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Trends and Factors Associated with Changes in Early Initiation of Breastfeeding: Analysis of the Tanzania Demographic and Health Surveys 2004-2016

Hans P. Maro[1], Tara Mtuy[1,2], Levina J. Msuya[3,4], Baraka Moshi[1], Michael J. Mahande[1]

[1]Department of Epidemiology and Biostatistics, Institute of Public Health, Kilimanjaro Christian Medical University College, Moshi, Tanzania
[2]Faculty of Public Health and Policy, London School of Hygiene and Tropical Medicine, London, UK
[3]Department of Pediatrics and Child Health, Kilimanjaro Christian Medical University College, Moshi, Tanzania
[4]Department of Pediatrics and Child Health, Kilimanjaro Christian Medical Centre, Moshi, Tanzania
Email: hnsmaro39@gmail.com, tara.mtuy@lshtm.ac.uk, levinamsuya@yahoo.com, jmmahande@gmail.com, bekamoshi2000@yahoo.com

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Abstract

Background: Despite WHO recommendations on the benefits of early initiation of breastfeeding for both the mother and child, only 53.5% of newborns in Tanzania are breastfed within the first hour of life. The trend for early initiation of breastfeeding shows little progress and Tanzania is still far behind reaching the global recommended rate of 70% of early initiation of breastfeeding. This study aims to determine trends and factors associated with changes in the early initiation of breastfeeding in Tanzania from 2004-2016. **Methodology:** This was an analytical cross-sectional study utilizing secondary data from the Tanzania Demographic and Health Surveys (TDHS) for the years 2004-2005, 2010, and 2015-2016. Data analysis was performed using Stata 15. Frequencies and proportions were used to summarize categorical variables. A Modified Poisson regression model was used to determine factors associated with the early initiation of breastfeeding. Multivariable Poisson decomposition analysis was used to assess factors associated with changes in the early initiation of breastfeeding across surveys. **Results:** Trends in early initiation of breastfeeding decreased from 59.53% in 2004/2005 to 46.72% in 2010, and then increased to 51.94% in 2015/2016. Only 5.9% of the overall change in early initiation of breastfeeding was contributed by the difference in characteristics such as mode of delivery and working status. The difference in coefficients contributed to a 94% decrease in early initiation of breastfeeding mostly due to a decrease in early initiation of breastfeeding among caesa-

rean section delivery patients. **Conclusion:** The prevalence of early initiation of breastfeeding in Tanzania decreased between 2004 and 2016, then increased from 2010-2016. Interventions and health policies need to target factors that had significant effects on the early initiation of breastfeeding such as increasing health facility delivery and promoting the initiation of breastfeeding soon after caesarean section delivery.

Keywords

Early Initiation of Breastfeeding, Trends, Factors Associated with Changes, Tanzania

1. Background

Optimal breastfeeding includes early initiation of breastfeeding (EIBF) within 1 hour after delivery, exclusive breastfeeding for 6 months, and continued breastfeeding up to 2 years of age [1]. The WHO has recommended optimal breastfeeding for infants and children of ≤2 years of age to maximize the full benefits of early initiation of exclusive breastfeeding [2]. Despite the WHO recommendation, the global early initiation breastfeeding rate is still low with only 42% of newborns breastfed within the first hour of life [3].

Early initiation of breastfeeding exposes the child to colostrum, strengthening gastrointestinal barriers and resulting in decreased risk of microbial translocation, and improved nutritional and immunological status [4]. It also reduces the risk of postpartum hemorrhage in mothers [4]. Furthermore, EIBF boosts brain development and offers protection against obesity and overweight [3]. It has also been associated with increased odds of exclusive breastfeeding for infants and children [5]. Children who are exclusively breastfed are 14 times more likely to survive in the first 6 months compared to their counterparts who are non-breastfed [6]. Exclusive breastfeeding also protects against diarrhea and childhood diseases such as pneumonia [7].

Globally, the rate of early initiation of breastfeeding varies across countries and regions. According to WHO, approximately 42% of infants have been initiated breastfeeding within the first hour of life. Twenty-one countries have EIBF rates of ≥70% while 14 countries had EIBF rates of <30% [3]. In Eastern and Southern Africa regions, only 65 % of infants were reported to have initiated breastfeeding within the first hour of life [3]. In Tanzania, more than half (53.5%) of infants were initiated within the first hour of life [8]. Only three regions in Tanzania have been reported to have EIBF rates above 70%, these include Mtwara (71.2%), Kigoma (76.9%), and Kagera (76.8%), while 9 regions are below 50%, Geita (46.7%), Mara (45.7%), Tabora (15%), Ruvuma (39.5%), Rukwa (39.5%), Shinyanga (3.9%), Katavi (36.4%), Pemba North (46.8%) and South (38.4%) [8].

