Determinants of Infant and Young Child Feeding Practices and their association with childhood illnesses among 0-23 months old in Rwanda: A nationwide study

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Abstract

Introduction: Optimal Infant and young child feeding (IYCF) practices such as exclusive breastfeeding and complementary feeding are essential for childhood development, and prevention of nutritional deficiency disorders and infectious diseases. Therefore, this study aimed to assess the association of IYCF practices with common childhood illnesses like diarrhea, cough, and fever, and the determinants of IYCF practices.

Methods: Secondary data from the Rwanda Demographic and Health Survey, 2020 of 3,142 participants was used. Multistage stratified sampling was used to select the participants. Multivariable logistic regression was conducted to explore the determinants of Infant and young child feeding practices and their association with common childhood illnesses, using SPSS (version 25).

Results: Of the 3,142 women with children below 24 months, 781 and 2,360 had children below 6 months and 6-23 months respectively. Among the 781 children below 6 months, 80.9% (95%CI: 78.2-83.7) were exclusively breastfed, and 7%, 24%, and 14% had suffered from diarrhea, cough, and fever in the last two weeks, respectively. Of the 2,360 children aged 6-23 months, 97.9% (95%CI: 97.3-98.5) were on complementary feeding, and 24%, 35%, and 26% had suffered from diarrhea, cough, and fever, in the last two weeks respectively. Compared to exclusively breastfed children, those not on exclusive breastfeeding had higher odds of suffering from diarrhea (AOR=4.19, 95%CI: 3.01-5.83), cough (AOR=1.63, 95%CI: 1.33-2.00) and fever (AOR=2.00, 95%CI: 1.55-2.58). However, children not on complementary feeding had less odds of suffering from diarrhea (AOR=0.24, 95%CI: 0.17-0.33), cough (AOR=0.61, 95%CI: 0.50-0.74), and fever (AOR=0.50, 95%CI: 0.39-0.64). Women with no health insurance, no media access, residing in the western, and southern regions of Rwanda had higher odds of practicing exclusive breastfeeding compared to their respective counterparts. Older age, primary education, and being in the richest wealth quintile were associated with higher odds of practicing complementary breastfeeding.

Conclusion: The study highlighted a significant association between IYCF practices and childhood illnesses. More efforts are needed to improve and promote IYCF practices, as this could also be a vital strategy in the prevention of childhood illnesses. IYCF promotion strategies should focus on the younger, less educated, and poor women residing in urban areas.

Introduction

Breastfeeding is a well-acknowledged and cause-effective intervention against malnutrition-related illnesses in children reducing child morbidity and mortality [1]. Exclusive breastfeeding (EBF) is defined as feeding infants only breast milk, either directly from the breast or expressed, with no addition of any liquid or solids apart from drops or syrups consisting of vitamins, mineral supplements, or medicine, and nothing else [2, 3]. The World Health Organisation (WHO) and United Nations Children's Fund (UNICEF) recommend that newborns should be breastfed within 1 hour after birth, and be exclusively breastfed during the first 6 months of life [2, 4]. Newborns should continue breastfeeding until 24 months of age with appropriate complementary feeding initiated at 6 months for optimal growth and higher intelligence quotient [2, 4, 5].

Exclusive breastfeeding enables the further provision of immunoglobulin and other vital bioactive molecules in colostrum for newborns that are critical for their immunity and growth [6]. It encourages bonding between the child and the mother resulting in beneficial outcomes for the infant [2, 6]. According to the WHO, nearly two out of three infants are not exclusively breastfed for the recommended six months globally [7]. In Africa, the overall prevalence of EBF in children below 6 months by 2017 was 23.7%, 56.6%, 46.4%, and 17.6% in Central, Southern, Western, and Eastern Africa respectively [8]. Previous studies in Rwanda showed that over 85% of infants were exclusively breastfed, however, there were very high proportions of stunting for children in their first 1,000 days of life; that is 18.2% and 49.4% at 6–8 months and 18–23 months of age respectively [9].

Inadequate breastfeeding increases the child's exposure to risk factors and health complications such as frequent gastrointestinal infections and poor brain development, coupled with lower and upper respiratory tract infections like cough and flu [10]. Failure to exclusively breastfeed for the first six months of life can result in 1.4 million deaths and 10% of disease burden in children below five years [10, 11]. Globally, about 40% of deaths among children under two years are associated with poor feeding practices, translating into 25–50% of infant mortality in low-income countries [12]. About 41% of under-5 death's occurrence in sub-Saharan Africa is linked to inadequate breastfeeding [13, 14].

The World Health Organisation (WHO) highlights the fact that for children older than 6 months, their energy and nutritional requirements exceed those that can be provided through EBF which necessitates the need for complementary feeding [1]. However, for complementary feeding to be effective, the food has to be given timely, in adequate amounts in terms of nutritional requirements, and safe in terms of hygiene and preparation and the children have to be fed to satiety [1]. A systematic review found that most of the challenges with complementary feeding arise from hygiene and not meeting the minimum meal frequency and acceptable diet [15]. A systematic review in Ethiopia reported that only 61.0% of the participants initiated timely complementary feeding, and 56% and 10% of these met the minimum meal frequency and minimum acceptable diet respectively [16].

