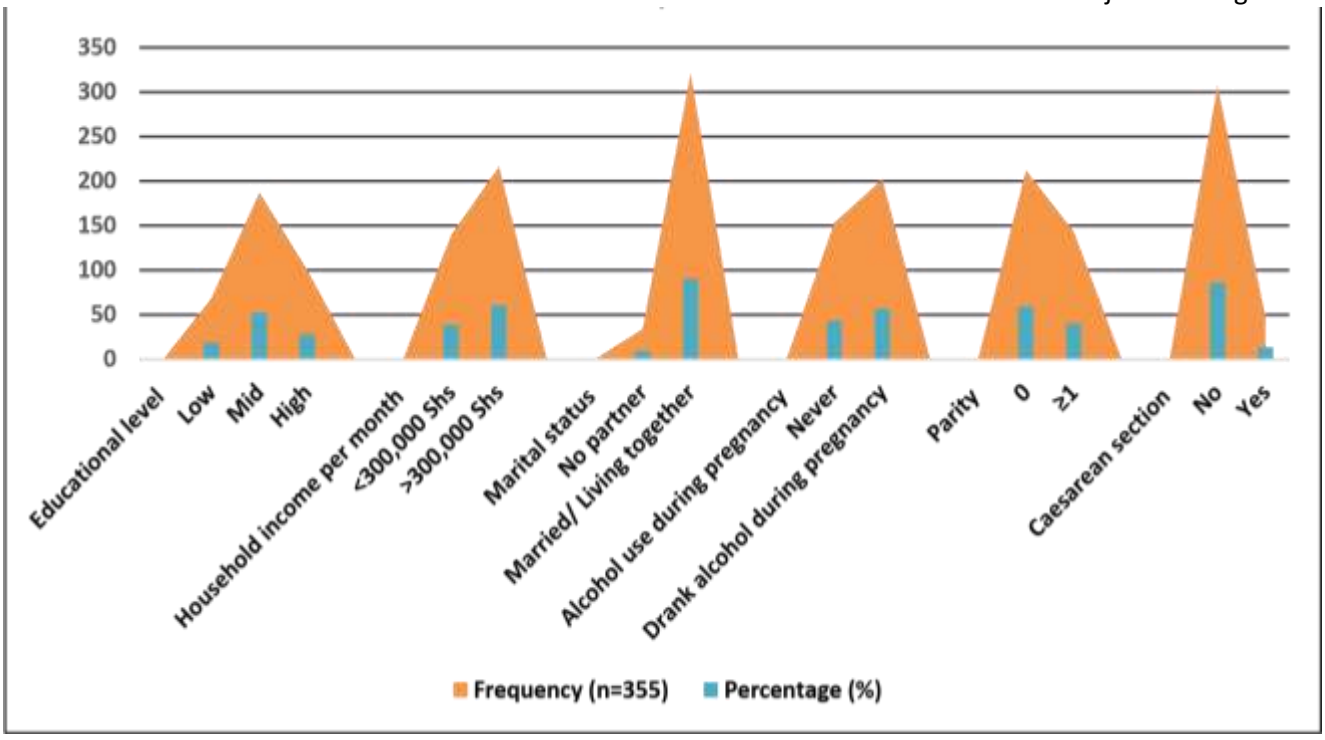

Figure 2: Area – Column graph showing maternal characteristics of mothers at Fort Portal Regional Referral Hospital

As shown in Table 2 and Figure 3, the majority of the 355 breastfeeding children aged 4 years who were studied as mother-child pairs were male 178 (50.1%), had breastfed for more than six months 113 (31.9%), were born after 37 weeks of gestation 336 (94.6%), had received a vitamin D supplement at 6–12 months of age 188 (53%) and had attended daycare in their first two years of life 137 (38.6%), as shown in the study.

Table 2: Characteristics of breast feeding children aged 5 years and below at Fort Portal Regional Referral Hospital

Characteristics	Breastfeeding duration							
	Never		**< 3 months**		**3–6 months**		**6 months**	
n = 355	**n = 60 (16.9%)**		**n = 107 (30.1%)**		**n = 75 (21.1%)**		**n =113 (31.9%)**	
	Number—% or mean ± SD		**Number—% or mean ± SD**		**Number—% or mean ± SD**		**Number—% or mean ± SD**	
Child characteristics								
Male – n (%)	31	51.7	55	51.4	38	50.7	54	47.7
Female	29	48.3	52	48.6	37	49.3	59	52.3
Gestational age at birth – n (%)				4.7				4.6
<37 weeks	4	7.7	5		5	6.7	5	
37 weeks	56	93.3	102	95.3	70	93.3	108	95.4
Vitamin D supplementation age 6–12 months – n (%) No	30	50.0	63	58.8	45	60.0	50	44.6
Yes	30	50.0	44	41.2	30	40.0	63	55.4
Day care attendance first 2 years – n (%)	17	28.3	25	23.3	67	89.3	28	24.6
No								
Yes	43	71.7	83	76.7	8	10.7	85	75.4

