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# **Health Literacy of Pregnant Women and Duration of Breastfeeding Maintenance: A Feasibility Study**

## **Health Literacy and Breastfeeding Maintenance**

### **ABSTRACT**

**Aims:** Research the association between health literacy and exclusive breastfeeding at four-months postpartum.

**Background:** Despite the benefits of breastfeeding, its rates are low worldwide. Among the reasons for abandonment is the level of maternal education. Maternal education has been associated with health literacy, but evidence between health literacy and breastfeeding maintenance is limited.

**Design:** A cross-sectional study.

**Methods:** The sample compromised 229 nursing mothers recruited from January 2018 to the end of December 2018 at Spain by systematic sampling method. Women were interviewed postpartum on parameters associated with the start and continuation of breastfeeding up to four months postpartum. Multivariate logistic regression models to explain exposure variables as well as exclusive breastfeeding cessation at four months.

**Results:** Approximately 10% of the participants had inadequate health literacy. Factors associated with early cessation of exclusive breastfeeding at four months in the multivariate model adjusted using a stepwise variable selection process based on a likelihood ratio test were civil status, risk of pregnancy, type of delivery, limited or inadequate level of health literacy, and LATCH score at discharge, with an 85.6% area under the ROC curve.

**Conclusions:** Our study offers preliminary evidence regarding the hitherto inconsistent relation between health literacy and early cessation exclusive breastfeeding at four months, supporting the conduct of further studies with larger sample sizes and greater statistical power. Such studies are warranted before endorsing health literacy-based interventions aiming to mitigate early cessation exclusive breastfeeding.

**Impact:** Low or inadequate health literacy is linked to multiple poor health and clinical outcomes. We investigated the prevalence of exclusive breastfeeding at four months postpartum, and the impact of health literacy in maintaining optimal exclusive breastfeeding practices. Limited or inadequate health literacy was one of the factors associated with early cessation of exclusive breastfeeding in the multivariate regression model, although further research is needed.

## **KEYWORDS**

health literacy, breastfeeding, breastfeeding duration, exclusive breastfeeding, nursing, breastfeeding abandonment, early cessation, women.

## **1. INTRODUCTION**

Breastfeeding (BF) has long-term clinical benefits, it lowers the risk of infections and sudden infant death syndrome, childhood leukaemia, or obesity (Chan, Ip, & Choi, 2016). In turn, maternal benefits comprise improved bonding with the newborn infant, body weight stabilisation, lessened risk of postpartum depression, as well as a lower incidence of breast or ovarian malignancies (Abou-Dakn, 2018; Chowdhury et al., 2015). Lastly, BF affords both short and long term economic and environmental societal advantages (Rollins et al., 2016).

## **2. BACKGROUND**

The World Health Organization recommend breastfeeding as the optimal feeding for all infants and exclusive breastfeeding (EBF) for the first 6 months of life; however, the rate of EBF within four months after delivery globally is still low (Victora et al., 2016). Despite these apparent benefits only about 36% of all infants are exclusively breastfed worldwide until approximately the age of six months (Victora et al., 2016; Vila-Candel, Soriano-Vidal, Murillo-Llorente, Pérez-Bermejo, & Castro-Sánchez, 2019). Many regions have different trends in the percentage of infants age 0 to 5 months exclusively breastfed, Eastern and Southern Africa 56%, South Asia 57%, North America 35%, and Eastern Europe and Central Asia 42% (UNICEF, 2019).

Several reasons for this early cessation have been identified, including hypogalactia, newborn weight gain below the recommendations, lower maternal age, low socioeconomic status, level of maternal education, breastfeeding knowledge, intention, and self-efficacy BF, an unsupportive working environment, and negative maternal expectations or experience with BF (Oribe et al., 2015; Ramiro González et al., 2018; Vila-Candel et al., 2019).

