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Association Between Acute Respiratory Tract Infections and Infant and Young Child Feeding Practices among 6 to 23 Months Old Children in Addis Ababa, Ethiopia, 2023: A Facility Based Cross Sectional Study

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Abstract

Background: Suboptimal child feeding practice is widely documented to be associated with an increased risk of acute respiratory tract infections (ARI) among children below two years. Although the reduction of acute respiratory tract infection was encouraging until 2010 in Ethiopia; however, since then the national prevalence of ARI is unchanged. Thus, we examined the association between acute respiratory tract infections and infant and young child feeding practices among 6 to 23 months old children attending public health centers in Addis Ababa, Ethiopia.

Objective: To examine the association between acute respiratory tract infections and infant and young child feeding practices.

Methods: A facility based analytical cross-sectional design was conducted from August to September, 2023 among 342 children aged 6- to 23-months paired with their mothers in three randomly selected public health centers located in Addis Ababa. Data on socio-demographic, household, child health and feeding practices were collected through face-to-face interview using electronic method. The collected information was entered and analyzed using the statistical package for social sciences (SPSS) version 26. The association between IYCF practices and ARI was analysed using Chi-square test and binary logistic regression model, respectively.

Result: The overall proportion of infants and children with acute respiratory tract infection was 31%. Early initiation of breastfeeding (AOR 0.57; 95% CI: 0.39, 0.82) and Exclusively Breastfed for the first two days after birth (AOR 0.64; 95% CI: 0.45, 0.91) were associated with lower risk of ARI. Infants and children who were frequently fed (AOR 0.54; 95% CI: 0.38, 0.76) and consumed fruits and vegetables (AOR 0.37; 95% CI: 0.23, 0.61) were also less likely to experience ARI compared to their counterparts.

Conclusion: Highlighting a critical knowledge gap, our study revealed that approximately one in three participants had experienced acute respiratory tract infection that could be attributed to suboptimal feeding. Actions targeting the revised IYCF practices that include early initiation of breastfeeding, exclusive breastfeeding in the first two days after delivery, consumption of vegetables or fruits and frequent feeding of infants and children are recommended to reduce the burden of ARI among under two years children.

Keywords: *Acute Respiratory Tract Infections; WHO Infant and Young Child Feeding Indicators*

Abbreviations

ARI: Acute Respiratory Tract Infection; EBF2D: Exclusively Breastfed for the First Two Days After Birth: EIBF: Early Initiation of Breast Feeding; IYCF: Infant and Young Child Feeding; MAD: Minimum Acceptable Diet; MDD: Minimum Dietary Diversity; MMF: Minimum Meal Frequency

Introduction

Acute respiratory infections (ARIs) are infections of the airways from nostrils to the alveoli and it is classified as upper respiratory tract infections (URIs) or lower respiratory tract infections (LRIs). The upper respiratory tract consists of the airways from the nostrils to the vocal cords in the larynx, including the paranasal sinuses and the middle ear. The lower respiratory tract covers the continuation of the airways from the trachea and bronchi to the bronchioles and the alveoli [1]. Acute respiratory tract infection is among the commonest childhood illnesses leading to morbidities and mortalities children under the age of five years [2]. They account for 6% of global disease burden, which is greater than the burden of diarrheal illness and malaria combined [3]. Nearly 50% of visits of children to health facilities globally are due to ARI [4] attributed child age, sex, nutritional status, breastfeeding (type and duration), socio-economic status, overcrowding, indoor pollution, passive smoking among others [5].

Studies have shown that adequate nutrition during infancy and early childhood is a safeguard to ensure the growth, health and development of children to their full potential [6] while inadequate nutrient intake is a major attribute to the total global disease burden constituting approximately half of the fatal acute lower respiratory tract infections [7]. Similarly, malnourished children with severe acute upper respiratory tract infection (URTI) were documented to have a 2 - 3 times higher mortality rate than healthy children [8]. Poor feeding practices in infants and young children is associated with an increased risk of infectious diseases, such as respiratory tract infections (RTIs), a leading cause of under-five mortality [9, 10]. About two-third of mortality is associated with suboptimal feeding practices during the first year of life [11]. Globally, about 40% of under two years of deaths are associated with poor feeding practices [12]. Significant associations have also been reported that breastfeeding is highly protective against the occurrence of ARI in infants [13]. Every day, 3 to 4 thousand infants die due to diarrheal disease, ARIs and sub optimal feeding among low-income countries including Ethiopia [14].