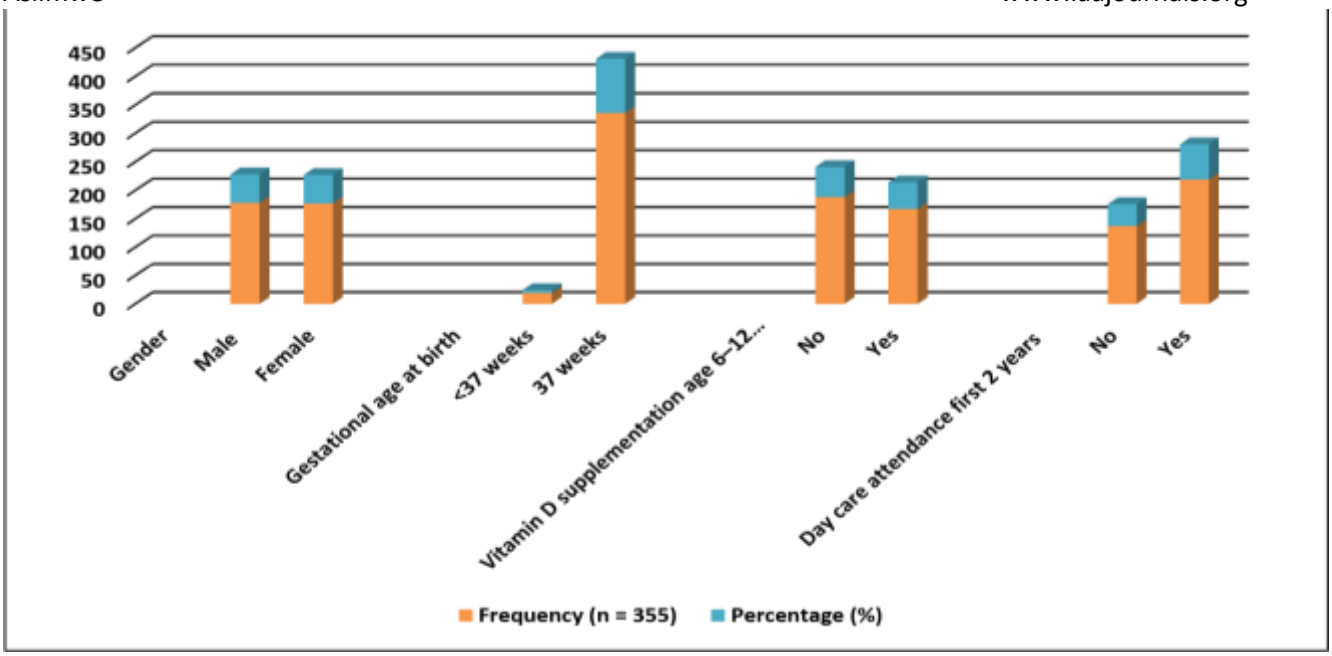

Figure 3: Stacked column graph showing characteristics breast feeding children aged 5 years and below at Fort Portal Regional Referral Hospital

In the second, third, and fourth years of life, 14% of the 355 children had experienced at least one episode of a lower respiratory tract infection. According to Table 3 and Figure 4, at least one episode of an upper respiratory tract infection was reported for 44% of children in their second year of life, 36% in their third year, and 31% in their fourth year.

