

## Original Article

**Investigating the Relationship Between Breastfeeding Duration and Health Literacy in Primiparous Women Referring to Tehran Health Centers: An Application of Bayesian Poisson Regression Model**Fatemeh Hosseini<sup>1</sup>, Aliakbar Rasekhi<sup>1\*</sup>, Minoor Lamyian<sup>2</sup><sup>1</sup> Department of Biostatistics, Faculty of Medical Sciences, Tarbiat Modares University, Tehran, Iran.<sup>2</sup> Department of Reproductive Health & Midwifery, Faculty of Medical Sciences, Tarbiat Modares University, Tehran, Iran.

## ARTICLE INFO

## ABSTRACT

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Published 01.02.2019**Key words:**Bayesian Analysis;  
Breastfeeding;  
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Poisson distribution**Introduction:** Breast milk is an ideal food for the healthy growth and development of infants. Breastfeeding is associated with benefits of lifelong health for both infants and mothers. This study aims to investigate the factors affecting breastfeeding duration in primiparous women referring to Tehran health centers.**Methods:** In this analytical study, the population consisted of primiparous women of reproductive age who referred to Tehran health centers in 2015-2016 having a child aged 2-5 years. Data were collected by a questionnaire for measuring the level of Health Literacy for Iranian Adults (HELIA) in the urban population, a Socio-Economic Status (SES) questionnaire and interviews with mothers. Statistical analysis was done using Bayesian Poisson regression model and OpenBUGS software.**Results:** In the present study, the minimum and maximum of breastfeeding duration were one and 24 months respectively, and the median duration of breastfeeding was 20 months. Also, exclusive breastfeeding was reported at 50.5%. The variables age of mother (CI 95%: -0.01, -0.008), health literacy score (CI 95%: 0.01, 0.02) and the first-time breastfeeding more than one hour after birth (CI 95%: -0.34, -0.04) had significant relationship with breastfeeding duration.**Conclusion:** The health literacy score, the age of mother and the first-time breastfeeding more than one hour after birth had a significant relationship with breastfeeding duration. Therefore, considering the importance of the effect of maternal health literacy on breastfeeding, it is suggested that mothers of pre-pregnancy have the ability to obtain a high score of health literacy.**Introduction**

Breastfeeding provides the ideal diet for the healthy growth and development of infants. It is also an integral part of the reproductive process with important implications for maternal health (1). Given the health benefits of human milk for infants, the World Health

Organization (WHO) recommends exclusive breastfeeding for the first 6 months and continued breastfeeding along with appropriate complementary feeding up to age two years or beyond (2). Breast milk is the natural first food for infants which provides all the energy and nutrients that the infant needs for the first 6 months of life (1) and plays an important role in

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improving nutrition and child's health (3). According to WHO, EBF strongly reduces the incidence of infant mortality due to pneumonia (4). If every infant is exclusively breastfed from birth for 6 months, an estimated 1.3 million lives will be saved worldwide every year (1). In a study by Moimaz et al in Brazil in 2017, the majority of women (96.5%) declared their intention of breastfeeding their babies. The main variables to affect the intention of breastfeeding were the number of gestations, previous breastfeeding experience, and previous breastfeeding guidance. Intended breastfeeding duration was significantly affected by women's age, employment, the number of gestations, and previous breastfeeding experience (5). In the study of Prior et al in the United States in 2012, they concluded, rates of early breastfeeding (any initiation or at hospital discharge) were lower after cesarean delivery (CD) compared with vaginal delivery (VD) (pooled OR: 0.57). In mothers who initiated breastfeeding, CD had no significant effect on any breastfeeding at 6 months (6). In the study of Liu et al in the Shihezi City in Northwest China 2013, the breastfeeding initiation rate was 95.9%. The breastfeeding rates then declined to 69.6% at 6 months, 29.7% at 12 months, and 2.3% at 24 months. The median duration of "any breastfeeding" was 9 months. Younger maternal age, employment, and suffering from illness were also associated with a shorter duration of breastfeeding (7). Therefore, this study was conducted to determine the relationship between effective factors such as health literacy score, mode of delivery, mother's age, occupation, and the first time of breastfeeding with the duration of breastfeeding in primiparous women referring to health centers by Poisson Regression model. The results of this study can be useful for both mothers and authorities of health centers. Knowing the factor affecting exclusive breastfeeding, we can increase the level of both mothers' and children's health.