Evidence from Ethiopia and India indicates an increase in the incidence of childhood illnesses like diarrhea and cough after transitioning from EBF to complementary feeding [17, 18]. These have all been attributed to the method of food preparation, hygiene, and quantity of nutrients [17, 18]. A previous study has established that the complementary feeding period (6–23 months) is characterized by a dramatic increase in the prevalence of stunting, from about 10·5% among children below 6 months to 49% of stunted children aged 18–23 months; that surge was attributed due to sub-optimal complementary feeding practices [19]. In Rwanda, 38% of children aged 6–59 months are stunted due to poor complementary breastfeeding practices [20].

Factors associated with an increased likelihood of EBF and appropriate complementary feeding in sub-Saharan Africa include higher maternal education, older age, rural residence, and richer household wealth quartile, among others [21]. Maternal education is an important indicator of socio-economic status, which can affect health behaviors and also improve understanding of the health benefits of breastfeeding and complementary feeding [22]. These factors were also considered and evaluated in our study.

Despite a steady trend in the prevalence of breastfeeding and complementary feeding, childhood illnesses remain a major challenge in Rwanda. Diarrhea remains a major health burden in Rwanda as the third leading cause of mortality among under 5 which was linked to lack of clean water and poor hygienic practices [23, 24]. An audit of 618 childhood deaths in Rwanda found that 28.2% of them were caused by respiratory infections like cough [25]. Studies show that people in Rwanda had a belief that complementary feeding should be initiated with fluids instead of semi-solid foods which was a barrier to proper and adequate feeding [19]. This study intended to assess the association of IYCF practices with common childhood illnesses like diarrhea, cough, and fever, and the determinants of IYCF practices. The study results will help in highlighting the gap in feeding practices that need to be tackled to reduce the incidence of childhood illnesses.

Methods

Study sampling and participants

This analysis used the 2019–2020 Rwanda Demographic Survey (RDHS) data. The RDHS used a two-stage sample design; the first stage involved cluster selection of enumeration areas (EAs), and the second stage involved systematic sampling of 13,005 households in all the selected EAs [26]. The data used in this analysis were from the household and women's questionnaires.

The 2019–2020 RDHS data collection period was between November 2019 and July 2020 [26]. The women's questionnaire collected data on women aged 15–49 years who were either permanent residents of the selected households or visitors who stayed in the household the night before the survey. Of the total 13,005 households that were selected for the survey, 12,951 were occupied, and 12,949 were successfully interviewed with a 99.9% response rate [26]. Moreover, from the selected households, 14,675 women aged 15–49 were eligible to be interviewed, but 14,634 women were successfully interviewed giving a 99.7% response rate [26]. Given the study objectives and scope, this analysis, however, included only women who had children below 24 months at the time of the survey (n = 3,142). We excluded women who had no child below 24 months and those with children above 23 months of age.

Variables

Dependent variables

The study had two main outcome variables: Infant and young child feeding practices (exclusive breastfeeding and complementary feeding) and the occurrence of common childhood diseases (that is, diarrhea, fever, and cough). Exclusive breastfeeding was defined as feeding infants with only breast milk, without supplemental liquids or solids, complementary feeding was when a child was breastfed and also given other liquids or solid foods [26]. This is based on UNICEF and WHO recommendation[27]s [27]. The occurrence of diarrhea, fever, and cough was when a child got any of the illnesses in the last two weeks

before the survey. This was reported by the mother/ caregiver during the survey and the three illnesses were considered because they had the most complete available data in RDHS.

Independent variables

We included possible determinants of child feeding practices based on the review of existing literature [28–33]. These included individual (mother and child), household, and community-level factors. Place of residence (categorized into rural and urban), and region (Kigali, South, West, East, North) were the community-level factors included. For household-level factors, we considered household size (less than six, six, and above), sex of household head (male, female), and wealth index (made of five quintiles ranging from the poorest to the richest quintile). Several individual-level factors were also included; mothers' age (15–24, 25–34, 35–44, 45–49), educational level (no education, primary, secondary, tertiary), working status (yes, no), marital status (married, unmarried), health insurance (yes, no), mass media access (yes, no), parity (1–2, 3–4, above 4), antenatal care visits (0, 1–3, 4 and more visits), place of delivery (home, health facility), delivery mode (virginal birth, cesarean section), child's sex (boy, girl) and religion (Catholic, Protestant, "Others"). Protestants also included Adventist and Jehovah's Witness while "Other" religions included Moslem, traditional, and others. The wealth index was calculated by RDHS from information on household asset ownership using principal component analysis and categorized into five quintiles that ranged from the poorest to the richest quintile [26]. Media access was measured as a woman having access to any of these; radio, newspapers, and television.