Multi-sectorial effort was initiated to end high burden of under-nutrition under the flagship of Seqota Declaration and National Nutrition program [15]. Despite these new initiatives, still half of the infants below the age of 6 months were not exclusively breastfed with more than one in four infants had pre-lacteal feeds suggesting infants are predisposed to acquire the common child illnesses [15]. According to the 2005 Ethiopian demographic and health survey (EDHS), the prevalence of ARI among under-five children was 13% and dropped to 7% in 2011 and remained 7% in 2016 [16] probably due to sub optimal feedings. Recent study showed about 3.4 million children suffer from ARI and 18% of all deaths annually signifying that Ethiopia is among the top 15 countries with highest burdens of ARI [17] though some pocket studies documented encouraging improvement in child survival and reduction of under-5 mortalities [18]. Yet, insights remain limited when it comes to the role of IYCF practices on the occurrence of ARI among under-two. In view of this, we examined the relationship between acute respiratory infection and IYCF practices among 6 up to 23 month old children attending public health centers in Addis Ababa and generate evidences for some program initiatives.

Objectives of the Study

To examine the association between acute respiratory tract infections and infant and young child feeding practices among 6 to 23 months old children attending public health centers in Addis Ababa, Ethiopia.

Methods

Study setting, design and period

A facility based cross-sectional design with analytical component was conducted in three sub cities constituting 30% of the total sub-cities of Addis Ababa from August to September 2023. The selected sub cities were Bole, Arada and Lideta which ranged from less to densely populated sites, respectively. One health center from each sub cities was randomly selected to recruit the participants. All Infants and young children aged 6 to 23 months paired with their mothers who visited the centers for immunization and medical care were enrolled while those on treatment for confirmed severe respiratory illnesses, cardiopulmonary disease and other chronic respiratory illness were excluded.

Sample size and sample technique

The sample size was determined using a single population proportion formula assuming a 95% level of confidence with 5% margin of error and a proportion value of 65.8% from previous study in Northern Shewa, Ethiopia [19] and 5% non-response rate. Based on these assumptions, a sample size of 362 was obtained and the required sample size was allocated to each three health centers proportionately. A consecutive sampling technique was used to select the participants fulfilling the inclusion criteria till the sample size was reached.

Data collection and test procedure

Data were collected through face to face interview using KOBO collect digital tool comprising four sections namely socio-demographic and socio-economic characteristics, household characteristics, child health and nutrition and child feeding practices by three trained female experienced health workers. The socio-demographic and economic, household characteristics, child health and nutrition sections were adapted from EDHS while the Infant and young child feeding (IYCF) practices were assessed according to the recently revised WHO indicators which included early initiation of breastfeeding, exclusive breastfeeding in the first two days after birth, continued breastfeeding 12 - 23 months, introduction of soft or semi-solid and solid foods at 6 to 8 months, Minimum meal frequency (MMF), Minimum dietary diversity (MDD), minimum acceptable diet, Minimum milk frequency for non-breastfed children, Egg or flesh consumption, Sweet beverage consumption, Unhealthy food consumption, Zero vegetable or fruit consumption and bottle feeding [20]. To assess minimum dietary diversity, minimum meal frequency, minimum milk frequency, continued breastfeeding and bottle feeding, a 24 hour recall approach was used while for the rest of the indicators the appropriate feeding practice was assessed based on compliance with the WHO recommended practices. Presence or absence of ARI symptoms was determined by the clinicians working in the health centers who were examining the participants for presence of signs like cough, sore throat, rapid breathing, noisy breathing, chest in-drawing and crackles or wheezing at any time in the last 2 weeks.

Data quality management

To maintain the data quality, three days theoretical and practical training was given to the health workers serving as data collectors by the principal investigator on the objective of the study, method of data collection. In addition, the translated Amharic version tool was pretested before the actual data collection and amended as appropriate based on the pretest result. To ensure the reliability of the data, the principal author checked the activities of each data collector by random spot-checking. Any error, ambiguity, incompleteness, or any other problems were addressed on the following day before starting the next day's activities.