The influence of health literacy (HL) on breastfeeding practices are yet to be explored by researchers (Tsai, Huang, & Lee, 2015). The World Health Organization (WHO) defines HL as “the cognitive and social skills which determine the motivation and ability of individuals to gain access to, understand and use information in ways which promote and maintain good health” (World Health Organization, 1998). A range of HL measurement tools are available (Kristine Sørensen et al., 2012). However, most tools do not reflect the multidimensional nature of HL, as they are predominantly focused on reading comprehension, pronunciation, and numeracy (Haun, Valerio, McCormack, Sørensen, & Paasche-Orlow, 2014). Low or inadequate HL is linked to poor health and clinical outcomes, including increased hospitalisations, emergency department use, poor

overall health status, and higher levels of mortality (Batterham, Hawkins, Collins, Buchbinder, & Osborne, 2016). Given the significant burden of low HL on citizens and users of the health and social care system (Castro-Sanchez, Vila-Candel, Soriano-Vidal, Navarro-Illana, & Diez-Domingo, 2018), on identifying and addressing this modifiable risk factor has been emphasised to improve health outcomes (Kilfoyle, Vitko, O'Connor, & Bailey, 2016). A factor that conditions behaviours that afford positive benefits towards BF is health literacy (HL) (Batterham et al., 2016; Castro-Sánchez, Chang, Vila-Candel, Escobedo, & Holmes, 2016).

Level of education has been associated with HL (Garcia-Codina et al., 2019; Kristine Sørensen et al., 2015), with clear evidence of the close and direct association between education level and health outcomes (Castro-Sanchez et al., 2018; Van Der Heide et al., 2013). However, low levels of HL were closely related to poorer health status, even in populations with high levels of education. Even though HL and its relationship with educational levels have not been clarified in previous literature (Van Der Heide et al., 2016), have strongly recommended that HL should be part of the equation to evaluate the manner in which health information is to be handled in the target population.

In view of the importance of maternal HL and BF, the definition of predictors and risk factors could make an essential contribution to improved maternal and infant health (Khorasani, Peyman, & Esmaily, 2017).

A limited number of studies have evaluated the relationship between maternal HL and BF behaviours. However, suggests a positive relationship between mother's HL with the continuation of BF, with lower HL being associated to a limited duration of EBF (Barnes, Barclay, McCaffery, & Aslani, 2018; Kaufman, Skipper, Small, Terry, & McGrew, 2001).

### **3. THE STUDY**

#### **3.1 Aims**

The present study was designed to investigate the association between health literacy and exclusive breastfeeding at four-months postpartum. The rate of exclusive breastfeeding at 6 months in Spain is very low, making it difficult to obtain a sufficient number of mothers for a robust analysis (Cabedo-Ferreiro et al., 2019).

Furthermore, to assess the prevalence of EBF at four months postpartum and identify the variables associated with low and high HL.

#### **3.2 Design**

This study used a descriptive, cross-sectional, questionnaire-based design.

#### **3.3 Participants**

The catchment area of the Health Department comprises of 251,000 inhabitants, with about 1700 births per year. La Ribera University Hospital is a state-funded tertiary hospital with 300 beds. The portfolio of health services offered to citizens in Spain depends on each of the 17 Autonomous Regions, and their ability to independently tailor health resources to the needs of the local population.

The population was defined as women in their postpartum period (24-48 hours after delivery) who were followed-up until their infants reached 4 months of age. We selected women in their postpartum period using a probability sampling with systematic monitoring. The research team selected to interview two women at random per week from those who were inpatient. Convenience sampling was performed, with the following inclusion criteria: (a) nursing mothers in their immediate postpartum period, (b) women without cognitive problems, language difficulties or those who were illiterate, and (c) single births at term in order to facilitate comparison with previous studies (Vila-Candel,

Castro-Sánchez, & Soriano-Vidal, 2017). Women could not be contacted in the telephone interview after three attempts were excluded during follow-up visits from the study.

During the first interview at the hospital, consent forms and personal contact information for further follow-up appointments were obtained from candidates who were willing to participate.

The sample size was estimated by EPIDAT 3.1 with the following settings: assuming a risk of attrition of EBF in the group of patients with adequate HL of 40% (Rius et al., 2014), versus 60% among patients with inadequate HL, with equally sized groups, a power of 85% and a 95% level of confidence. The calculated sample size required was 222 participants.