Early Initiation of breastfeeding, has only improved significantly in countries

with increased proportions of institutional deliveries [3]. The rise in early breastfeeding initiation rates among countries with an increase in health facility deliveries has primarily has been contributed to low-income countries, where early initiation rates increased by 15 percentage points, compared with an increase of 8 percentage points in lower-middle-income countries from 2005-2017 [3]. Despite the increase from 53% in 2005 to 71% in 2017 in institutional delivery in these countries, the rise of EIBF was lower (45% in 2005 to 51% in 2017), this reflects a missed opportunity to support mothers and newborns in initiating breastfeeding immediately after birth [3].

The Global trend of EIBF has slightly increased from 37% in 2005 to 42% in 2017 [3]. In Tanzania, the EIBF has decreased significantly from 59% in 2004/2005 to 51% in 2015/2016 [9]. Numerous countries have demonstrated the largest changes in trends of early initiation of breastfeeding from 2005-2017. These include Georgia (36.6% to 68.7%) and Belarus (21.1% to 53.0%) [3]. However, some countries have shown a downward change in trends of early initiation of breastfeeding during the same period (2005-2017). These include the Dominicans Republic (60.5% to 38.1%) and Vietnam (44.0% to 26.5%) [3].

Previous studies have demonstrated that improving breastfeeding practices could save more than 800,000 children under 5 years of age, and could reduce the risk of neonatal mortality by 22% globally, and add more than 300 billion dollars to the global economy [3] [10] [11]. A systematic review that included more than 130,000 infants from Tanzania, Ghana, and India revealed that infants who initiated breastfeeding within 2 - 23 hours after birth had a 33% higher risk of neonatal mortality compared to those who initiated breastfeeding within ≤1 hour after birth while those who initiated within ≥24 hours after birth had nearly 2-fold greater risk of neonatal mortality [12]. The authors also showed that delayed breastfeeding was also associated with an 11% increased risk of coughing and a 48% increased risk of difficulty breathing [13].

Various interventions have been implemented by the WHO, UNICEF, and international agencies to increase and promote breastfeeding. In 2017, the WHO, UNICEF, and international organizations collectively launched global breastfeeding collective to improve breastfeeding practices through funding, improved policies, and programs [3]. The team identified seven policy action priorities, each with an indicator and a set target to be achieved by 2030 [3]. Another intervention is a Baby Friendly Hospital Initiative which was launched in 1991 by UNICEF and WHO, which aimed to ensure that maternity units should become centers of breastfeeding support [3]. Since its launching, 15,000 facilities in 134 countries have been awarded Baby-Friendly status [3]. In 2010, only 37% of hospitals in Tanzania have been certified as Baby Friendly [3]. Furthermore, in 2008, a national road map strategic plan to improve reproductive, maternal, newborn, child, and adolescent health in Tanzania was introduced, which included improving infant and young child feeding practices. The country is currently implementing plan II (2016-2020) after success in plan 1 (2008-2015) [14] [15].

With collaborative efforts of different stakeholders to improve breastfeeding

practices globally. Yet globally, including in Tanzania, the rate of EIBF is still far below the 2030 global target, aiming for 70% of infants to be initiated breastfeeding within 1 hour [3]. Both the global and Tanzania trend shows a slow rising in EIBF rates [3].

Currently, it is not clear how factors associated with early initiation of breastfeeding changed over time. Understanding the factors associated with changes in the early initiation of breastfeeding will enable stakeholders, including governments, to design appropriate interventions to achieve national and global targets of early initiation of breastfeeding. It will also enable stakeholders and the government to achieve SDG target 3.2 set on reducing the neonatal mortality rate to 12 death per 1000 live births and under 5 years mortality rate to 25 death per 1000 live birth through eliminating preventable child deaths [16]. The aim of this study is to describe the trends and factors associated with changes in the early initiation of breastfeeding in Tanzania.

2. Methods

2.1. Data Source

This study used nationally representative datasets from the Tanzania Demographic and Health surveys (TDHS) for 2004/05, 2010 and 2015/2016. Tanzania DHS employs a multi-stage sampling procedure. This sampling design is guided by the considerations of the availability of an existing sampling frame to get the full coverage of the target population. The sampling technique intends to provide country-wide estimates for urban and rural areas of Tanzania mainland and Zanzibar.

The first stage involves the selection of a stratified sample from a list of EA that has been obtained from the recent census conducted in Tanzania. These EAs are the clusters. This sample of EAs is selected with considerations to probability proportional to size (PPS) that considers the size of the enumeration area. A listing procedure is then performed on each of the selected EAs such that all dwellings and households are listed.

In the second stage, after a complete list of households is available in each of the selected EAs, a fixed number of households are selected by an equal probability systematic sampling technique. In each of the selected households, a questionnaire is then completed to identify men aged 15 - 59, women aged 15 - 49, and children under the age of 5 years. Every eligible woman and man is then interviewed.

2.2. Study Design and Time

An analytical cross-sectional study was conducted using secondary data from TDHS 2004/2005, TDHS 2010, and TDHS 2015/2016.