Data entry, processing and analysis

The data in Excel sheet was exported from KOBO tool box into statistical package for social sciences (SPSS) version 26 and analyzed. Descriptive statistics was used to present baseline characteristics of the participants. The IYCF Indicators were expressed as dichotomous

variables (zero and one for not fulfilling and fulfilling the indicator criteria) to estimate the proportions of children who met or otherwise the MDD, MMF, and MAD. Bivariate and multivariate logistic regression model was performed to determine the association between feeding practices and respiratory tract infections with their corresponding ORs and 95% confidence interval and p-values.

Definitions

- **Acute respiratory tract infection (ARI):** Children that had history of cough accompanied by short rapid breathing and/ or difficulty of breathing reported by mothers or caregivers within 2 weeks preceding the study [17].
- **Type of cooking fuel**: Households that used electric stove, natural gas, biogas or kerosene as a cooking fuel were classified as 'improved' while those households that used charcoal, wood and animal dung were grouped as 'not improved' [21].
- **Source of drinking water:** Households that used piped water, public tab or stand pipe, a tube or a bore hole, protected well/spring, rain water and/or bottle water were classified as 'improved' while households that used unprotected well/spring, tanker truck cart, surface water and/or sachet were grouped as 'not improved water' [22].
- **Household ventilation:** 'Poor Ventilation' is a house with only one room, one door and no or only one window while 'Good ventilation' is a house with three or more rooms, doors and windows [23].
- **Minimum dietary diversity (MDD):** Percentage of children 6 - 23 months of age who consumed foods and beverages from at least five out of eight defined food groups during the previous day [20].
- **Minimum meal frequency (MMF):** Percentage of children 6 - 23 months of age who consumed solid, semi-solid or soft foods (but also including milk feeds for non-breastfed children) the minimum number of times or more during the previous day [20].
- **Minimum acceptable diet:** Percentage of children 6 - 23 months of age who consumed minimum acceptable diet during the previous day [20].
- **Minimum milk frequency for non breastfed:** Percentage of non-breastfed children 6 - 23 months of age who consumed at least two milk feeds during the previous day [20].

Result

Altogether 342 mothers/caregivers paired with their infants and young children (IYC) were enrolled with a 95% response rate.

Socio-demographic and economic characteristics

More than half 201 (58.8%) of the mothers/caretakers were aged between 26 and 35 years, while the age of children ranged from 6-11 months in 175 (51.2%) and the rest 161 (47.1%) were between 12 and 23 months with slightly higher female (50.3%) children than males (49.7%). The proportion of mothers who were married, housewives, had primary education and above was 96.8%, 68.3% and 38.2%, respectively. Whereas the percentage of fathers who had primary education and above, employed were 96.8% and 81.2%, respectively (Table 1).

Household characteristics

The mean household size was 4.05 (1.04) and ranged from 2 to 9 persons while the mean number of children was 1.81 (0.87). All respondents used improved type of drinking water supply (piped water) and 99.7% practiced hand washing before child feeding. Over three-quarters (79.5%) of the households had good ventilation and 128 (37.8%) of them used improved type of cooking fuel (electric stove, natural gas, biogas or kerosene). The majority 310 (91.7%) had no passive cigarette smoking exposure (Table 2).

Variables	Categories	Frequency	%
Maternal age	18 - 25	115	33.6
	26 - 35	201	58.8
	> 35	26	7.6
Child Age	6 - 11	175	52.1
	12 - 23	161	47.9
Child Sex	Male	170	49.7
	Female	172	50.3
Marital status of the mother	Single	11	3.2
	Married	331	96.8
Mother's education level	Not able to read and write	17	5.0
	Read and write	8	2.4
	Primary education (1-8)	130	38.2
	Secondary education (9-12)	111	32.6
	Technical/vocational training	20	5.9
	Tertiary education (above 12)	54	15.9
Mother's occupation	Housewife	233	68.3
	Daily Laborer	3	0.9
	Merchant	9	2.6
	Government employee	51	15.0
	Private employee	45	13.2
Father's education level	Not able to read and write	6	1.8
	Read and write	5	1.5
	Primary education (1-8)	67	19.9
	Secondary education (9-12)	151	44.9
	Technical/ vocational training	23	6.8
	Tertiary education (above 12)	84	25.0
Father's Occupation	Daily Laborer	14	4.2
	Merchant	39	11.7
	Government employee	76	22.8
	Private employee	195	58.4
	Not employed	10	3