### **3.4 Data Collection**

Data were collected from participants using a paper questionnaire. The researchers recruited convenience samples of women from hospital from January 2018 to the end of December 2018. The health literacy screening tool was self-administrated and took approximately 10 minutes to complete.

Feeding type was classified into exclusive breastfeeding including expressed milk or milk from a donor (Oribe et al., 2015; Winkvist et al., 2015) or formula feed, either alone or mixed (if feeding combined BF and formula feed). Breastfeeding status was recorded at the time of hospital discharge (48-72 hours), and at one, two, and four months postpartum. Early cessation of EBF was classified as cessation before four months postpartum (yes/no).

Subsequently, the community midwife at the health care centre, who already had two established postpartum control appointments with the mothers (at one, and two months postpartum), gathered information regarding their breastfeeding status. At four months postpartum, a telephone interview was conducted, chosen to minimise the risk of

missing data and maximise data accuracy, as this was the period where women scheduled an appointment with their paediatrician and the pediatric nurse responsible for the care of the newborn for routine immunisation.

### **3.5 Ethical considerations**

The study adhered with the recommendations of the Declaration of Helsinki and was approved by the Clinical Research Ethics Committee of La Ribera University Hospital in November 2017 (HULR\_11/2017/#43). All participants were fully informed about the study, the voluntary nature of participation, and confidentiality. The research team recruited the women at the hospital and written informed consent was obtained in all cases, and guaranteed anonymity and confidentiality.

### **3.6 Data analysis**

Descriptive statistics were reported as means and standard deviations for continuous variables (age, age at first pregnancy, gestational age, birth weight, LATCH score, duration of BF), and as ranges and percentages for categorical variables.

The exposure variable of the literacy level measured by NVS was analysed categorically. The categories 'Inadequate' and 'Limited' were collapsed into a single category.

Regarding BF status from hospital discharge, the response variable "EBF cessation at 4 months" was divided into two categories: "EBF at 4 months" and "gives up BF at 4 months", which included either formula feeding or mixed feeding.

We analysed the level of HL with the NVS screening tools and the characteristics of the women who gave up breastfeeding at four months via 2x2 tables and the chi-squared test ( $\chi^2$ ) for qualitative variables. Moreover, the comparison of averages was made with the application of the Student *t*-test for quantitative variables. Likewise,

follow-up dropouts were analysed over the four months to determine any differences between groups.

To analyse the magnitude of the association between variables, we generated multivariate logistic regression models to explain exposure variables as well as EBF cessation at four months. These models were adjusted using a stepwise variable selection process based on a likelihood ratio (LR) test. The results present adjusted odds ratios (*OR*), confidence intervals (CIs) calculated for a confidence level of 95%, and associated *p*-values. Data analysis was performed on SPSS v.25.0 statistical package (IBM Corp. Released 2018. IBM SPSS Statistics for Windows, Armonk, NY, USA) and R (R project 2019, Version 3.5.1). Statistical significance was considered for  $p < .05$ .

### **3.7 Validity, reliability and rigour**

Data collection included demographic characteristics and, health literacy evaluation tools. LATCH and, other gynaecological data were obtained from electronic medical records.

#### **3.7.1 Early cessation of exclusive breastfeeding**

In all routine visits, the mothers were asked about the early cessation of EBF and duration of EBF since their discharge from hospital (1.-Are you breastfeeding your baby without the help of any formula feeding? 2.- If not, for how long have you been exclusively breastfeeding your baby?). Finally, the information related to the type of feeding and duration was registered in the personal electronic medical health record.