Statistical analysis

Frequency distributions to describe the background characteristics of the respondents were used; where we presented frequencies and proportions/ percentages for categorical dependent and independent variables. Chi-square tests were used to explore the percentage distribution/ row prevalence of the outcome variables. We, then, conducted bi-variable and multivariable logistic regression to explore associations between i) infant and young child feeding practices (exclusive breastfeeding and complementary feeding) and occurrence of childhood illness (diarrhea, cough, and fever) and ii) various socio-demographic variables and feeding practices. During the analysis, the occurrence of IYCF practices and childhood illness were assessed by child age group (below 6 months, 6–23 months). When exploring determinants of feeding practices, only variables significant at p-value < 0.25 on bi-variable analysis were included in the multivariable analysis. Respective crude odds ratio (COR), adjusted odds ratios (AOR), 95% confidence interval (CI), and p-values are presented. A statistical significance of < 0.05 was considered in the multivariable analysis. We applied DHS sample weights to account for the unequal probability sampling in different strata and ensure the representativeness of the study results [34, 35]. The analysis was done using Statistical Package for Social Sciences (SPSS) (version 25.0) - a complex samples package. Individual sample weight, sample strata for sampling errors/design, and cluster number were incorporated in the analysis plan to account for the multistage sample design intrinsic to the RDHS dataset [34, 35]. Multi-collinearity was also assessed among all the predictor variables in the models using a variance inflation factor (VIF) of less than 5 as a cutoff [36]. None of the factors exceeded the cutoff.

Results

Socio-demographic characteristics of participants

A total of 3142 women with children below 24 months were included in this analysis (Table 1). The majority (about 70%) were below 35 years, married (83%), had primary education (63%), working (72%), had health insurance (83%), and with access to mass media (80%). The respondents were sampled from all regions of Rwanda, with over 80% of households residing in rural areas and their wealth index distributed across five quintiles. Only 47% had received 4 and above ANC visits when pregnant for their most young child, the majority (over 80%) had a normal virginal birth at a health facility and were currently breastfeeding (94%), Table 1.

Table 1
Socio-demographic characteristics of the study participants (*N* = 3142)

Characteristics	Total Sample % (n)
Mothers' age	
15–24	22.4(704)
25–34	47.5(1493)
35–44	28.6(898)
45–49	1.5(46)
Education level	
Tertiary or above	4.9(154)
Secondary	21.9(688)
Primary	63.1(1983)
No education	10.1(317)
Marital status	
Married	82.9(2606)
Unmarried	17.1(536)
Religion	
Catholic	34.5(1082)
Protestant (including Adventist, Jehovah's Witness)	62.8(1972)
Others	2.8(87)
Working status	
Working	71.8(2255)
Not working	28.2(887)
Health insurance	
Yes	82.7(2599)
No	17.3(543)
Parity	
1–2	49.4(1552)
3–4	31.7(995)

Characteristics	Total Sample % (n)
Mothers' age	
Above 4	18.9(595)
Region of Residence	
Kigali	13.1(412)
South	21.3(668)
West	24.2(759)
North	14.5(455)
East	27.0(847)
Media Access	
Yes	79.9(2511)
No	20.1(631)
Antenatal visits	
No visit	2.3(73)
1–3 visits	50.2(1577)
4 and above visits	47.5(1492)
Place of delivery	
Home	5.8(181)
Health facility	94.2(2961)
Mode of delivery	
Normal virginal birth	82.9(2605)
Caesarean birth	17.1(536)
Sex of the child	
Boy	50.7(1592)
Girl	49.3(1550)
Currently breastfeeding	
No	5.5(174)
Yes	94.5(2968)

Characteristics	Total Sample % (n)
Mothers' age	
Child's age	
Below 6 months	24.9(781)
6–23 months	75.1(2360)
Household characteristics	
Household size 6 and above	38.7(1216)
The male head of household	78.1(2454)
Household in urban area	16.2(510)

Protestant (include Adventist, Jehovah's Witness), other (Include Moslem, Traditional and others)

Table 2
Child feeding practices and occurrence of common childhood illnesses among children below 24 months

	Children below 6 months % (n), N = 781	Children of 6–23 months % (n), N = 2360
Appropriate feeding*		
Yes	80.9(632), 95%CI:78.2–83.7	97.9(2311), 95%CI: 97.3–98.5
No	19.1(149)	2.1(49)
Common childhood illness		
Diarrhea		
Yes	6.6(52)	24.4(577)
No	93.4(730)	75.6(1783)
Cough		
Yes	24.0(187)	34.9(825)
No	76.0(594)	65.1(1536)
Fever		
Yes	13.9(109)	26.5(625)
No	86.1(673)	73.5(1735)

*Appropriate feeding included Exclusive breastfeeding for children below 6 months, and Complementary feeding for children 6–23 months, $\chi 2$ test p-value < 0.001 comparing feeding practices by age group, as well as the occurrence of diarrhea, cough, and fever by age group.