Table 1: *Socio-demographic and economic characteristics of respondents.*

Variable	Categories	Frequency	%
Household size	< 5	315	92.4
	> 5	26	7.6
Mean number of children (SD)	1.81 (0.87)		
Improved drinking water	Yes	342	100
	No	0	0
Hand washing before child feeding	Yes	339	99.7
	No	1	0.3
House Ventilation	Good ventilation	271	79.5
	Poor ventilation	70	20.5
Type of fuel used for cooking	Improved	128	37.8
	Not improved	211	62.2
Passive cigarette smoking exposure	Yes	28	8.3
	No	310	91.7

Table 2: *Household characteristics of respondents attending public health centers in Addis Ababa, Ethiopia, 2023 (n = 342).*

Child health and nutrition

Among the 342 IYC, 205 (59.9%) of them visited health facility for immunization services and 123 (36%) for medical care. The proportion of mothers who reported illnesses of their IYC preceding the study was 58.4 and were distributed as follows; 134 (39%) presented with ARI clinical symptoms and physical signs which included fever in 44 (13%), 7 (2%) had short and rapid breathing, 4 (1.2%) had wheezing or crackles and 50 (15%) had runny nose. Based on the diagnosis of the clinicians, the proportion of IYC with ARI diagnosis was 31% distributed as follows; 41 (12%) common cold, 47 (14%) upper respiratory tract infection, 7 (2%) pneumonia, 5 (1.5%) acute tonsilo-pharyngitis, 4 (1.2%) acute bronchitis and 2 (0.6%) acute otitis media. Of these, 95 (27.8%) had upper respiratory tract infection and 11 (3.2%) had lower respiratory tract infection. All of the children were vaccinated according to their ages. Of these, 214 (62.8%) received BCG, PENTA 1, PENTA 2, PENTA 3 and measles vaccinations. The majority (86.5%) of the IYC had received vitamin A dose (Table 3).

Variable	Categories	Frequency	%
Reason for health facility visit	Immunization	205	59.9
	Medical care	123	36.0
	Both	14	4.1
Illness in the past two weeks	Yes	199	58.4
	No	142	41.6
Symptoms of AR in the past two weeks	Yes	134	39
	No	65	19
ARI physical signs	Fever	44	13
	Short and rapid breathing	7	2
	Wheezing or crackles	4	1.2
	Chest retraction	1	0.3
	Runny nose	50	15
	No physical sign	58	17
Diagnosis of the physician	Acute otitis media	2	0.6
	Common cold	41	12
	Acute tonsillo-pharyngitis	5	1.5
	Acute bronchitis	4	1.2
	Pneumonia	7	2
	Upper respiratory tract infection	47	14
Type of ARI	Upper respiratory tract infection	95	27.8
	Lower respiratory tract infection	11	3.2
Type of Vaccination	BCG, PENTA1, PENTA 2	16	4.7
	BCG, PENTA1, PENTA2, PENTA 3	111	32.6
	BCG, PENTA 1, PENTA 2, PENTA 3, Measles	214	62.8
Vitamin A dose	Yes	296	86.5
	No	46	13.5

Table 3: *Child health and nutrition of the study participants attending public health centers in Addis Ababa, Ethiopia, 2023 (n = 342).*

Child feeding practices

As shown in table 4, the vast majority of mothers 331 (97.6%) practiced breastfeeding and 278 (84.5%) initiated breastfeeding within the first 1 hour after delivery while the rest 51 (15.5%) initiated within hours or days. Less than a quarter 74 (22.4%) practiced exclusive breastfeeding for the first two days after birth. Most (77.2%) of old children (12 - 23 months) continued to breastfeed within the last 24hrs while 235 (69.3%) of them practiced bottle feeding in 24 hours prior to the data collection. The same proportion (77.2%) of the mothers introduced solid, semi-solid or soft foods within 6 - 8 months of age.

Of the total numbers of breastfed children, 70 (20.4) were complemented less than two times for infants aged 6 - 8 months and less than three times for infants and children aged 9 - 23 months whereas 225 (74.6) were complemented two and more times for infants aged 6 - 8 months and three and more time for infants and children aged 9 - 23 months.