2.3. Study Population

The study population included children below <2 years of age in Tanzania who

took part in the TDHS 2004/2005, TDHS 2010, and TDHS 2015/2016. Children aged ≥ 2 years and those missing the outcome of interest where excluded. A final sample size of 10,465 children were surveyed during these periods, with 3409 children from the 2004-2005 survey, 3005 children from the 2010 survey and 4051 children from the 2015-2016 survey respectively.

2.4. Sample Size and Sampling Method

Sample size

This study used secondary data from Tanzania demographic and health surveys from 2004-2005, 2010, and 2015-2016. The total sample size from the 3 surveys was 10,465 children aged < 2 years whereby 3409 children were from the 2004-2005 survey, 3005 children were from the 2010 survey and 4051 children were from the 2015-2016 survey respectively.

Power of the study

Power for this study was calculated separately for each survey year using the equations below which were obtained from (Kirkwood & Sterne, 2003). Firstly, the sample size that would have been obtained under simple random sampling was calculated using the design effect (DEFF) of early initiation of breastfeeding provided by each TDHS respectively (Equation (1). This was followed by the calculation of the effect size using the proportions of early initiation of breastfeeding obtained from TDHS and our study (p_0 and p_1) respectively (Equation (2). Lastly, the power of the study during each survey year was calculated from (Equation (3) after making Z_β the subject (Equation (4). The formulas used for the calculation of power are presented below:

$$N(\text{SRS}) = \frac{N(\text{survey})}{\text{DEFF}} \tag{1}$$

$$\text{ES} = \frac{|p_1 - p_0|}{\sqrt{p_1(1-p_1)}} \tag{2}$$

$$n = \left(\frac{Z_{\alpha/2} + Z_\beta}{\text{ES}}\right)^2 \tag{3}$$

$$Z_\beta = \left(\sqrt{N(\text{SRS})} * \text{ES}\right) - Z_{\alpha/2} \tag{4}$$

where;

ES: Effect Size.

p_0: Prevalence of early initiation of breastfeeding reported from TDHS.

p_1: Prevalence of early initiation of breastfeeding obtained in the study.

N(SRS): Sample size obtained under simple random sampling.

N(survey): Sample size obtained under survey design.

DEFF: Design effect.

$Z_{\alpha/2}$: Standard normal value for 5% precision (1.96).

Z_β: Standard normal value for power.

This study had an overall average of 90% power to detect a difference in early

initiation of breastfeeding by considering a 0.05 significance level.

2.5. Variable Definitions

Outcome of interest

The outcome of interest in this study was the time after the birth at which the respondent first breastfed the child, which was operationalized to be a binary variable carrying 1 (within 1 hour) and 0 (beyond 1 hour)

Primary exposure

I reviewed previous studies on factors associated with previous studies and categorized them into maternal, obstetric, and child-related factors.

Maternal factors

The maternal factors include Age (15 - 24, 25 - 34, 35 - 49), residence (rural vs urban), mother's education level (no education, primary, secondary, and above), mother's marital status (never married, married/cohabiting, widowed/divorced/separated), maternal working status (Yes-working vs No-not working, household wealth (1-poor, 2-middle, 3-rich)

Obstetric factors

ANC visits (0, 1 - 3, ≥4), place of delivery (health facility or home delivery), delivery mode (normal delivery or caesarean section delivery), parity (1 - 2, 3 - 4, 5 - 6, 7+)

Child related factors

Sex (Male or Female), birth size (<2500 g and ≥2500), and birth order (1, 2 - 3, ≥4).

2.6. Data Management and Analysis

Data cleaning and analysis were performed using STATA version 15. Missing values on the outcome of interest (time of initiation of breastmilk) were dropped from the analysis. Some of the variables were re-categorized for proper interpretation between studies. This re-categorization was based on previous literature and plausibility.

The data was set to consider the complex nature of survey design by application of weights, primary sampling unit (cluster), and strata. Descriptive statistics were summarized using frequency and proportions for categorical. To evaluate the trends of early initiation of breastfeeding, descriptive analysis was done separately across the 3 survey periods (2004-2005, 2010, and 2015-2016).

Multivariable Poisson decomposition models were used to determine the changes in the early initiation of breastfeeding and associated factors across survey years. The change in early initiation of breastfeeding was explained by changes in the population structure and changes in the effects of the characteristics (coefficients).

2.7. Ethical Considerations

The study was approved by Kilimanjaro Christian Medical University College

Research and Ethics Committee before the commencement of the study. Permission to use DHS data was granted from the DHS program. The parent study obtained ethical approval from ICF Institutional Review Board (IRB) as well as from the local IRB in Tanzania and informed consent was obtained from all the study participants. All the issues related to confidentiality adhered.