Child feeding practices and occurrence of common childhood illness as per the 2020 Rwanda Demographic Health Survey

Of the analyzed 3142 women, 781 and 2360 had children below 6 months and 6–23 months respectively (Table 2). Among the 781 children below 6 months, 80.9% (95%CI: 78.2–83.7) were exclusively breastfed. Regarding childhood illness, 7%, 24%, and 14% had gotten diarrhea, cough, and fever in the last two weeks, respectively. Of the 2360 children of 6–23 months, 97.9% (95%CI: 97.3–98.5) were on complementary feeding, that is, breast milk and other liquids and solid foods. Out of those, 24%, 35%, and 26% had suffered from diarrhea, cough, and fever, respectively, in the last two weeks, Table 2.

Association of child feeding practices with the occurrence of common childhood illness among children below 24 months

In the overall sample, exclusive breastfeeding was associated with less occurrence of common childhood illness (Table 3Compared to exclusively breastfed children, those not on exclusive breast milk had higher odds of getting diarrhea (AOR = 4.19, 95%CI: 3.01–5.83), cough (AOR = 1.63, 95%CI: 1.33-2.00) and fever (AOR = 2.00, 95%CI: 1.55–2.58). Complementary feeding in the overall sample had the opposite effect, as it was associated with more occurrences of childhood illness. Children not on complementary feeding had less odds of getting diarrhea (AOR = 0.24, 95%CI: 0.17–0.33), cough (AOR = 0.61, 95%CI: 0.50–0.74), and fever (AOR = 0.50, 95%CI: 0.39–0.64), compared to those on complementary feeding. However, both exclusive breastfeeding and complementary feeding had no statistically significant association with childhood illness when stratified according to respective age groups, that is, below 6 months and 6–23 months, Table 3.

Table 3
Association of child feeding practices with the occurrence of common childhood illnesses among children below 24 months

	Diarrhea		**Cough**		**Fever**	
	Row %(n)	OR (95%CI)	Row %(n)	OR (95%CI)	Row %(n)	OR (95%CI)
Exclusive breastfeeding (Overall sample)^						
Yes	7.6(48)	1.00	16.6(168)	1.00	13.8(101)	1.00
No	25.2(633)	CR: 4.07(2.96–5.61)*	24.1(513)	CR: 1.60(1.31–1.95)*	24.1(580)	CR: 1.99(1.56–2.55)*
		AR: 4.19(3.01–5.83)*		AR: 1.63(1.33-2.00)		AR: 2.00(1.55–2.58)*
Exclusive breastfeeding (> 6 months group)^						
Yes	76.9(40)	1.00	80.7(151)	1.00	80.6(87)	1.00
No	81.2(592)	CR: 1.31(0.63–2.75) **	81.0(481)	CR: 0.99(0.63–1.54)**	81.0(545)	CR: 1.05(0.60–1.82)**
		AR: 1.35(0.62–2.91)**		AR: 1.03(0.65–1.63)**		AR: 1.08(0.60–1.92)**
Complementary feeding (Overall sample)^^						
Yes	92.4(581)	1.00	83.4(844)	1.00	86.2(633)	1.00
No	74.6(1876)	CR: 0.24(0.18–0.33)*	75.7(1612)	CR: 0.62(0.51–0.76)*	75.7(1823)	CR: 0.50(0.39–0.64)*
		AR: 0.24(0.17–0.33)*		AR: 0.61(0.50–0.74)*		AR: 0.50(0.39–0.64)*
Complementary feeding (6–23 months group)^^						
Yes	98.6(568)	1.00	97.9(808)	1.00	97.8(611)	1.00

	Diarrhea		Cough		Fever	
No	97.7(1742)	CR: 0.62(0.28–1.35)**	97.9(1503)	CR: 0.97(0.54–1.76)**	98.0(1700)	CR: 1.10(0.55–2.20)**
		AR: 0.57(0.26–1.24)**		AR: 0.92(0.50–1.69)**		AR: 1.12(0.56–2.21)**

*= p = value < 0.05 (significant), **= p-value > 0.05 (non-significant), CR = Crude odds ratio, AR = Adjusted odds ratio, ^=adjusted models for exclusive breastfeeding controlled for the region, health insurance, and media access, ^^=adjusted models for complementary feeding controlled for mothers' age, education, and wealth index.

Factors associated with child feeding practices

Table 4 presents the univariable and multivariable logistic regression of factors associated with exclusive breastfeeding among children below 6 months. The multivariable analysis showed health insurance, media access, and region as significant factors. Higher odds of exclusive breastfeeding among women with no health insurance (AOR = 2.43, 95%CI: 1.06–5.60) and no media access (AOR = 1.99, 95%CI: 1.08–3.65), compared to those with health insurance and media access. In addition, women residing in the Western (AOR = 2.71, 95%CI: 1.31–5.61) and Southern (AOR = 2.54, 95%CI: 1.24–5.20) regions had higher odds of practicing exclusive breastfeeding compared to those in Kigali.

The results of univariable and multivariable analysis for factors associated with complementary feeding among children of 6–23 months are detailed in Table 5. Multivariable analysis revealed mothers' age, educational level, and wealth index as significant predictors. Older women of 45–49 years (AOR = 21.80, 95%CI: 7.87–60.40) and primary education (AOR = 2.60, 95%CI: 1.20–5.64) had higher odds of practicing complementary feeding compared to younger women with no formal education. However, women in the poorest wealth quintile (AOR = 0.21, 95%CI: 0.06–0.77) had less odds of the outcome variable compared to those in the richest wealth quintile.