On the other hand those non-breastfed children aged 6 - 23 months, 2 (26.6%) consumed less than two milk feeds and 5 (71.4%) consumed two or more milk feeds. Regarding dietary diversity, 306 (89.5%) of children consumed less than five food groups and 26 (7.6%) five food groups or above. The proportion of IYC who had Minimum dietary diversity, Minimum milk feeding frequency, months non-breastfed Minimum acceptable diet, consumed Egg and or flesh food, used Sweetened beverage, used Unhealthy food, and had Zero vegetable or fruit was 7.6, 71.4, 7.6, 15.5, 19.5, 3.8 and 74.3, respectively.

Variables	Categories	Frequency	%
Ever breastfed	Yes No	331 8	97.6 2.4
Early initiation of breastfeeding	Yes No	279 51	84.5 15.5
Exclusive breastfeeding for the first two days after birth	Yes No	74 257	22.4 77.6
Continued breastfeeding in the last 24hrs	Yes No	125 35	77.2 22.8
Bottle feeding in the last 24hrs	Yes No	235 104	69.3 30.7
Introduction of solid, semi-solid or soft foods 6-8 months	Yes No	96 11	77.2 22.8
Minimum meal frequency in the last 24hrs	Yes No	255 70	74.6 20.4
Minimum dietary diversity in the last 24hrs	Yes No	26 306	7.6 89.5
Minimum milk feeding frequency for 6-23 months non-breastfed children	Yes No	5 2	71.4 26.6
Minimum acceptable diet for 6-23 months children	Yes No	26 313	7.6 91.5
Egg and or flesh food consumption 6-23 months	Yes No	53 289	15.5 84.5
Sweetened beverage consumption 6-23 months	Yes No	67 275	19.5 80.4
Unhealthy food consumption 6-23 months	Yes No	13 329	3.8 96.2
Zero vegetable or fruit consumption 6-23 months	Yes No	254 88	74.3 25.7

Table 4: *Frequency distribution of feeding practices of the participants according to the revised WHO IYCF guideline (n = 342).*

As displayed in table 5, the proportion of IYC who consumed plain water, cereals and grains, animal milk, roots and tubers, Commercially fortified baby foods like Fafa, Hilina, Cerilak, Cerifam, tea or coffee, vitamin A rich fruits and vegetables, fruit juice or fruit flavored drinks, eggs, other vegetables and fruits like DGLV, pulses (beans, peas, lentils, nuts and seeds), flesh foods (meat, fish, poultry, organ meat), dairy products, fried foods (chips, crisps, French fries, fried dough, instant noodles) sweet foods such as chocolates, candies, pastries, cakes, biscuits or frozen treats like ice cream and popsicles was 249, 222, 160, 119, 103, 98, 60, 45, 40, 28, 13, 13, 8, 8 and 5, respectively.

Food groups consumed	Frequency	%
Plain water	249	72.8
Cereals and grains	222	65.7
Animal milk	160	46.7
Roots and tubers	119	35.2
Commercially fortified baby foods (Fafa, Hilina, Cerilak, Cerifam)	103	30.5
Tea or coffee	98	28.6
Vitamin A rich fruits and vegetables	60	17.8
Fruit juice or fruit flavored drinks	45	13.1
Eggs	40	11.8
Other vegetables and fruits	28	8.3
Pulses (beans, peas, lentils), nuts and seeds	13	3.8
Flesh foods (meat, fish, poultry, organ meat)	13	3.8
Dairy products	8	2.4
Chips, crisps, French fries, fried dough, instant noodles	8	2.4
Sweet foods such as chocolates, candies, pastries, cakes, biscuits or frozen treats like ice cream and popsicles	5	1.5

Table 5: *Foods groups and liquids consumed by respondents in 24 hours prior the study.*