3. Results

3.1. Background Characteristics of Study Participants

A total number of 10,465 children were analyzed across the survey years (Figure 1). Over the years the majority of women were aged 25 - 34 and the proportion across the survey periods decreased from 43.82% in 2004/2005 to 43.15% in 2010 and 40.92% in 2015/2016. There was a decrease in the proportion of women who were employed across the survey from 85.56% in 2004/2005 to 74.94% in 2015/2016. There was a decrease in the proportion of women who resided in rural areas across all surveys from 80.68% in 2004/2005 to 79.51% in 2010 and then to 72.64% in 2015/2016. The proportion of women who delivered at Health facilities increased across all survey years from 51.40% in 2004/2005, 52.40% in 2010 to 66.71% in 2015/2016. The proportion of women who delivered by caesarean section increased over survey years from 3.40% in 2004/2005, 5.07% in 2010, and 5.18% in 2015/2016 (Table 1).

3.2. Trends in Early Initiation of Breastfeeding across Survey Rounds

The trend period of early initiation of breastfeeding was categorized into 3 phases; 2004-2010 (Phase **1**) and 2010-2016 (Phase **2**) and 2004-2016 (phase **3**) to detect the significant differences in early initiation of breastfeeding use over time. Overall, early initiation of breastfeeding decreased by 7.59% points from 2004/2005 to 2015/2016 (Figure 2). Early initiation of breastfeeding decreased by 12.81% points from 2004/2005 to 2010 and increased by 5.22% points from

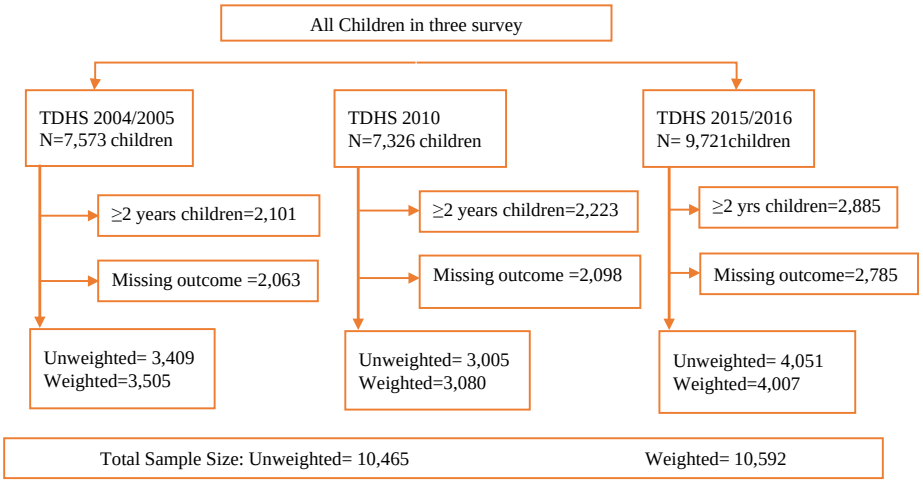

Figure 1. Flow chart for selection of study participants.

Table 1. Percentage distribution (weighted) of participant's characteristics in the TDHS 2004/2005, 2010, and 2015/2016 surveys (N= 10,465).

Variable	Survey year		
	2004/2005 (n = 3409)	2010 (n = 3005)	2015/2016 (n = 4051)
Age (years)			
15 - 24	39.48	37.27	40.26
25 - 34	43.82	43.15	40.92
35 - 49	16.70	19.58	18.82
Working Status[ab]			
Yes	85.56	85.41	74.94
No	14.44	14.59	25.06
Wealth Quintile			
Poor	43.98	45.29	45.81
Middle	21.43	21.33	18.38
Rich	34.59	33.37	35.81
Residence			
Urban	19.32	20.49	27.36
Rural	80.68	79.51	72.64
Woman's education level			
No education	25.10	25.71	19.36
Primary education	69.56	66.81	63.59
Secondary and above	5.34	7.49	17.05
Marital status			
Never married	6.23	6.91	8.39
Married/cohabiting	86.21	84.57	82.01
Widowed/divorced/separated	7.55	8.52	9.60
ANC Visits[cde]			
0	2.83	2.04	2.31
1 - 3	39.93	59.21	49.63
4+	57.24	38.75	48.06
Place of delivery[fgh]			
Health facility	51.40	52.04	66.71
Home delivery	48.60	47.96	33.29
Delivery Mode[Ij]		94.93	94.82
Normal delivery	96.60	94.93	94.82
Caesarean section	3.40	5.07	5.18
Sex of the child			
Male	50.08	49.25	50.92
Female	49.92	50.75	49.08

Continued

Birth weight[klm]			
<2500	7.65	6.25	5.18
≥2500	92.35	93.74	94.82
Parity			
1 - 2	41.01	39.15	45.99
3 - 4	28.69	29.47	26.69
5 - 6	16.30	17.93	15.38
7+	14.00	13.45	11.95
Birth Order			
1	21.58	19.65	26.79
2 - 3	35.41	35.96	34.49
4+	43.01	44.39	38.79

[a]2004/05 n = 3408; [b]2010 n = 3003; [c]2004/05 n = 3401; [d]2010 n = 2997; [e]2015/16 n = 4041 [f]2004/05 n = 3405; [g]2010 n = 2965; [h]2015/16 n = 3993; [i]2004/05 n = 3404; [j]2010 n = 3000 [k]2004/05 n = 1706; [l]2010 n = 1584; [m]2015/16 n = 2593.