#### **3.7.2 Breastfeeding LATCH score**

The breastfeeding LATCH score serves to predict EBF success up to 6 weeks postpartum (Sowjanya & Venugopalan, 2018) and provides a systematic method to gather information about individual BF sessions. LATCH score assigns a numerical score of 0, 1 or 2 to five key components of BF for a possible total score of 10 points: “L” is for how well the infant latches onto the breast, “A” is for the amount of audible swallowing

noted, “T” is for the mother’s nipple type/condition, “C” is for the mother’s level of comfort, and “H” is for the amount of help the mother needs to hold her infant to the breast (Jensen, Wallace, & Kelsay, 1994). LATCH score showed that correlations were strong and positive for each item and total LATCH score. The Spearman correlation coefficients ranged from 0.65 to 0.91 (Altuntas et al., 2014). We assessed the LATCH score in the maternity unit daily during admission and included it in our data upon discharge (Tornese et al., 2012).

### **3.7.3 Health literacy screening tool**

The HL was explored through an interview at discharge using the Newest Vital Sign (NVS) (Weiss et al., 2005). This tool explores reading and numeracy using a set of 6 questions based on an ice-cream’s nutritional information label to the respondent. Participants were not briefed about the type of answer expected nor was extra time provided. The total score (0 to 6 points) categorises individuals as having a strong probability of limited literacy (score: 0-1 points), possible limited literacy (score: 2-3 points) or adequate literacy (score: 4-6 points) as per authors instructions. NVS scale has also been validated for the Spanish speaking population, with moderate reliability (Cronbach  $\alpha = .69$ ).

## **4. RESULTS**

### **4.1 Demographic characteristics**

Regarding the sociodemographic characteristics of the participants, the mean (SD) age was 32.5 (5.2) years. At table 1 can be found details of the distribution according to the HL screening tool used. The mean (SD) LATCH score on the day of discharge in women with EBF and mixed breastfeeding was 8.95 (0.95). A third (38.8%,  $n = 89$ ) of the women

planned to use formula feeding immediately after delivery, as the only continued type of feeding.

A total of 278 women were initially selected through the inclusion criteria for the study. Two hundred and twenty-nine mothers completed the interviews at discharge (82.3%) and 187 mothers at infant age 4 months (65.1%), as presented in Figure 1. We analysed the homogeneity among those who agreed, and those who declined to participate. There were no significant differences in age, age at first pregnancy, gestational age at delivery, or country of origin between the group that accepted and the group that declined to participate.

Regarding the women lost to follow-up, statistically significant reductions in the sample population were recorded at one, two and four months among the participants with lower educational status ( $p = .011$ ;  $p = .017$ ;  $p = .019$ , respectively) and lower HL levels as measured by the NVS ( $p = .019$ ;  $p = .035$ ;  $p = .016$ , respectively), presented in Figure 2.

#### **4.2 Prevalence of exclusive breastfeeding**

The time course of EBF over follow-up is presented in Figure 3. The prevalence of EBF at the time of hospital discharge was 55.0%, 95% CI [48.5-61.4] versus 46.0%, 95% CI [26.5-38.6] at one month, 39.0%, 95% CI [20.8-32.2] at two months, and 25.6%, 95% CI [16.1-26.6] at four months. In turn, 48.3%, 95% CI [14.1-24.2] of the women showed early cessation of EBF.

#### **4.3 Variables related to health literacy**

The NVS screening tool yielded scores between 0 and 6. These scores were categorized as indicative of inadequate (9.6%,  $n=22$ ), limited (45.4%,  $n = 104$ ), and adequate HL (45%,  $n = 103$ ).

Table 1 presents the results obtained with the HL levels analysed in relation to the NVS tool (Adequate/Inadequate or Limited). We identified statistically significant differences in terms of the level of education ( $p < .001$ ) and maternal employment ( $p < .001$ ). The multivariate logistic regression model for inadequate or limited HL suggested that level of education and maternal employment were associated with limited or inadequate HL. In addition, maternal age was identified as a confounding variable. Women who were unemployed or currently studying were more likely to have inadequate HL as compared to self-employed/higher professional/managerial employed women, all presented in Table 2.

