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Research Article

# Initiation of Breast Milk Expression and Associated Factor Among Mothers of Preterm Neonates Admitted to Neonatal Intensive Care Unit, Amhara Region Comprehensive Specialized Hospitals, Ethiopia 2023: Cross-Sectional Study

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## Abstract

**Background:** The initiation of breast milk expression was when mothers began expressing their breast milk. In preterm neonates, due to poor coordination of the sucking and swallowing reflex with breathing, breast milk expression is the best solution to start feeding. This study assesses the initiation of breast milk expression and associated factors among mothers of preterm neonates admitted to NICUs in the Amhara region and comprehensive specialized hospitals.

**Methods:** An institutional-based cross-sectional study was conducted in the Amhara region's comprehensive specialized hospitals from April 15–May 15, 2023. Maternal interviews and the neonate's chart review were used to gather data from 401 respondents using systematic random sampling. The collected data was entered, coded, and cleaned into Epi-Data version 4.6.0.2 and analyzed by Stata 14.0 software. In the bivariable logistic regression model, variables that had a p-value <0.25 were further analyzed in the multivariable logistic regression model, where a p-value <0.05 with a 95% confidence interval was used to determine the association between the dependent and independent variables.

**Result:** Late initiation of breast milk expression was 340 (84.79%). Respondents GA <32 weeks (AOR = 3.59; 95% CI: 1.21, 10.61), getting instruction (AOR = 2.48; 95% CI: 1.06, 5.79), family support (AOR = 2.19; 95% CI: 1.10, 4.36), and importance of mother's milk (AOR = 2.36; 95% CI: 1.24, 4.47) were the results express factors that negatively impact breast milk expression initiation.

**Conclusion and recommendation:** Based on the findings, the initiation of breast milk expression was poor, 15.21% of mothers expressed within the first 6 hours of delivery. In the delivery room, it is better to encourage mothers to express breast milk who gave preterm birth, especially those <32 weeks.

**Keywords: Associated factor; Breast milk; Expression; Initiation; Neonate**

## List of Abbreviations and Acronyms

ANC: Antenatal Care; AOR: Adjusted Odds Ratio; CS: Cesarean Section; CSH: Comprehensive Specialized Hospitals; EBM: Expressed Breast Milk; GA: Gestational Age; KMC: Kangaroo Mother Care; LBW: Low Birth Weight; NICU: Neonatal Intensive Care Unit; PTBs: Preterm Births; SVD: Spontaneous Vaginal Delivery; VLBWT: Very Low Birth Weight; UNICEF: United Nations Children's Fund; WHO: World Health Organization

## Introduction

The initiation of breast milk expression was when mothers began expressing milk from their breasts [1]. The World Health Organization (WHO) advises mothers to breastfeed their newborns during their first life hour [2]. In preterm neonates, sucking and swallowing reflex coordination with breathing is poor, and breast milk expression is the solution to start feeding [1,3]. Early initiation of breast milk expression plays a similar role as early initiation of breastfeeding [1,4-10]. Breast milk is the best form of milk for premature neonates; it reduces complications, improves long-term health, and improves neurodevelopmental outcomes [11-15]. Studies in Finland, Australia, and Florida suggest that early initiation of breast milk expression within the first six hours following delivery is key to the long-term success of providing breast milk and is recommended as a strategy to increase milk production [7,16-18]. Initiating milk expression after the first 6 hours following delivery was found to be related to an increased likelihood of being formula-fed, according to a study in Milan, Italy [19]. According to WHO estimates, failure to follow the best practices for newborn breastfeeding results in more than 800,000 neonatal deaths worldwide each year [20]. Breastfeeding could reduce 20% to 22% of infant fatalities, according to recent studies from Ethiopia, Ghana, Bolivia, and Madagascar [21]. In Ethiopia, preterm birth complications were the first cause of neonatal mortality, it accounts for 37% of the total neonatal deaths, and premature neonates die 1.3 times more than term neonates [1,22]. Breast milk reduces morbidity and mortality and supports optimal growth, development,