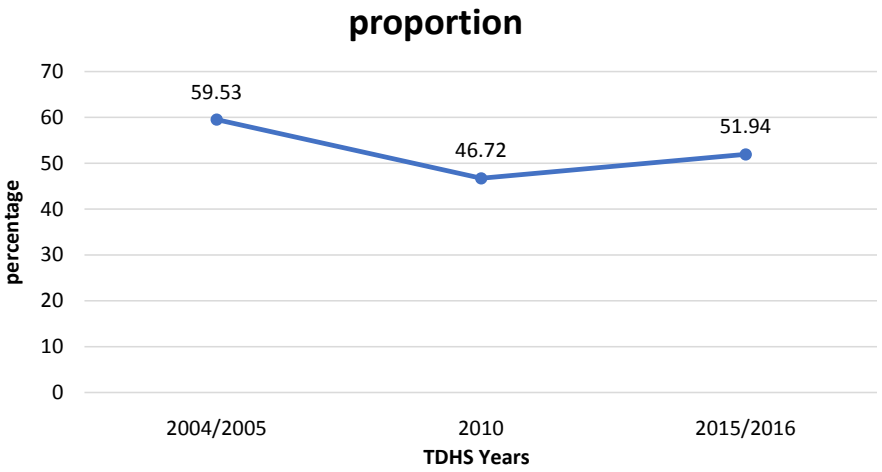

Figure 2. Trends in early initiation of breastfeeding in the past 10 years, Tanzania Demographic and Health Surveys, 2004/2005–2015/2016.

2010 to 2015/2016. The change in trend in all phases is significantly based on the confidence interval

3.3. Factors Associated with Changes in Early Initiation of Breastfeeding

Phase I: 2004/2005 and 2010

Multivariable Poisson decomposition analysis for the factors associated with changes in early initiation of breastfeeding between 2004/2005 and 2010. Only 3.5% of the overall change in early initiation of breastfeeding was due to differences in characteristics (compositional factors). Factors that contributed to the positive change in the early initiation of breastfeeding included working status

and delivery mode. Delivery mode, an increase in the proportion of caesarean section delivery (Table 2), resulted in a significant positive contribution (4.16%, p-value: <0.001) to changes in the early initiation of breastfeeding. After controlling for compositional factors, 96.5% of the decrease in early initiation of breastfeeding was attributed to changes in the effects of characteristics (endowments). Factors such as residence showed a significant effect on the observed positive change in early initiation of breastfeeding between 2004/2005 and 2010. Furthermore, 56.5% of the decrease in early initiation of breastfeeding during 2004/2005 and 2010 surveys was due to behavioral change in early initiation of breastfeeding among women residing in rural areas (p-value: 0.019) (Table 2).

Table 2. Poisson decomposition of changes in early initiation of breastfeeding in Phase I (N = 6414).

Early initiation of breastfeeding	Due to differences in characteristics (E)			Due to differences in coefficients (C)		
	Coeff.	%	p-value	Coeff.	%	p-value
Working status						
No	1.0			1.0		
Yes	−0.00003	0.0228	<0.001	−0.1335	105.79	<0.001
Residence						
Urban	1.0			1.0		
Rural	0.0011	−0.9056	<0.001	−0.07131	56.503	0.019
Delivery mode						
Normal delivery	1.0			1.0		
Caesarean section delivery	−0.0053	4.1636	<0.001	−0.0033	2.6464	0.435
Wealth Quantile						
Poor	1.0			1.0		
Middle	−0.00005	0.03915	0.173	0.0015	−1.1542	0.861
Rich	−0.0005	0.4029	0.043	−0.0084	6.6503	0.520
Parity						
1 - 2	1.0			1.0		
3 - 4	−0.0001	0.0971	0.528	−0.0007	0.55366	0.956
5 - 6	−0.0006	0.44276	0.349	0.0068	−5.3857	0.535
7+	0.0004	−0.30421	0.117	−0.0069	5.482	0.483
Birth order						
1	1.0			1.0		
2 - 3	0.0011	−0.0863	0.414	−0.0152	12.015	0.306
4+	0.0006	−0.4639	0.216	0.0072	5.7214	0.796
Total	0.0044	3.5008	<0.001	0.12179	96.499	<0.001

Phase II: 2010 and 2015/2016

Multivariable Poisson decomposition analysis for the factors associated with changes in early initiation of breastfeeding between 2010 and 2015/2016. The majority (64.5%) of the overall change in the early initiation of breastfeeding was due to differences in characteristics (compositional factors). Factors that contributed to a positive change in the early initiation of breastfeeding included working status, place of delivery, and parity.