Table 4
Prevalence and factors associated with Exclusive breastfeeding among children below 6 months, as per the 2020 Rwanda demographic health survey

Characteristics	Row % (n)	Crude odds ratio (95%CI)*	P-value	Adjusted odds ratio (95%CI)**	P-value
Mothers' age			0.854	N/A	
15–24	80.5(153)	1.00			
25–34	82.3(297)	1.13(0.67–1.90)			
35–44	79.4(177)	0.94(0.56–1.59)			
45–49	75.0(6)	0.75(0.14–3.91)			
Education level			0.241		0.415
No education	89.5(77)	1.00		1.00	
Primary	80.6(386)	0.46(0.20–1.07)		0.50(0.21–1.16)	
Secondary	78.6(143)	0.41(0.17–1.01)		0.54(0.21–1.38)	
Tertiary or above	75.0(27)	0.35(0.11–1.16)		0.64(0.17–2.39)	
Marital status			0.334	N/A	
Married	80.3(518)	1.00			
Unmarried	83.8(114)	1.27(0.78–2.09)			
Religion			0.183		0.413
Catholic	83.4(191)	1.00		1.00	
Protestant	79.7(425)	0.79(0.48–1.28)		0.85(0.50–1.43)	
Others	84.2(16)	1.11(0.32–3.79)		1.74(0.53–5.76)	
Working status			0.246		0.436
Working	82.2(406)	1.00		1.00	
Not working	78.5(226)	0.79(0.53–1.18)		0.84(0.55–1.30)	
Health insurance			0.045		**0.036**
Yes	80.0(567)	1.00		1.00	
No	89.2(66)	2.15(1.02–4.55)		2.43(1.06–5.60)	
Parity			0.940	N/A	
1–2	80.8(295)	1.00			

*=significant at 0.25, **=significant at 0.05, Bold = significant subcategory

Characteristics	Row % (n)	Crude odds ratio (95%CI)*	P-value	Adjusted odds ratio (95%CI)**	P-value
3–4	80.5(219)	0.98(0.62–1.56)			
Above 4	81.9(118)	1.08(0.65–1.80)			
Region of Residence			0.001		**0.001**
Kigali	71.8(74)	1.00		1.00	
West	88.2(186)	2.95(1.44–6.04)		**2.71(1.31–5.61)**	
East	73.2(153)	1.06(0.57–1.96)		0.97(0.53–1.80)	
North	81.4(83)	1.69(0.75–3.81)		1.58(0.69–3.61)	
South	87.2(136)	2.66(1.31–5.41)		**2.54(1.24–5.20)**	
Residence			0.107		0.761
Urban	74.4(93)	1.00		1.00	
Rural	82.2(540)	1.62(0.90–2.91)		1.12(0.54–2.35)	
Media access			0.008		
Yes	78.8(494)	1.00		1.00	**0.027**
No	89.0(138)	2.23(1.24–4.04)		1.99(1.08–3.65)	
Antenatal visits			0.788	N/A	
No visit	80.0(16)	1.00			
1–3 visits	79.9(315)	0.88(0.34–2.24)			
4 and above visits	82.0(301)	1.00(0.39–2.58)			
Place of delivery			0.691	N/A	
Home	77.4(24)	1.00			
Health facility	81.0(609)	1.18(0.52–2.66)			
Mode of delivery			0.996	N/A	
Normal virginal birth	80.9(518)	1.00			
Caesarean birth	80.9(114)	1.00(0.57–1.75)			
Sex of the child			0.764	N/A	

*=significant at 0.25, **=significant at 0.05, Bold = significant subcategory

Characteristics	Row % (n)	Crude odds ratio (95%CI)*	P-value	Adjusted odds ratio (95%CI)**	P-value
Boy	81.4(320)	1.00			
Girl	80.4(312)	0.94(0.65–1.38)			
Household size			0.207		0.130
Below 6	82.5(376)	1.00		1.00	
6 and above	78.6(257)	0.78(0.53–1.15)		0.73(0.49–1.10)	
Household head			0.723	N/A	
Male	81.3(490)	1.00			
Female	79.8(142)	0.91(0.56–1.50)			
Wealth index			0.105		0.349
Richest	71.5(113)	1.00		1.00	
Richer	83.0(127)	1.97(0.96–4.04)		1.82(0.86–3.85)	
Middle	82.4(117)	1.90(0.97–3.71)		1.32(0.63–2.76)	
Poorer	86.9(119)	2.60(1.26–5.37)		1.74(0.78–3.87)	
Poorest	81.8(157)	1.79(1.01–3.20)		1.01(0.51–1.99)	
*=significant at 0.25, **=significant at 0.05, Bold = significant subcategory					

Table 5
Prevalence and factors associated with Complementary feeding among children 6–23 months, as per 2020 Rwanda demographic health survey