Bivariate and multivariate logistic regression analysis

To examine the association of ARI versus Infants and young children (IYC) feedings, both Bivariate and multivariate logistic regression analysis were performed. After controlling for the confounding effect of other predicting variables, those IYC who were breastfed within the first hour of birth were less likely to experience ARI than those who were not breastfed within the first hour of birth (AOR: 0.57; 95% CI: 0.39, 0.82). Similarly, those IYC who were on Exclusive breastfeeding for the first two days after birth were also had lower odds of ARI (AOR: 0.64; 95% CI: 0.45, 0.91). In the same manner, IYC who were frequently fed according to their age were less likely to experience ARI than those who were not frequently fed (AOR: 0.54; 95% CI: 0.38, 0.76). Likewise those IYC who consumed fruits and vegetables were less likely to develop ARI compared to their counterparts (AOR: 0.37; 95% CI: 0.23, 0.61). The odds of ARI occurring among households with Improved Type of cooking fuel (AOR: 0.43; 95% CI: 0.32, 0.59), whose IYC received Vitamin A supplementation (AOR: 0.38; 95% CI: 0.17, 0.86), Had Good Household ventilation (AOR: 0.53; 95% CI: 0.32, 0.90) with young motherhood (AOR: 0.68; 95% CI: 0.48, 0.98) and high maternal education (AOR: 0.49; 95% CI: 0.26, 0.92) was less likely than their referent groups.

Interestingly, those IYC who ever breastfed, continued breastfeeding at 12 - 23 months, bottle fed, with MAD, passive cigarette smoking and household size showed no significant association with ARI.

IYCF indicators and other important variables	Occurrence of ARI		COR (95% CI)	AOR (95% CI)	P value
	Yes (%)	No (%)			
Ever breastfed					
Yes	103 (31)	227 (69)	0.3 (0.03, 2.59)	0.2 (0.21, 1.39)	0.211
No	1 (12.5)	7 (87.5)	1	1	
Early initiation of breastfeeding					
Yes	84 (30.3)	193 (69.7)	0.7 (0.42, 1.49)	0.57 (0.39, 0.82)	0.003*
No	18 (35.3)	33 (64.7)	1	1	
EBF for the first two days after birth					
Yes	21 (28.4)	53 (71.6)	0.8 (0.48, 1.51)	0.64 (0.45, 0.91)	0.008*
No	81 (31.4)	175 (68.6)	1	1	
Continued breastfeeding 12-23 months					
Yes	92 (31.9)	196 (68.1)	1.2 (0.51, 2.84)	0.67 (0.41, 1.11)	0.118
No	11 (26.2)	31 (73.8)	1	1	
Bottle feeding in the last 24hrs					
Yes	69 (29.5)	165 (70.5)	0.8 (0.5, 1.35)	0.97 (0.60, 1.58)	0.921
No	35 (33)	69 (67)	1	1	
Solid and semi-solid foods started at 6-8					0.086
Yes	32 (33.7)	63 (66.3)	0.6 (0.17, 2.15)	0.57 (0.31, 1.08)	
No	5 (45.5)	6 (54.5)	1	1	
Minimum dietary diversity 6-23 month old					
Yes	11 (42.3)	15 (57.7)	0.6 (0.26, 1.37)	1.08 (0.48, 2.43)	0.845
No	94 (30.8)	211 (69.2)	1	1	
Minimum meal frequency 6-23 old months					
Yes	77 (29.5)	184 (70.5)	1.4 (0.81, 2.41)	0.54 (0.38, 0.76)	<0.001*
No	27 (37)	46 (63)	1	1	
Minimum acceptable diet 6-23 old months					
Yes	11 (42.3)	15 (57.7)	1.7 (0.75, 3.84)	1.13 (0.50, 2.55)	0.765
No	94 (30.12)	218 (69.88)	1	1	
Zero vegetable/fruit consumption 6-23 months					
Yes	22 (25)	63 (75)	0.7 (0.41, 1.25)	0.37 (0.23, 0.61)	< 0.001*
No	82 (32.5)	170 (67.5)	1	1	
Type of cooking fuel					
Yes	43 (34)	85 (66)	0.8 (0.50, 1.29)	0.43 (0.32, 0.59)	<0.001*
No	61 (29)	149 (71)	1	1	
Passive cigarette smoking exposure					
Yes	8 (29)	20 (71)	0.8 (0.37, 2.08)	0.73 (0.31, 1.74)	0.489
No	96 (31)	213 (69)	1	1	
Vitamin A supplementation					
Yes	97 (72)	37 (28)	0.4 (0.23, 1.07)	0.38 (0.17, 0.86)	0.020*
No	9 (4)	198 (96)	1	1	
Household size					
Yes	99 (32)	215 (68)	0.6 (0.25, 1.67)	0.53 (0.21, 1.39)	0.201
No	6 (23)	20 (77)	1	1	