Table 3: Prevalence of lower and upper respiratory tract infections among children aged 5 years and below at Fort Portal Regional Referral Hospital (n = 355)

Outcome	Age 2				Age 3				Age 4			
	Original data		Multiple imputed		Original data		Multiple imputed		Original data		Multiple imputed	
LRTI	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**
No	263	74	305	85.9	259	73	327	92.1	266	74.9	334	94
Yes	46	13	50	14.1	25	7	28	7.9	18	5.1	21	6
Missing	46	13			71	20			71	20		
URTI	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**
No	203	42.8	199	56.1	159	44.8	227	63.9	185	52	245	69
Yes	153	43.1	156	43.9	121	34.1	128	36.1	99	28	110	31
Missing	50	14.1			75	21.1			71	20		

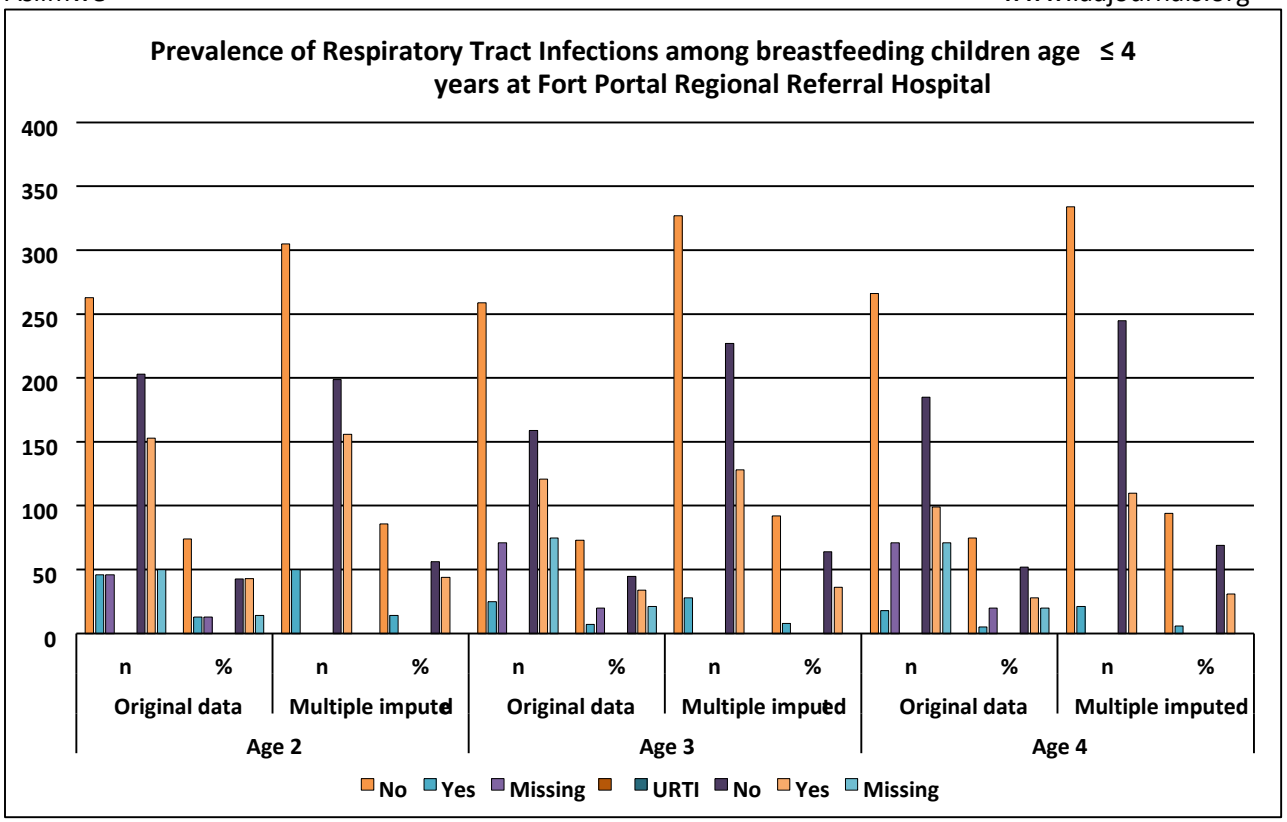

Figure 4: *Column graph showing prevalence of lower and upper respiratory tract infections*

In this study we compared children who were never breastfed and those that were breast fed. Compared to children who were never breastfed, breastfeeding for 6 months or longer was significantly associated with a decreased risk of lower respiratory tract infections after infancy up to 4 years of age. Similar correlation for lower respiratory tract infections were found with breastfeeding for less than 3 months and breast-feeding for 3–6 months but this was not statistically significant (aOR: 0.75; 95% CI: 0.56 – 1.00 and aOR: 0.75; 95% CI: 0.508 – 1.115). Although in the same direction, weaker ORs were found for upper respiratory tract infections and breastfeeding for less than 3 months, 3–6 months or 6 months and longer after adjustment for confounding variables (aOR: 0.86; 95% CI: 0.70 – 1.04) for less than 3 months, aOR: 0.91; 95% CI: 0.73–1.12 for 3–6 months and aOR: 0.85; 95% CI: 0.69–1.05 for 6 months and longer). The effects of the duration of breastfeeding on respiratory tract infections did not differ between the ages of 2, 3 and 4 years (P - interaction >0.23 for lower and upper respiratory tract infections) as shown in Table 4.