Characteristics	Row % (n)	Crude odds ratio (95%CI)	P-value	Adjusted odds ratio (95%CI)	P-value
Mothers' age			< 0.001		**< 0.001**
15–24	98.6(508)	1.00		1.00	
25–34	97.9(1109)	0.62(0.27–1.43)		0.55(0.23–1.33)	
35–44	97.2(656)	0.46(0.17–1.21)		0.40(0.14–1.15)	
45–49	100.0(38)	31.17(13.99–69.45)		**21.80(7.87–60.40)**	
Education level			0.004		**0.024**
No education	94.4(220)	1.00		1.00	
Primary	98.4(1479)	3.54(1.74–7.19)		**2.60(1.20–5.64)**	
Secondary	97.8(495)	2.53(1.01–6.32)		1.05(0.37–2.97)	
Tertiary or above	99.2(117)	5.72(1.09–30.07)		1.64(0.22–12.11)	
Marital status			0.646		
Married	97.9(1918)	1.00		N/A	
Unmarried	98.3(393)	1.21(0.53–2.79)			
Religion			0.097		0.134
Catholic	98.7(842)	1.00		1.00	
Protestant	97.4(1401)	0.48(0.24–0.95)		0.49(0.24-1.00)	
Others	98.6(68)	0.98(0.12–7.71)		1.05(0.13–8.57)	
Working status			0.961	N/A	
Working	97.9(1724)	1.00			
Not working	97.8(587)	0.98(0.47–2.04)			
Health insurance			0.945	N/A	
Yes	97.9(1851)	1.00			
No	97.9(460)	1.03(0.49–2.16)			
Parity			0.059		
1–2	98.4(1167)	1.00		1.00	0565

*=significant at 0.25, **=significant at 0.05, Bold = significant subcategory

Characteristics	Row % (n)	Crude odds ratio (95%CI)	P-value	Adjusted odds ratio (95%CI)	P-value
3–4	98.1(708)	0.78(0.37–1.66)		0.92(0.33–2.54)	
Above 4	96.5(435)	0.43(0.21–0.87)		0.63(0.20–1.99)	
Region of Residence			0.233		0.375
Kigali	99.0(306)	1.00		1.00	
West	97.3(533)	0.39(0.10–1.55)		0.64(0.15–2.72)	
East	98.3(627)	0.63(0.15–2.59)		0.83(0.19–3.74)	
North	96.3(340)	0.30(0.06–1.38)		0.44(0.09–2.05)	
South	98.6(505)	0.80(0.19–3.33)		1.18(0.26–5.38)	
Residence			0.289	N/A	
Urban	98.7(380)	1.00			
Rural	97.8(1931)	0.57(0.20–1.61)			
Media access			0.008		0.083
Yes	98.4(1853)	1.00		1.00	
No	96.0(458)	0.41(0.21–0.79)		0.57(0.30–1.08)	
Antenatal visits			0.041		0.178
No visit	92.5(49)	1.00		1.00	
1–3 visits	97.8(1156)	4.14(1.11–15.48)		3.08(0.85–11.24)	
4 and above visits	98.3(1106)	5.32(1.46–19.40)		3.39(0.92–12.41)	
Place of delivery			0.407	N/A	
Home	96.7(146)	1.00			
Health facility	98.0(2165)	1.56(0.54–4.47)			
Mode of delivery			0.236		0.617
Normal virginal birth	97.8(1920)	1.00		1.00	

*=significant at 0.25, **=significant at 0.05, Bold = significant subcategory

Characteristics	Row % (n)	Crude odds ratio (95%CI)	P-value	Adjusted odds ratio (95%CI)	P-value
Caesarean birth	98.7(391)	1.90(0.66–5.46)		1.33(0.44–4.02)	
Sex of the child			0.436	N/A	
Boy	97.7(1170)	1.00			
Girl	98.1(1140)	1.25(0.71–2.22)			
Household size					
Below 6	98.2(1443)	1.00	0.340	N/A	
6 and above	97.5(868)	0.74(0.40–1.37)			
Household head			0.378	N/A	
Male	97.8(1810)	1.00			
Female	98.4(501)	1.43(0.64–3.18)			
Wealth index			0.030		**0.038**
Richest	99.0(393)	1.00		1.00	
Richer	98.9(467)	0.99(0.24–4.08)		0.82(0.18–3.70)	
Middle	98.3(451)	0.61(0.18–2.05)		0.45(0.11–1.91)	
Poorer	97.4(484)	0.40(0.13–1.24)		0.30(0.08–1.11)	
Poorest	96.3(516)	0.27(0.09–0.78)		**0.21(0.06–0.77)**	
*=significant at 0.25, **=significant at 0.05, Bold = significant subcategory					

Discussion

This study assessed the association of Infant and young child feeding (IYCF) practices with childhood illnesses and the possible determinants of IYCF practices in Rwanda using the Rwanda Demographic and health survey 2020. Among children below 6 months, 80.9% of them were exclusively breastfed. This prevalence is higher compared to the overall worldwide 48% prevalence of exclusive breastfeeding among children 0–5 months reported by UNICEF [4] and the collective target for the global rate by 2030 of 70% [37]. The prevalence of EBF in Rwanda is still higher compared to the whole of sub-Saharan Africa (32%) [38]. The prevalence of EBF in countries like Uganda (42.8%) and Tanzania (59%) is lower compared to that of Rwanda in this study[3]. Findings from previous studies concur with those from a study in sub-Saharan Africa which found the overall prevalence of EBF at 36% [38, 39]. The difference in the findings may be explained by the variations in the national level breastfeeding policies, attitudes, and perceptions regarding breastfeeding, as well as sociodemographic dynamics such as the level of education of women,

their wealth index, exposure to media, mode of delivery, number of antenatal visits attended and place of delivery [21, 39].