Household ventilation					
Yes	82 (30)	88 (70)	1.1 (0.63, 1.96)	0.53 (0.32, 0.90)	0.019*
No	23 (33)	47 (67)	1	1	
Maternal age					
18-25	31 (27)	83 (73)	1.2 (0.77, 2.12)	0.68 (0.48, 0.98)	0.039*
26-35	65 (32)	136 (68)	1.6 (0.68, 4.08)	0.92 (0.38, 2.19)	0.921
>35	10 (38)	16 (62)	1	1	
Maternal education					
Not able to read and write	6 (37)	10 (63)	0.5 (0.8, 3.69)	0.43 (0.08, 2.32)	
Read and write	2 (25)	6 (75)	0.6 (0.21, 1.88)	0.49 (0.26, 0.92)	0.029*
Primary education (1-8)	36 (28)	94 (72)	0.9 (0.31, 2.77)	0.71 (0.38, 1.34)	
Secondary education (9-12)	40 (36)	71 (64)	0.5 (0.13, 2.32)	0.46 (0.15, 1.46)	
Technical/vocational training	5 (25)	15 (75)	0.6 (0.19, 2.07)	0.49 (0.23, 1.00)	
Tertiary education (above 12)	15 (28)	39 (72)	1	1	

Table 6: *Association between ARI, infant and young child feeding indicators and other important variables.*

**Predicator variables adjusted for IYCF indicators.*

Discussion

The present study assessed the current infant and young child feeding practices and their associations with ARI occurrence in the selected health centers and found one in three IYC experiencing ARI. Compared with similar study conducted in India where one in two (51%) suffered ARI, our finding was lower [24] while higher than the findings documented for rural Ethiopia (7.8% vs 31.0%) [16]. The discrepancy between the Indian finding could be attributed to the effect of overcrowding (densely populated) as well as the study settings which included both urban and rural regions of India as opposed to our study which enrolled the urban population. On the other hand when compared to the previous study in Ethiopia our result is higher due to the differences in the study settings and the participants assessed in which our study involved only urban children aged 6 - 23 months while the other study was done in among all under-five rural children.

In terms of timely initiation of breasting (84.5%), continued breastfeeding at 12-23 months (77.2%), introduction of solid, semi-solid and soft foods 6 - 8 months (77.2%), minimum meal frequency (74.6%) and minimum milk frequency (71.4%) for non-breastfed infants based on the recent WHO recommendations was encouraging. Nevertheless, exclusive breastfeeding in the first two days after delivery (22.4%), minimum dietary diversity (7.6%), minimum acceptable diet (7.6%), consumption of egg or flesh (15.5%), fruits and vegetables (25.7%) were lower even when compared with the study findings documented in South Ethiopia [25] underscoring the need for more advocacy work in this regard.

WHO recommends that mothers to initiate breastfeeding (BF) within one hour of birth, it has dual advantage for the mothers and infant to stimulate breast milk (BM) production and releases a hormone that helps the uterus to contract and reduces postpartum blood loss of the mothers and reduce maternal death due to puerperal sepsis and anemia [26]. The level of initiation of breastfeeding within one hour of birth in this study (84.5%) was relatively higher than similar studies conducted in SNNPR and the Ethiopian national average which are 61.5% and 69%, respectively [26]. Although most of the participating mothers initiated breastfeeding within the first hour, their exclusive breastfeeding (EBF) practice in the first two days was 22.4% which appears to be low probably due to maternal illnesses (sore nipples, pain, engorged breasts, mastitis or insufficient milk production) and neonatal issues such as difficulty in suckling or socio-cultural pressures to introduce water or soft foods.

Introduction of appropriate complementary food is needed at six months to ensure children's growth and thrive [27] In our study, optimal complementary feeding practice for breastfed children was 7.6% which means proportion of IYC who had fulfilled the minimum dietary diversity and minimum meal frequency 24 hr preceding the survey was lower when compared with similar study done in Ethiopia [26].