#### **4.4 Variables related to early cessation of exclusive breastfeeding at four months**

On considering the characteristics of the women and the referred early cessation of EBF before four months, we observed statistically significant differences in the multivariate logistic regression model performed ( $n= 88$ ). The area under the ROC curve for early cessation of breastfeeding was .856 (95% CI [.777-.935];  $p < .001$ ). Regarding the quantitative variables, only the BF LATCH score at discharge was associated to early cessation of EBF ( $p = .002$ ), with a higher average score 9.3, (SD 0.64) vs. 8.7 (SD 1.01) among the women who stopped EBF. Civil status ( $p = .001$ ), risk of pregnancy ( $p = .002$ ), and type of delivery ( $p = .018$ ) were associated with cessation. The HL level as per the NVS tool was not statistically significant with the early cessation of EBF but the association was high (OR= 2.6; 95% CI [.837-8.553];  $p = .097$ ) and clinically relevant, as presented in Table 3.

### **5. DISCUSSION**

This is one of the most comprehensive studies published to date in Spain on breastfeeding initiation, maintenance, and predisposing factors for EBF at four months postpartum, and on the overall influence of HL upon these behaviours. Based on the results of the present

study, even though there was no significant relationship between the levels of HL of nursing mothers with the EBF at four months, although their association could be plausible.

The prevalence of EBF at four months was slightly higher than what was reported previously in Spain (Rodríguez-Pérez et al., 2017), although lower than in other cohorts in northern Spain (51.4-62.5%) (Oribe et al., 2015; Ramiro González et al., 2018). These differences could be attributable to the methodologies used for data collection, or the scope of breastfeeding policies of the different organisations (Díaz-Gómez, Ruzafa-Martínez, Ares, Espiga, & De Alba, 2016). Additionally, we need to consider the impact of follow-up losses on the true prevalence of EBF.

In our study, over one-half of all the women were using formula feeding at four months. It could, therefore, be inferred that a 13.5% of the women had opted for formula feeding due to EBF failure, and this was in line with our previous study (Vila-Candel, Duke, Soriano-Vidal, & Castro-Sánchez, 2018). While breastfeeding initiation rate was high, the continuation rate declined subsequently. The EBF rate was still sub-optimal and do not meet the global public health recommendation set by WHO, and this may indicate that additional measures are needed (De Roza et al., 2019).

Health literacy has been identified as a critical and modifiable factor to improve health outcomes and reduce health disparities (Hoffman, Marsiglia, Nevarez, & Porta, 2017). We found that while the NVS tool classified 45% of the women as having adequate HL, this figure was higher than previously reported across the board (Cheong et al., 2018; Gazmararian, Yang, Elon, Graham, & Parker, 2012; Komenaka et al., 2015; Poorman, Gazmararian, Elon, & Parker, 2014). Factors associated with HL were level of education and employment status. Since education is a crucial HL predictor, this could explain the relatively weak discriminating capacity of the NVS scale (Delanoë et al., 2016). In

general, low HL was also correlated with lower socioeconomic or employment status (K Sørensen et al., 2013). Accordingly, mothers with a higher education level tended to initiate BF more often and were likely to breastfeed for a more extended period of time, compared to their less-educated counterparts (Ramiro González et al., 2018; Whipps, 2017). Thus, our findings confirm the existence of relationships between educational level and HL, as per other studies (Van Der Heide et al., 2013).

Among the women opting for early cessation of EBF, about half had limited or inadequate HL according to the NVS. Some authors have reported that 30% of women with inadequate HL have never breastfed, as compared to 13% of women with adequate HL (Poorman et al., 2014). Other studies based on the REALM (Rapid Estimate of Adult Literacy in Medicine) tool have concluded that a high HL is associated with EBF at two months (Kaufman et al., 2001), and with a significantly high likelihood of BF continuation at postpartum (Stafford, Lathrop, & Haddad, 2016). Other authors have observed an association between maternal HL and BF self-efficacy (Khorasani et al., 2017). Furthermore, no significant relationship between HL levels and BF pattern has been reported as per other studies (Mirjalili, Jaber, Jaber, & Bonabi, 2018).