Working status, a decrease in the proportion of women working (Table 1), resulted in a significant positive contribution (18.81%, p-value: <0.001) to changes in the early initiation of breastfeeding. An increase in the proportion delivering at a health facility resulted in a significant positive contribution (71.5%, p-value: <0.001) to the changes in the early initiation of breastfeeding.

After controlling for compositional factors, 35.5% of the increase in early initiation of breastfeeding was attributed to changes in the effects of characteristics but was not significant. Factors such as residence showed a significant effect on the observed positive change in early initiation of breastfeeding between 2010 and 2015/2016. Furthermore, 112.3% of the increase in early initiation of breastfeeding during the 2010 and 2015/2016 surveys was due to behavioral change in early initiation of breastfeeding among women residing in rural areas (p-value: 0.025) (Table 3).

Phase III: 2004/2005 and 2015/2016

Multivariable Poisson decomposition analysis for factors associated with changes in early initiation of breastfeeding between 2004/2005 and 2010 are shown in (Table 4). Results indicated that 5.9% of the overall change in early initiation of breastfeeding was due to differences in characteristics (compositional factors). One factor that contributed to the positive change in the early initiation of breastfeeding was the mode of delivery. An increase in the proportion of caesarean section delivery (Table 1), resulted in a significant positive contribution (8.9%, p-value: 0.022) to the changes in the early initiation of breastfeeding.

After controlling for compositional factors, 94.1% of the decrease in early initiation of breastfeeding was attributed to changes in the effects of characteristics. Factors such as mode of delivery showed a significant effect on the observed positive change in early initiation of breastfeeding between 2004/2005 and 2015/2016. Furthermore, 14.1% of the decrease in early initiation of breastfeeding during the 2004/2005 and 2015/2016 surveys was due to behavioral change in early initiation of breastfeeding among women delivering by caesarean section (p-value: 0.008) (Table 4).

4. Discussion

The overall trend in early initiation of breastfeeding decreased in the past 10 years from 59.53% in 2004/2005 to 51.94% in 2015/2016. The trend also increased from 46.72% in 2010 to 51.94% in 2015/2016. It was observed that 5.9% of the overall change in early initiation of breastfeeding between 2004/2005 and

Table 3. Poisson decomposition of changes in early initiation of breastfeeding in Phase II ($N = 7056$).

Early initiation of breastfeeding	Due to differences in characteristics (E)			Due to differences in coefficients (C)		
	Coeff.	%	p-value	Coeff.	%	p-value
Age (5 years)						
15 - 24	1.0			1.0		
25 - 34	−0.0014	−2.6828	0.051	−0.0175	−33.859	0.238
35 - 49	−0.0004	−0.7650	0.007	−0.0012	−2.3279	0.902
Working status						
No	1.0			1.0		
Yes	0.0097	18.8070	<0.001	0.0432	83.403	0.067
Residence						
Urban	1.0			1.0		
Rural	−0.0014	−2.7823	0.389	0.0581	112.3	0.025
Woman's education level						
No education	1.0			1.0		
Primary education	−0.0004	0.78003	0.650	0.0057	10.923	0.792
Secondary and above	0.0014	2.6815	0.702	−0.0052	−10.093	0.142
Place of delivery						
Home delivery	1.0			1.0		
Health facility delivery	0.0370	71.502	<0.001	−0.0167	−32.292	0.224
Delivery mode						
Normal delivery	1.0			1.0		
Caesarean section delivery	−0.0127	−24.569	<0.001	−0.0066	−12.729	0.341
Parity						
1 - 2	1.0			1.0		
3 - 4	0.0017	3.2324	0.081	−0.0038	−7.3212	0.748
5 - 6	0.0047	9.0519	<0.001	−0.0133	−25.766	0.235
7+	0.0038	7.3335	<0.001	−0.0165	−31.827	0.118
Birth order						
1	1.0			1.0		
2 - 3	−0.0015	−2.9139	0.006	0.0172	33.218	0.219
4+	−0.0062	−11.999	0.022	0.0222	42.955	0.401
Total	0.0333	64.456	<0.001	0.0184	35.544	0.189

2015/2016 was attributed to the changes in the population structure. 94% of the changes in early initiation of breastfeeding that occurred between 2004/2005 and 2015/2016 were due to differences in the effects of characteristics.

Table 4. Poisson decomposition of changes in early initiation of breastfeeding in Phase III ($N = 7460$).