Early initiation of breastfeeding (EIBF) and EBF in the first two days after delivery (EBF2D) were significantly associated with lower risk of ARI for breastfed infants and children compared to their counterparts and was consistent with previous study conducted in Ethiopia [26]. On the other hand, study conducted in India showed that initiating breastfeeding within first hour had no association with acute lower respiratory tract infections (ALRI) [27] probably due to the sub classification of ARI.

Continued breastfeeding at the age of 12 - 23 months was individually associated with reduced risk of ARI in our study. The biological mechanism for the protective effect of optimal breastfeeding against ARI may be due to the presence of immunological substances (immunoglobulin, hormones, and enzymes) in breast milk. These immunological substances provide passive immunity to the infant, as well as assist in the maturation of the infant immune system and could also improve childhood nutrition status from optimal breastfeeding could partially explain the protective effect of breastfeeding against ARI [26].

Bottle feeding was not significantly associated with ARI in our study probably due to the fact that all respondents used improved type of drinking water supply (piped water) and nearly all of them practiced hand washing before child feeding. Whereas the previous study conducted in Ethiopia showed bottle-fed children had higher odds of ARI (OR: 1.36; 95% CI: 1.10, 1.68) [26]. Likewise, the systematic review conducted in Costa Rica also revealed that there is evidence of medium quality that supports the association between feeding bottle use and an increased incidence of upper respiratory infections in the lower infants [28].

Early initiation of complementary feeds can lead to the displacement of breast milk and increased risk of infections, which further contributes to weight loss and malnutrition. Conversely, late initiation of complementary food is also associated with negative consequences to the infant's health [29]. Despite of this fact, this study has only shown a marginal significant association between timely introduction of complementary feeding and ARI probably due the study settings variation and small sampled facilities.

MDD and MAD were not significantly associated with ARI whereas MMF was associated with lower odds of ARI for breastfed and non-breastfed infants. These findings were in contrast with a study conducted in Suriname which revealed that MDD and MAD were significantly associated with upper respiratory tract infections. Other than this, the study also showed that in contrast to the MDD indicator, individually, the MMF indicator was not significantly associated with respiratory tract infections and needs to be interpreted carefully [30]. Though our finding was not fully in line with initial expectations due to being fed from variety of food groups has essential contribution for child health and development.

Strengths of the Study

We enrolled the participants with detail records of diagnosis made by the attending clinicians to avoid misclassification with high response rate. The use of standardized tool and controlling the potential confounders in the estimation of the association between IYCF and ARI are among the strength of this study. Nonetheless, this study had some limitations due to the nature of the design employed which may not be appropriate to measure the temporal relationship between IYCF and ARI. Secondly, household characteristics variables assessed were based on self-report of the mothers who may be prone to recall bias. Further study is required to increase the reliability of IYCF indicators at community level with larger sample size.

Conclusion

Based on our findings, acute upper respiratory tract infection is among the leading causes of IYC morbidity in our settings. Most of the IYCF practices were in line with the WHO recommendations though EBF in the first two days after delivery, minimum dietary diversity, minimum acceptable diet and consumption of fruit or vegetables were not consistent. Early initiation of breastfeeding and EBF in the first two days of delivery was observed to be protective against ARI. IYC who were frequently fed according to their age category and who consumed fruits and vegetables were less likely to experience ARI. Maternal age and education, Vitamin A supplementation, type of cooking fuel and household ventilation were factors associated with ARI. To decrease the occurrence of ARI among IYC, interventions targeting the major modifiable predicator factors are needed.

Ethical Approval and Consent to Participate

Ethical clearance was obtained from the Ethical review committee of School of Public Health, College of Health Science, Addis Ababa University (Ref No. SPH/187/2023) and Addis Ababa health Bureau. A legal permission letter was written to the selected public health centers from each sub cities health Bureaus. Written informed consent was obtained from study participants during data collection, and confidentiality of the information was secured.

Consent for Publication

Not applicable.

Availability of Data and Materials

A full data set and other materials about this study can be obtained from the corresponding author on reasonable request.

Competing Interest

The authors declare that they have no competing interests.

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Authors' Contribution

SM executed the entire research work as her partial fulfillment for the MPH and developed the manuscript. JH and RY had provided critical comments on each step of the overall project and reviewed the MS. All authors read and approved the final manuscript.

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