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and the overall outcome of the preterm neonate [4,17,23-28]. Preterm neonates have increased impacts on short- and long-term negative outcomes due to delaying breast milk feedings, such as sepsis and necrotizing enterocolitis (NEC), hypoglycemia, weight loss, jaundice, neurodevelopmental delays, morbidity, and mortality [29,30]. Initiation of breast milk expression is affected by different factors, including mode of delivery (CS), gestational hypertension, gestational age, a high risk of necrotizing enterocolitis, respiratory distress syndrome, and patent ductus arteriosus [1,31,32]. WHO recommends a universal target coverage of 90% for exclusive breastfeeding to prevent 13% to 15% of the 9 million under-five deaths per year in middle- and low-income countries [33]. However, the survival, health growth, and neurodevelopment of preterm newborns remain a problem in many countries despite significant advancements over the previous ten years [2]. According to a study on the breastfeeding experiences of mothers of preterm neonates, expressing milk and breastfeeding are seen as ways to strengthen the development of motherhood and build a stronger bond with their child [19]. A previous study in Ethiopia shows that all respondents were late to initiate breast milk expression [6,34]. In the Amhara region, there is limited study, and early breast milk expression is crucial to the management of preterm neonates. Identifying factors promoting ideal breastfeeding practices facilitates efforts to decrease preterm deaths. However little concern was given to the early initiation of breast milk expression. This study aimed to assess the initiation of breast milk expression and associated factors among mothers of preterm neonates admitted to NICUs in the Amhara region.

## Methods

### Study design, period, and area

A multicenter institutional-based cross-sectional study was conducted from April 15 to May 15, 2023, in the Amhara region. The study was conducted in eight comprehensive specialized hospitals (University of Gondar, Felege-Hiwot, Tibebe-Ghion, Debre-Markos, Dessie, Deberetabor, Debreibrhan, and Woldya). Those hospitals have special units, like the NICU, and the major services in the NICU include general neonatal care services, routine prescription of a complete blood count, blood exchange transfusion, phototherapy, and ventilation support.

### Population

The source population was all mothers with their preterm neonates who were admitted to the NICU of the Amhara Region Comprehensive Specialized Hospitals, and the study population was all mothers with their preterm neonates who were admitted to the NICU at Amhara Region Comprehensive Specialized Hospitals during the study period. Neonates keeping NPO, mothers with the presence of medical contraindications for breastfeeding, and neonates with incomplete charts during the data collection period were excluded from the study.

### Sample size determination and sampling procedure

The sample size was determined using the single population proportion formula by considering the following assumptions: p = 50% (proportion of mothers with initiation of breast milk expression), 95% confidence interval (Z = 1.96), 5% level of significance, and 5% margin of error (d = 0.05).

$$n = (Z)2^{*}(p^{*}1\text{-}p)/ d^{2}$$

$$n = (Z)2^{*}(p^{*}1\text{-}p)/ d^{2},\ n = (1.96)^{2} * 0.5\ (1\text{-}\ 0.5)/ (0.05)^{2} = 384$$

By adding 10% non-respondents (by considering refusal and incomplete charts) the final sample size was estimated to be 422. The allocation of the sample to each hospital was made based on the average number of neonate admissions per month. The overall sample was taken proportionally from each hospital, and a systematic random sampling technique (sampling interval ≈ 2) was used to select the sample participants.

### Study variables and their measurements

Initiation of breast milk expression was the outcome variable; it is the time when mothers began expressing milk from their breasts, which was measured by asking the mother when she started milk expression. And socio-demographic characteristics of the mother (maternal age, educational status, occupational status, marital status and residence), obstetric and maternal characteristics (Knowing the importance of breast milk for preterm neonate, getting instruction to express breast milk from NICU staff within 6 hours after delivery, pregnancy-induced hypertension, knowing the benefits of colostrum, mode of delivery, parity, place of delivery, previous neonatal intensive care unit experience and previous lactation experience), neonatal characteristics (GA, gender, birth weight, postnatal first milk-feeding time, the pattern of feeding), psychological factors (Support from family members, separation from their premature infants and worried about the amount of milk) were the independent variables.