In this work, single, separated, divorced or widowed women, at risk in pregnancy, with limited or inadequate HL, with spontaneous delivery and with low LATCH values at discharge were associated with the early cessation of EBF at four months. In our study, a stable relationship was associated with more extended periods of BF and was attributed to partner support of BF. This support has been previously associated with increased rates of initiation and duration of BF (Leng, Shorey, Yin, Chan, & He, 2019; Rempel, Rempel, & Moore, 2017).

Besides, women at increased antenatal obstetric risk were less likely to opt for EBF at four months. The underlying reasons could be clinical or psychological, as seen

in limited EBF and assisted reproduction (Barrera, Kawwass, Boulet, Nelson, & Perrine, 2019), or hypertensive pregnancy disorder (Groer, Jevitt, Sahebzamani, Beckstead, & Keefe, 2013). Nevertheless, the observation could be related to increased levels of anxiety, resulting in a shortened EBF period (Ystrom, 2012).

Several studies have confirmed that birth by cesarean section significantly hinders BF within the first hour of life (Hobbs, Mannion, McDonald, Brockway, & Tough, 2016). However, mothers who successfully start BF after a cesarean section procedure are as likely to continue EBF at 6 months, as compared to mothers who give birth via vaginal delivery (Kiani, Rich, Herkert, Safon, & Pérez-Escamilla, 2018; Lau, Htun, Lim, Ho-Lim, & Klainin-Yobas, 2015).

Regarding HL levels, women with higher scores could have increased awareness of the importance of BF, have better access to resources, or be surrounded by other women who would help them address difficulties (Díaz-Gómez et al., 2016; Vila-Candel et al., 2017). This seems to support our hypothesis, as women with low HL have lower EBF rate at four months postpartum than women with adequate HL.

We analysed the HL and sociodemographic characteristics of women who were lost to follow-up. Women with lower educational and HL levels were at a higher risk of dropping out of abandoning the study. Healthcare professionals should thus tailor local resources to support these women. The use of tools including the LATCH score at discharge or HL screening questionnaires before delivery (Tornese et al., 2012), could identify women who may be more hesitant to access health services or seek specialised professional help (Soriano-Vidal, Vila-Candel, Soriano-Martín, Tejedor-Tornero, & Castro-Sánchez, 2018).

## **5.1 Limitations**

Our results related to EBF, while far from excellent, improve upon other comparable studies (Oribe et al., 2015; Rius et al., 2014). Nevertheless, our study has limitations. Firstly, regarding the multivariate model constructed to determine the factors that explain the early cessation EBF, only 88 subjects could be included in the model. This size to build a model that identifies effects between variables is scarce. Secondly, the magnitude of the OR obtained should be considered in the light of the limited sample size, corresponding to women with low HL and early cessation of EBF. This could have led to overestimating the likelihood of EBF cessation. However, factors associated with cessation would not be influenced by this limitation.

On the other hand, we pragmatically selected and used NVS tool based on their soundness and experience. While there are more than 40 tools available, there is still a paucity of HL research conducted in Spain (Karnoe & Kayser, 2015), with no tools validated in this country. The only validated tools to date are referred to Spanish-speaking Hispanics (Lee, Stucky, Lee, Rozier, & Bender, 2010; Weiss et al., 2005). In these cases, some authors recommended adjusted linguistic validation procedures. Unfortunately, such validation has been made for Spanish spoken in Spain, with no transcultural validation or adaptation to the pregnant women (Acquadro, Conway, Hareendran, & Aaronson, 2008).

## **6. CONCLUSION**

Multiple well-known bio-psycho-social and economic factors influence decisions about breastfeeding, such determinants should already be considered by breastfeeding support and promotion programs.

Our study offers preliminary evidence regarding the hitherto inconsistent relation between HL and early cessation EBF at four months, supporting the conduct of further

studies with larger sample sizes and greater statistical power. Such studies are warranted before endorsing health literacy-based interventions aiming to mitigate early cessation EBF. On the other hand, health literacy would contribute to and promote person-centred maternity health care and would result in multiple other benefits for women and infants.

#### **ANONYMISED CONFLICT OF INTEREST STATEMENT**

The authors have declared no conflict of interest.

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