Early initiation of breastfeeding	Due to differences in characteristics (E)			Due to differences in coefficients (C)		
	Coeff.	%	p-value	Coeff.	%	p-value
Age (5 years)						
15 - 24	1.0			1.0		
25 - 34	−0.0002	0.3121	0.259	0.0023	−3.1344	0.840
35 - 49	−0.0002	0.2216	0.411	−0.0040	5.3225	0.511
Working status						
No	1.0			1.0		
Yes	0.0026	−3.5004	<0.001	−0.0686	92.417	0.007
Delivery mode						
Normal delivery	1.0			1.0		
Caesarean section delivery	−0.0066	8.9032	0.022	−0.0105	14.097	0.008
Wealth Quantile						
Poor	1.0			1.0		
Middle	−0.0003	0.3975	0.326	−0.0020	2.6772	0.786
Rich	0.0004	−0.5657	0.049	−0.0922	12.421	0.328
Total	−0.0044	5.9176	0.102	−0.0698	94.082	<0.001

This study demonstrated that EIBF decreased from 2004/2005 to 2010 and then increased in 2015/2016. This finding is consistent with trends from a DHS study in Ethiopia in which EIBF decreased from 2004/2005 to 2010 and then increased in 2016 [17]. Similarly, DHS studies from Namibia and Vietnam also demonstrated that EIBF decreased from 2000 to 2013 in Namibia and from 2006 to 2011 in Vietnam [4] [18]. On the contrary, there was an increase in EIBF in all southern Asia countries except Afghanistan [19]. An increase in EIBF rates in this study from 2010 to 2015/2016 may be explained by the Tanzania government's efforts through the national road map strategic plan to accelerate the reduction of maternal, newborn, and child deaths in Tanzania 2008-2015 [14]. This included increasing coverage of healthcare workers trained in infant and young child feeding (IYCF) and training on essential nutrition actions on both maternal, neonates, and children [14]. The decrease from 2004/5 to 2010 could be explained by the increase in the proportion of caesarean section delivery. The impact of an increase in caesarean section delivery on decreasing EIBF has been reported in different studies from Ethiopia and Dominican Republic [3]. This implies more efforts by stakeholders should be made especially in addressing missed opportunities for EIBF for caesarean section deliveries.

About 6% of the change in early initiation of breastfeeding was due to differences in characteristics and 94% was largely contributed by the changes in effects

of characteristics. The decrease in early initiation of breastfeeding was largely contributed by an increase in the proportion of caesarean section delivery over 10 years and the increase of EIBF from 2010 to 2016 was largely contributed by the increase in health facility delivery. This can be explained by the fact health facility delivery has essential newborn care and baby-friendly services which target EIBF while caesarean section delivery delays EIBF due to reduced suckling ability of the baby, reduced milk production by the mother and separation of the mother from the baby soon after delivery. The Government and other stakeholders should continue addressing gaps of EIBF in caesarean section and low proportion of hospital delivery.

Strengths and Limitations of the Study

This is the first study to evaluate the trends and factors associated with the early initiation of breastfeeding in Tanzania. Thru the use of large sample size by utilizing the Tanzania Demographic and Health Survey (TDHS) it allowed for generalizing the findings to conclude early initiation of breastfeeding. The application of decomposition analysis also allowed for changes in the population structure and dynamics over time to be accounted for.

This study had a few limitations. Being cross-sectional, we were not able to infer causal relationships between exposures on early initiation of breastfeeding since both exposures and the outcome (early initiation of breastfeeding) were measured at one point in time.

5. Conclusion

Early initiation of breastfeeding has been significantly decreasing over the past decade (2004/2005-2015/2016) but it has also significantly increased from 2010 to 2015/2016 survey. Numerous factors were associated with changes in the early initiation of breastfeeding. These included factors such as delivery mode and place of delivery. An increase in the proportion of caesarean section delivery over the past 10 years was associated with a decrease in EIBF and an increase in the proportion of health facility delivery was associated with an increase in EIBF from 2010 to 2016. Policy designing of interventions that specifically target these factors may be a path to early initiation of breastfeeding in Tanzania to accelerate progress in reaching national targets, 2030 targets set by global breastfeeding targets as well as SDGs 3.2.

Availability of Data and Materials

The TDHS data and materials used in this study are available for free and on request on the Demographic and Health Survey website at www.dhsprogram.com.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

References

[1] WHO (2020) Infant and Young Child Feeding. https://www.who.int/news-room/fact-sheets/detail/infant-and-young-child-feeding

[2] WHO (2003) Global Strategy for Infant and Young Child Feeding. https://apps.who.int/iris/bitstream/handle/10665/42590/9241562218.pdf;jsessionid=A1894867B56553C18BBF8A7CC24FEF85?sequence=1

[3] UNICEF (2018) Capture the Moment—Early Initiation of Breastfeeding: The Best Start for Every Newborn. UNICEF, 1-42. https://www.unicef.org/eca/media/4256/file/Capture-the-moment-EIBF-report.pdf

[4] Ndirangu, M.N., Gatimu, S.M., Mwinyi, H.M. and Kibiwott, D.C. (2018) Trends and Factors Associated with Early Initiation of Breastfeeding in Namibia: Analysis of the Demographic and Health Surveys 2000-2013. *BMC Pregnancy Childbirth*, **18**, Article No. 171. http://www.ncbi.nlm.nih.gov/pubmed/29769063 https://doi.org/10.1186/s12884-018-1811-4

[5] Nkoka, O., Ntenda, P.A.M., Kanje, V., Milanzi, E.B. and Arora, A. (2019) Determinants of Timely Initiation of Breast Milk and Exclusive Breastfeeding in Malawi: A Population-Based Cross-Sectional Study. *International Breastfeeding Journal*, **14**, Article No. 37. https://doi.org/10.1186/s13006-019-0232-y