In this study response variable, duration of breastfeeding, is a counting variable (non-

negative integer values). One common method for analysis of counting responses variables is Poisson regression (8), which can be regarded as a special case of the generalized linear models (9). In other words, Poisson regression is analogous to standard linear regression, except that the mean is modeled as the exponential of a linear function (10). So far, Poisson regression has been successfully applied to many real-world scenarios, such as crowd counting, age estimation, ecology related organisms, criminology applications, survival analysis (11,12), etc. In this study, we applied the standard Poisson regression model in a Bayesian setting, by considering a multivariate normal distribution as the prior distribution and obtained the estimations through computational Bayesian methods.

## Methods

This cross-sectional study was conducted in Tehran, Iran in 2015-2016. The research population consisted of primiparous women at the age of fertility with children aged 2-5 years, who referred to Tehran's health centers including Akbarabad, Farmanfarmayan, Shahid Ayat, Yaftabad and Tehran Sara. A sample of size  $n = 190$  was selected at random and the clients were consciously entered in the study after completing their consent. Data were collected by a midwifery student using a questionnaire for measuring the level of Health Literacy for Iranian Adults in the urban population known as HELIA (13), and a Socio-Economic Status questionnaire known as SES described in (14). Other variables measured by interview with mothers. To analyze the data the Bayesian Poisson regression model with response variable breastfeeding duration  $y_i$  ( $i = 1, \dots, n$ ) was considered, which can be expressed as,

$$\log(\mu_i) = \beta_0 + \beta_1 x_{1i} + \dots + \beta_p x_{pi},$$

where  $p$  is number of parameters,  $\mu_i$  is the mean of response variable  $y_i$  and  $y_i$  has Poisson density; that is  $f(y_i|\mu_i) = \exp(-\mu_i) \mu_i^{y_i} / y_i!$ . In Bayesian analysis we considered

multivariate normal density  $\pi(\beta_1, \dots, \beta_p)$  as prior for the vector of coefficients with zero means and a diagonal variance-covariance matrix with variances 10. The Posterior distribution of the coefficients,  $f(\beta_1, \dots, \beta_p | y_1, \dots, y_n)$ , computed as

$$f(\beta_1, \dots, \beta_p | y_1, \dots, y_n) \propto f(y_1, \dots, y_n | \beta_1, \dots, \beta_p) \pi(\beta_1, \dots, \beta_p).$$

For these computations, the OpenBUGS software was used and the means of posterior distributions considered as estimates of the coefficients. Convergence of the algorithm checked by auto-correlation plots and Geweke's statistic (15)

## Results

The median breastfeeding duration was 22 months. The mean age of mothers was  $31 \pm 4.13$  years that varied from 20 to 41 years, most mothers had good health literacy ( $67.62 \pm 13.12$ ) (Table 1). Qualitative predictive variables, mode of delivery, maternal occupation and first-time breastfeeding are shown in Table 2. Most of the mothers were housewives (64%) and had cesarean delivery (80%). Mothers who had first-time breastfeeding during one hour after birth were the most frequent (42%).

Bayesian Poisson regression results are in Table 3 and show that age of mother has a significant relationship with the breastfeeding duration (-0.008 with CI 95%: -0.01, -0.0001),

Health literacy score has a significant relationship with the breastfeeding duration (CI 95%: 0.01, 0.02), i.e. for 10-unit increase in health literacy score, the average breastfeeding duration is increased by 0.21 months (about 6 days), since  $\exp\{10 \hat{\beta}\} = 1.21$ .

First-time breastfeeding more than one hour after birth is significant with the breastfeeding duration (CI 95%: -0.34, -0.04). It's mean, the average breastfeeding duration in mothers with the first time breastfeeding more than one hour after birth was reduced to 17% months (about 5

days) compared to the mothers with the first-time breastfeeding immediately after birth.