Table 4: Association between breastfeeding duration and lower and upper respiratory tract infections up to age 4 years among children at Fort Portal Regional Referral Hospital (n = 355)

Breastfeeding	n (%)	Lower respiratory tract infections		Upper respiratory tract infections	
		Univariate model	**Multivariable model 1**	**Univariate model**	**Multivariable model 1**
		OR (95% CI)	**aOR (95% CI)** [a]	**OR (95% CI)**	**aOR (95% CI)** [a]
Never	**60 (16.9%)**	***Reference***	***Reference***	***Reference***	***Reference***
< 3 months	107 (30.1%)	0.75 (0.56–1.02)	0.75 (0.56–1.00)	0.87 (0.71–1.06)	0.86 (0.70–1.04)
3–6 months	75 (21.1%)	0.72 (0.48–1.06)	0.78 (0.53–1.13)	0.80 (0.64–1.00)	0.91 (0.73–1.12)
≥ 6 months	114 (32.1%)	**0.63 (0.46–0.87)**	**0.71 (0.51–0.98)**	**0.78 (0.62–0.98)**	0.85 (0.69–1.05)
Never	406 (10%)	*Reference*	*Reference*	*Reference*	*Reference*
Partially until 4 months	2647 (64%)	**0.71 (0.54-0.92)**	0.66 (0.39-1.11)	0.93 (0.79-1.10)	0.86 (0.61-1.21)
Predominantly until 4 months	1056 (26%)	**0.52 (0.39-0.71)**	**0.53 (0.30-0.93)**	0.84 (0.70-1.01)	0.95 (0.66-1.37)

As presented in Tables 4 and 5; Partial breastfeeding until 4 months by mothers at Fort Portal Regional Referral Hospital was significantly associated with a decreased risk of lower respiratory tract infections after infancy up to age 4 years (OR: 0.71; 95% CI: 0.481 – 0.902).

However, this association did not remain significant after adjustment for confounders in a multivariate model (aOR: 0.75; 95% CI: 0.584–1.006). The same trend was found for predominant breast- feeding but not statistically significant. Before multiple imputation, predominant breastfeeding was associated with lower respiratory tract infections. Although partial breastfeeding until 4 months and predominant breastfeeding until 4 months was not significantly associated with upper respiratory tract infections, the effect estimates were found to be in the same direction (aOR: 0.89; 95% CI: 0.72–1.10 and aOR: 0.93; 95% CI: 0.72–1.20) (Table 4). The effects of breastfeeding dose on respiratory tract infections did not differ between the ages of 2, 3 and 4 years (P - interaction >0.59 for upper and lower respiratory tract infections).

Table 5: Association between breastfeeding duration and lower and upper respiratory tract infections up to age 4 years among children at Fort Portal Regional Referral Hospital (n = 355)

Breastfeeding		Lower respiratory tract infections		Upper respiratory tract infections	
		Univariate model	Multivariate model 1	Univariate model	Multivariable model 1
	n (%)	OR (95 % CI)	aOR (95 % CI) [a]	OR (95 % CI)	aOR (95 % CI) [a]
Never	32 (9%)	*Reference*	*Reference*	*Reference*	*Reference*
< 3 months	124 (34.9%)	**0.73 (0.55-0.96)**	0.71 (0.41-1.21)	0.97 (0.81-1.15)	0.79 (0.56-1.14)
3-6 months	71 (20%)	**0.68 (0.50-0.92)**	0.59 (0.34-1.04)	0.87 (0.73-1.05)	0.95 (0.66-1.37)
≥ 6 months	128 (36.1%)	**0.59 (0.45-0.79)**	**0.56 (0.32-0.99)**	0.86 (0.72-1.02)	0.91 (0.63-1.31)

Tables 4, and 5 compare ORs to never-breastfed. Caesarean section, maternal age, marital status, ethnicity, educational level, household income per month, maternal BMI before pregnancy, child's gender, child's exposure to smoke or alcohol during pregnancy, child's gender, child's vitamin D supplementation age 6–12 months, child's gestational age at birth, parity, and parent's history of asthma or atopy were all adjusted for.