[6] Mullany, L.C., Katz, J., Li, Y.M., Khatry, S.K., LeClerq, S.C., Darmstadt, G.L., *et al.* (2008) Breast-Feeding Patterns, Time to Initiation, and Mortality Risk Among Newborns in Southern Nepal. *The Journal of Nutrition*, **138**, 599-603. https://pubmed.ncbi.nlm.nih.gov/18287373 https://doi.org/10.1093/jn/138.3.599

[7] Turin, C.G. and Ochoa, T.J. (2014) The Role of Maternal Breast Milk in Preventing Infantile Diarrhea in the Developing World. Vol. 1, Current Tropical Medicine Reports. Springer Verlag, Berlin, 97-105.

[8] MoHCDGEC (2019) United Republic of Tanzania Tanzania National Nutrition Survey 2018. https://www.unicef.org/tanzania/media/2141/file/Tanzania%20National%20Nutrition%20Survey%202018.pdf

[9] MoHCDGEC, MoH, NBS, OCGS, ICF (2016) Tanzania Demographic and Health Survey and Malaria Indicator Survey (TDHS-MIS) 2015-16. https://dhsprogram.com/pubs/pdf/FR321/FR321.pdf

[10] Edmond, K.M., Zandoh, C., Quigley, M.A., Amenga-Etego, S., Owusu-Agyei, S. and Kirkwood, B.R. (2006) Delayed Breastfeeding Initiation Increases Risk of Neonatal Mortality. *Pediatrics*, **117**, e380-e386. https://doi.org/10.1542/peds.2005-1496

[11] Victora, C.G., Bahl, R., Barros, A.J.D., França, G.V.A., Horton, S., Krasevec, J., *et al.* (2016) Breastfeeding in the 21st Century: Epidemiology, Mechanisms, and Lifelong Effect. *The Lancet*, **387**, 475-490. https://pubmed.ncbi.nlm.nih.gov/26869575 https://doi.org/10.1016/S0140-6736(15)01024-7

[12] Smith, E.R., Hurt, L., Chowdhury, R., Sinha, B., Fawzi, W. and Edmond, K.M. (2017) Delayed Breastfeeding Initiation and Infant Survival: A Systematic Review and Meta-Analysis. *PLOS ONE*, **12**, e0180722. https://doi.org/10.1371/journal.pone.0180722

[13] Smith, E.R., Locks, L.M., Manji, K.P., McDonald, C.M., Kupka, R., Kisenge, R., *et al.* (2017) Delayed Breastfeeding Initiation Is Associated with Infant Morbidity. *The Journal of Pediatrics*, **191**, 57-62.e2. https://doi.org/10.1016/j.jpeds.2017.08.069 http://www.ncbi.nlm.nih.gov/pubmed/29173323

[14] MOHSW United Republic of Tanzania Ministry of Health and Social Welfare (2008) The National Road Map Strategic Plan to Accelerate Reduction of Maternal, Newborn and Child Deaths in Tanzania.
http://www.mcdgc.go.tz/data/One_MNCH_plan.pdf

[15] MoHCDGEC (2016) United Republic of Tanzania the National Road Map Strategic Plan to Improve Maternal, Newborn, Child & Adolescent Health in Tanzania (2016-2020).
https://www.globalfinancingfacility.org/sites/gff_new/files/Tanzania_One_Plan_II.pdf

[16] UN (2019) The Sustainable Development Goals Report.
https://unstats.un.org/sdgs/report/2019/The-Sustainable-Development-Goals-Report-2019.pdf

[17] Woldeamanuel, B.T. (2020) Trends and Factors Associated to Early Initiation of Breastfeeding, Exclusive Breastfeeding and Duration of Breastfeeding in Ethiopia: Evidence from the Ethiopia Demographic and Health Survey 2016. *International Breastfeeding Journal*, **15**, Article No. 3.
https://internationalbreastfeedingjournal.biomedcentral.com/articles/10.1186/s13006-019-0248-3
https://doi.org/10.1186/s13006-019-0248-3

[18] Bui, Q.T.T., Lee, H.Y., Le, A.T.K., Van Dung, D. and Vu, L.T.H. (2016) Trends and Determinants for Early Initiation of Exclusive breastfeeding under Six Months in Vietnam: Results from the Multiple Indicator Cluster Surveys, 2000-2011. *Global Health Action*, **9**, Article No. 29433. https://doi.org/10.3402/gha.v9.29433

[19] Benedict, R.K., Craig, H.C., Torlesse, H., Stoltzfus, R.J. and Foundation, M.G. (2018) Trends and Predictors of Optimal Breastfeeding among Children 0-23 Months, South Asia: Analysis of National Survey Data. *Maternal & Child Nutrition*, **14**, e12698.
https://doi.org/10.1111/mcn.12698