## Discussion and Conclusion

This research was first conducted on primiparous women for studying the effect of health literacy on exclusive breastfeeding. In the study of Hosseini et al. in Farooja city in 2010, the median breastfeeding duration in children was reported to be 22 months, which is close to the reported 22 months in the present study (16). The findings of this study showed that age of mother has a significant relationship with the breastfeeding duration (CI 95%: -0.01, -0.008), the result reported in this study was similar to the results of the study in Liu et al (P =0.01) (7), Chen et al (P =0.00) (17) and finding is different from the results of the study in Chan et al (P =0.19) (18), Misty et al (P >0.05) (19). Health literacy score has a significant relationship with the breastfeeding duration (CI 95%: 0.01, 0.02) and this is an importance finding because women were primiparous in this study. Therefore, it is possible to provide accurate health plans and provide specialized training by midwifery professionals to increase the level of women's health literacy at reproductive age, in order to achieve better results in promoting breastfeeding. The first-time breastfeeding more one hour after birth is significant with the breastfeeding duration (CI 95%: -0.34, -0.04). Due to the fact that there is no similar study in Iran, the results compared with studies close to this study. In the study of Pourahmad Garbandi et al. among breastfeeding mothers referred to Bandar-Abbas health centers there was a significant relation between the time of the first feeding of the child and lactation (P <0.05) which is similar to the finding of the present study (20). The exclusive breastfeeding rate in the present study after removal of Perth data was 50.5%, which is more than the exclusive breastfeeding worldwide 38% reported by the WHO (1). In the study of Pourahmad Garbandi et al, exclusive breastfeeding rate 53% were reported (20). The rate of the first time breastfeeding one hour after birth in the current study was

41.5%. In contrast, 68% were reported in the study by Akhtaruzzaman M et al. This difference may be due to the larger sample size of their study (21). The findings of this study showed that there was a significant relationship between the health literacy score, age of mother and the first-time breastfeeding with the breastfeeding duration. Given the fact that the study population of the study was restricted to primiparous mothers, this limitation can be eliminated by the selection of multiple mothers. Therefore, considering the importance of the effect of maternal health literacy on breastfeeding, it is suggested that mothers in the pre-pregnancy duration oriented towards high scores of health literacy.

### Conflicts of interests

The authors declare that there is no conflict of interest regarding the publication of this article.

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**Tables**

*Table 1: Frequency distribution of sample quantitative variables*

Variable	Mean	SE	Minimum	Maximum
Age of mother	31.11	4.13	20	41
Health literacy score	67.62	13.12	34.4	95.4

*Table2: Frequency distribution of sample qualitative variables*

Variable	Level	Frequency	Percent (%)
<b>Mode of delivery</b>	Vaginal delivery	38	20%
	Caesarean section delivery	152	80%
<b>Maternal occupation</b>	Maternal occupation	70	36%
	Housewife	120	64%
<b>first-time breastfeeding</b>	Immediately after birth	28	15%
	During one hour after birth	80	42%
	One hour after birth	37	19.5%
	More than one hour after birth	45	23.5%

**Table3:** The results of the Bayesian Poisson regression model

Variable	Level	$\beta$	SE	$\exp(\beta)$	95% CI
<b>Age of mother</b>	-	-0.008	0.004	0.99	(-0.01, -0.0001)
<b>Health literacy score</b>	-	0.019	0.001	1.02	(0.01,0.02)
<b>Maternal occupation</b>	Maternal occupation	-	-	-	-
	Housewife	0.05	0.04	1.06	(-0.02,0.13)
<b>Mode of delivery</b>	Vaginal delivery	-	-	-	-
	caesarean section delivery	-0.10	0.05	0.89	(-0.21,0.001)
<b>first-time breastfeeding</b>	Immediately after birth	-	-	-	-
	During one hour after birth	-0.02	0.061	0.97	(-0.14,0.09)
	One hour after birth	-0.10	0.064	0.90	(-0.24,0.03)
	More than one hour after birth	-0.18	0.064	0.83	(-0.34, -0.04)