DISCUSSION

The majority of breastfeeding children admitted to Fort Portal Regional Referral Hospital under the age of 5 were male (50.1%), had breastfed for more than six months (31.9%), were born after the 37th week of pregnancy (94.6%), had received vitamin D supplementation at the age of 6 to 12 months (53%) and had attended day care in the preceding two years (38.5%). Prior research in Ethiopia, Nigeria, and Kenya found that more boy babies were born at term, exclusively breastfed, and supplemented with vitamin D when needed [26-34].

In this study, the average age of the breastfeeding mothers was 31.1 ± 2.6 years; the majority had breastfed their children for more than six months; 52.7% had completed a primary education; 60.8% had monthly incomes of less than 300,000 Ugandan shillings, or less than $1 US; 72.7% were married or cohabiting; 56.9% had consumed alcohol while pregnant; and 86.5% had normal deliveries. Studies in Ghana, Japan, Eastern Europe, and social demographic stratification of breastfeeding moms all support the study's conclusions [35-43].

In the second, third, and fourth years of life, 14% of the children at the FRRH examined had experienced at least one episode of a lower respiratory tract infection. 44% of kids in their second year of life, 36% in their third year, and 31% in their fourth year of life reported having at least one episode of an upper respiratory tract illness. These results are in line with earlier reports from comparable research from Ethiopia, South Sudan, Tanzania, and Cameroon [44-51].

In a Tanzanian study of children under the age of five, [32] found that 42% of all children had experienced at least one recognized upper respiratory tract infection by the time they were five years old. [31] reported an upper respiratory tract prevalence among Cameroonian children studied to at 30 - 46% for the fast five years of life.

In contrast, [33] found that 16% of breastfeeding Ethiopian toddlers would get at least one episode of a lower respiratory tract infection, and [34] found that 15% of South Sudanese children under the age of five were prone to lower tract infections.

These similarities between Cameroon, Ethiopia, South Sudan, and Tanzania can be explained by the fact that all of these nations share socio-demographic characteristics, such as par capita income, maternal education, nutritional education, and household income, all of which have been linked to respiratory tract infections in children [40-51].

Studies conducted in the US, Germany's Bavaria region, and Japan, however, found reduced prevalences of both upper and lower respiratory infections in children of a similar age range, contradicting our findings [37, 38].

This difference between Germany, the United States, and Japan can be related to the fact that these nations are among the world's economic powerhouses and are thus less impacted by the causes that are strongly linked to respiratory tract infections in developing nations like Uganda.

According to this study, breastfeeding for 6 months or longer is linked to a lower risk of lower respiratory tract infections in children from infancy to age 4 years. In contrast to what we discovered, a prospective longitudinal study discovered that breastfeeding duration, including breastfeeding for more than 6 months, was not linked to pneumonia or lung infection in 6-year-old children [39]. However, the association was only examined in children who initiated breastfeeding whereas we also included children who were never breastfed. In agreement with our findings on breastfeeding dose, [39] did not find breastfeeding exclusivity to be associated with lower respiratory tract infections. As for upper respiratory tract infections, we did not observe a significant association among children who were breastfed (duration and dose) compared to those who were never breastfed.

Moreover, [27] observed that infants 6-72 months old who were fully breastfed for fewer than 6 months did not have an elevated risk of recurrent otitis media or upper respiratory tract infections. Additionally, [39] observed no correlation between colds or upper respiratory tract infections in 6-year-old children and breastfeeding, including duration and exclusivity. It has previously been proposed that the beneficial effects of breastfeeding could diminish after discontinuation [42-51].

In agreement with our findings, a birth cohort study from Hong Kong found no evidence that breastfeeding exclusively or partially for three months reduced the incidence of hospital admissions for respiratory tract infections from 6 months to 8 years of age [43].

However, [1] did discover that hospitalization for respiratory tract infections between the ages of 18-42 months was strongly related with exclusive breastfeeding at 6-7 months of age. Additionally, [39] found that exclusive breastfeeding for 6 months or longer was substantially associated with a lower risk of ear, throat, and sinus infection at age 6 years, compared to breastfeeding for 0 to 4 months.

CONCLUSION

There is a lower incidence of lower respiratory tract infections in kids under the age of five when breastfeeding exclusively for six months or longer. The results of this study are consistent with the idea that breastfeeding for a prolonged period of time protects against respiratory tract infections even after infanthood, confirming the current WHO guidelines to breastfeed for at least six months.

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