### Data collection tool

The data were collected using interviewer-administered and neonate chart review through structured and validated questionnaires that were adapted from a questionnaire developed from previous studies (24-26) (6) (19, 30, 31, 35, 36). To ensure consistency and accuracy, the data collection instrument was written in English, translated into the local language (Amharic) by a language expert, and then back into English. Onsite training was given to data collectors and supervisors before the beginning of data collection. The data was collected by nurses who have previous experience in the Neonatal intensive care unit and data collection.

### Data processing and analysis

The collected data were entered and coded into Epi-Data version 4.6.0.2 and exported into Stata 16.0 software for analysis. Descriptive statistics were carried out using the mean, frequency, percentage, tables, and figures to present the findings. A box plot was used to check the normality of the continuous data. The outcome variable was dichotomized and coded as 0 and 1, representing those late in initiation of breast milk expression and early in initiation of breast milk expression, respectively. The data was checked for consistency. Descriptive statistics were used to identify the distributions of socio-demographic characteristics among study respondents. Frequencies and cross-tabulations were computed before regression analysis. Multicollinearity was checked by using variance inflation factors (VIF 1.02–1.57, mean VIF=1.20), and the model goodness of fit test was checked by Hosmer and Lem show goodness of fit tests (p=0.63). A bivariable logistic regression was conducted to see the relation between the dependent and independent variables of initiation of breast milk expression using a p-value < 0.25. Multivariable logistic regressions at p-value <0.05 with a 95% confidence interval of the odds ratio were used to determine a statistically significant association.

### Ethical approval and consent to participate

Ethical approval (Ref. No S/N/178/2015) was obtained from the ethical review committee of the institution review board (IBR) of

the University of Gondar. A formal latter of administrative approval was obtained from Amhara Public Health Institute for each Hospital. Finally, both written and verbal informed consent was obtained from the mothers after explaining all the purpose, benefits, confidentiality of the information, and the voluntary nature of participation in the study before data collection. All methods were carried out in accordance with the declaration of Helsinki and relevant guidelines and regulations. The names, identification number of study participants were not recorded on the data collection tool. All data were kept in strictly confidential and used only for the study purpose.

## Results

Out of 422 participants, 401 (95.02%) were involved in the study.

### Socio-demographic characteristics

Among the study respondents, the age range of respondents was 16–42, and the mean age was 28.86 ± 6.77 SD. More than half of the 245 (61.10%) respondents lived in urban areas. Regarding marital status, 338 (84.29%) respondents were married (Table 1).

**Table 1:** Socio-demographic characteristics of the respondents on the Initiation of breast milk expression among mothers of preterm neonate admitted at NICU in Amhara region CSH, Ethiopia, 2023 (n=401).

| Variable | Frequency (N = 401) | Percent (%) |
|---|---|---|
| **Age** | | |
| <24 | 121 | 30.17 |
| 25-29 | 87 | 21.7 |
| 30-34 | 96 | 23.94 |
| >35 | 97 | 24.19 |
| **Residence** | | |
| Rural | 156 | 38.9 |
| Urban | 245 | 61.1 |
| **Marital status** | | |
| Married | 338 | 84.29 |
| Single | 27 | 6.73 |
| Widowed, Divorced, separated | 36 | 8.98 |
| **Educational status** | | |
| Unable to read and write | 105 | 26.18 |
| Primary school | 98 | 24.44 |
| Secondary school | 92 | 22.94 |
| Diploma and above | 106 | 26.43 |
| **Occupational status** | | |
| Housewife | 187 | 46.63 |
| Governmental employer | 65 | 16.21 |
| Student | 21 | 5.24 |
| Private employer | 53 | 13.22 |
| Daily laborer | 29 | 7.23 |
| Merchant | 46 | 11.47 |

### Maternal and obstetric characteristics

Out of 401 respondents, 236 (58.85%) were Multi para. And 347 (85.79%) have ANC follow-ups; 119 (29.68%) of them have had 4 or more visits. Regarding pregnancy complications, 150 (37.41%) have pregnancy complications. 289 (72.07%) mothers knew the importance of mother's milk over other (powder, cow) milk (Table 2).