According to this study, despite the high levels of complementary feeding of the children aged 6–23 months, some mothers (2.1%) delayed complementary feeding. These findings align with previous studies in Rwanda. For example, Umugwaneza et al. found out that women had a belief that children should be first fed on fluids before starting semi-solid food which deprived most of the children the essential nutrients for growth [19]. The misconceptions and negative beliefs about child feeding among women in Rwanda could thus explain the observed trend in delayed complementary feeding. Moreover, a previous study in Rwanda, found that despite the high and stagnated prevalence of complementary feeding, there were high levels of stunting among children attributable to low nutrient intake from complementary feeds [40]. The global alliance for improved nutrition attributed such trends to the high costs of buying nutritious complementary feeds in Rwanda [41].

There was a higher incidence of diarrhea, cough, and fever among children below 24 months of complementary breastfeeding in this study as compared to those on EBF. In other words, EBF had an overall protective advantage against common childhood illnesses considered in this study, regardless of the age group (below 6 months vs 6–23 months). These results concur with those from many other studies that have also shown EBF to be inversely associated with the occurrence of childhood illnesses like fever, cough and diarrhea, and infective gastroenteritis [42–45]. The observed higher odds of childhood illness among children on complementary feeding may be attributed to improper hand-washing practices, and providing half-cooked or uncooked food as complementary feeds which increases exposure to pathogens [44]. As compared to complementary feeding, EBF limits exposure to environmental pathogens that may be introduced through feeds and fluids and breast milk also has bioactive constituents that may function alone to enhance an infant's immune system [46]. In addition, complementary feeds might be either too early or too late, are hard to measure, and may therefore end up delivering an inappropriate quantity of nutrients to support the energy needs of a child for a healthy life in addition to microbial contamination, hence causing illnesses [47].

In this study, 5.5% of the females were not breastfeeding at all. Although small, it has public health relevance since the effects of compromised nutrition in such a critical stage of child development may be irreversible. Our findings are supported by a UNICEF report that highlighted that some (about 3.3%) women do not breastfeed their children in low- and middle-income countries [4]. Some factors that may influence women’s decision to not breastfeed their children at all include a need to return to work and tight work schedules, lack of support from the spouse, insufficient breast milk, financial barriers like pump assistance, personal issues like body image, stigma and lack of confidence which can cause a negative attitude towards breastfeeding [48]. Medical reasons like suffering from HIV/AIDS, and ill health for both the child and the mother are some of the other factors that could influence decisions against breastfeeding even when the mothers know about its benefits [49–51]. These same reasons might explain why some women in Rwanda do not breastfeed at all.

The study also found various sociodemographic factors associated with child-feeding practices. Regarding exclusive breastfeeding, women with no health insurance had higher odds of practicing exclusive breastfeeding than those with health insurance. These results are contrary to those from other studies where health insurance was found to increase, by 21%, the chances of EBF since it provided means to cover for costs of lactation support services and breastfeeding equipment [47, 52]. This can be explained by the fact that health insurance in low- and middle-income countries rarely covers breastfeeding equipment and lactation support services. Alternatively, mothers who afford insurance are in higher economic classes and have stable but highly demanding jobs/ employment which limits their time to breastfeed. Such mothers find it convenient to buy formula and other feeds for their babies instead of compromising their working time to breastfeed.

Women who had no media access had higher odds of EBF compared to those with media access. This concurs with results from a study that reported women with mobile phones to have 75% lower odds of EBF which was attributed to the distractive effect of mobile phones on breastfeeding women [53]. In addition, a study found that mothers who viewed more adverts about infant formula in media had lower odds of breastfeeding than their counterparts who viewed less or no adverts, as the latter perceived infant formula as the most convenient option for child feeding [54]. This is supported by the fact that the tendency to exclusively breastfeed mainly depends on the specificity of the content shared on media. Information focusing on the negative implications of breastfeeding like breast deformation could discourage women from breastfeeding [55].

Our results also show that women living in the Western and Southern regions, which are rural areas of Rwanda, had higher odds of EBF than those in Kigali, an urbanized region. This corroborates the findings of previous studies that also report women staying in urbanized regions having lower odds of EBF compared to those in rural areas [56]. A study done in Lao People's Democratic Republic, south-East Asia also found that mothers in urban areas had significantly lower odds of exclusive breastfeeding and complementary feeding [57]. This was explained by the fact that most urban households were in a higher wealth quartile, and can easily afford infant formula [57]. Another study in Ethiopia found that mothers in urban areas were 67% less likely to breastfeed exclusively [58]. This could be because women in urban areas are also more likely to be in formal employment, with limited maternity leave and a shorter time to dedicate to EBF compared to the women in the rural areas of the country.

Regarding complementary feeding among children aged 6–23 months, mothers who had attained at least primary education had higher odds of practicing complementary breastfeeding as compared to those with no formal education. In the same regard, a study in Pakistan found that children of uneducated mothers were highly malnourished [59]. This could be because educated mothers have attained knowledge about proper feeding practices and their benefits for their children.

In this study, older maternal age (45-49years) was associated with higher odds of complementary feeding, and this aligns with results from a systematic review that found mothers with advanced maternal age to have prior experience with proper child feeding practices [60]. Studies in Bangkok and Zimbabwe also reported a similar trend, with mothers below 25 years having lower odds of appropriate child practices due

to lack of experience [61, 62]. Moreover, mothers of younger age have been reported to have less concern about their children's hunger compared to those of advanced age [63].

Study findings also indicate that women in the poorest wealth quintile had less odds of complementary feeding compared to those in the richest wealth quintile. These results are consistent with other studies, for example, in Bangladesh where women with a higher wealth index were in the position to initiate appropriate complementary feeding for their children [62]. Studies from Zimbabwe and Mongolia reported that economic independence increased the odds of appropriate complementary feeding [61, 64]. This is because such women are more likely to meet the minimum meal frequency for their children [65]. Also, the wealth index is directly proportional to the household food security; thus the higher the wealth index, the higher the likelihood of affording appropriate complementary feeding [66].

Strengths and limitations

In this study, we used the most recent data from the 2020 Rwanda Demographic and Health survey, with a large sample size hence making our results generalizable to all women with children below 24 months in Rwanda. Additionally, worldwide, the DHS is known to have high response rates, with a big sample size and quality standardized data collection procedures, thus, our findings can be compared with other studies of the same design elsewhere.

However, the study has some limitations. The study used a cross-sectional design, and this does not allow causal inference but rather associations only. There is also a risk of recall and information bias since most of the data was self-reported. Since this is a secondary data analysis, there was also a lack of data on some key aspects of IYCF such as meal frequency, method of preparation, and hygienic environment, among others. Despite the limitations, the study provides useful insights into the relationship between IYCF practices and childhood illnesses in Rwanda.

Conclusions

The study found that IYCF practices had a significant association with the occurrence of childhood illnesses like diarrhea, cough, and fever. In addition, the study highlighted several sociodemographic factors associated with IYCF practices of exclusive breastfeeding and complementary feeding. To address the observed poor IYCF practices such as not breastfeeding at all and delayed complementary feeding, there is a need for more efforts in the promotion of optimum IYCF, for example through community education and sensitisation on the benefits of exclusive breastfeeding and proper practice of complementary feeding. Such IYCF promotion strategies should focus on the younger, poor, and less educated women residing in urban areas (Kigali). In addition, infodemic management and proper use of media to disseminate educational messages on proper child feeding would also be vital strategies. Given the observed link between IYCF practices and childhood illnesses, the suggested strategies would not only help to promote appropriate IYCF but also reduce the occurrence of childhood illness and morbidity.

Abbreviations

EBF	Exclusive breastfeeding
IYCF	Infant and Young Child Feeding
UNICEF	United Nations Children's Fund
EA	Enumeration area
AOR	Adjusted Odds Ratio
RDHS	Rwanda Demographic Health Survey
CI	Confidence Interval
DHS	Demographic Health Survey
VIF	Variance Inflation Factor
COR	Crude Odds Ratio
OR	Odds Ratio
SPSS	Statistical Package for Social Science
WHO	World Health Organisation

Declarations

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Availability of data and materials

This data set used is openly available upon obtaining permission from the MEASURE DHS website (URL: https://www.dhsprogram.com/data/available-datasets.cfm). However, authors are not authorized to share this data set with the public however anyone interested in the data set can seek it with written permission from the MEASURE DHS website (URL: https://www.dhsprogram.com/data/available-datasets.cfm).

Authors' contributions

L.N and J.K Conceived the idea, drafted the manuscript, performed analysis, interpreted the results, and drafted the subsequent versions of the manuscript. E.A, J.B.A, Q.S, L.M, G.G, E.D, and A.N reviewed the first

draft, helped in results interpretation, and drafted the subsequent versions of the manuscript. All authors read and approved the final manuscript.

Ethics approval and consent to participate

High international ethical standards are ensured during MEASURE DHS surveys and the study protocol is performed following the relevant guidelines. The RDHS 2019 survey protocol was reviewed and approved by the Rwanda National Ethics Committee (RNEC) and the ICF Institutional Review Board. Written informed consent was obtained from human participants and written informed consent was also obtained from legally authorized representatives of minor participants.

Consent for publication

This is not applicable.

Competing interests

All the authors declare that they have no competing interests.

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