### Neonatal factors

Among 401 neonates 217 (54.11%) were female and 184 (45.89%) were male neonates. Regarding birth weight, there were 249 (62.09%) LBWT and 152 (37.91%) VLBWT, and the mean birth weight of neonates was 1557.73 with ± 303.23 SD, and the minimum and maximum birth weights were 1000 g and 2200 g, respectively (Table 3).

**Table 2:** Obstetric and maternal factors of the respondents on the Initiation of breast milk expression among mothers of preterm neonate admitted at NICU in Amhara region CSH, Ethiopia, 2023 (n=401).

| Variable | Frequency | Percent |
|---|---|---|
| **Parity** | | |
| Prime para | 126 | 31.42 |
| Multi para | 236 | 58.85 |
| Grand multi para | 39 | 9.73 |
| **ANC follow-up (private or governmental health institution)** | | |
| No | 57 | 14.21 |
| 1 time | 35 | 8.73 |
| 2 times | 74 | 18.45 |
| 3 times | 116 | 28.93 |
| 4 and above | 119 | 29.68 |
| **Pregnancy-related complications** | | |
| No pregnancy complication | 251 | 62.59 |
| Pregnancy-induced hypertension | 87 | 21.7 |
| Gestational Dilbits Miletus | 10 | 2.49 |
| Other (APH, malaria, chorioamnionitis, PROM) | 53 | 13.21 |
| **Place of Delivery** | | |
| Hospital | 245 | 61.1 |
| Health Center | 123 | 30.67 |
| Home | 33 | 8.23 |
| **Mode of delivery** | | |
| SVD | 270 | 67.33 |
| CS delivery | 120 | 29.93 |
| Instrument assisted delivery | 11 | 2.74 |
| **Previous NICU experience with preterm admission** | | |
| Yes | 51 | 12.72 |
| No | 350 | 87.28 |
| **Previous milk expression experience for the preterm neonate** | | |
| Yes | 44 | 10.97 |
| No | 357 | 89.03 |
| **Know the importance of colostrum (first milk)** | | |
| Yes | 134 | 33.42 |
| No | 267 | 66.58 |
| **Know the importance of mother's milk over other (powder, cow) milk** | | |
| Yes | 289 | 72.07 |
| No | 112 | 27.93 |
| **Know the importance of mother's milk for the preterm neonate** | | |
| Yes | 182 | 45.39 |
| No | 219 | 54.61 |
| **Get instruction to express breast milk within 6 hrs of delivery, from NICU staff** | | |
| Yes | 296 | 73.8 |
| No | 105 | 26.1 |
| **When do you express breast milk (outcome variable)** | | |
| Birth – 6 hours | | 61 |
| 15.21 | | |
| >6 hours | | 340 |
| 84.79 | | |

### Psychological factors

Psychological factors Out of 401 participants, 236 (58.85%) got family support during breast milk expression and 109 (27.18%) are worried about the amount of milk to express milk the first time (Table 4).

### Initiation of breast milk expression

Out of 401 participants, 340 (84.79%) with [95% CI (80.91, 87.99)] were late initiation of breast milk expression (expressed after 6

**Table 3:** Neonatal characteristics of the respondents on the Initiation of breast milk expression among mothers of preterm neonate admitted at NICU in Amhara region CSH, Ethiopia, 2023 (n=401).

| Variable | Frequency | Percent |
|---|---|---|
| **Gender** | | |
| Male | 184 | 45.89 |
| Female | 217 | 54.11 |
| **Gestational age (GA)** | | |
| <32 wks (Early preterm) | 132 | 32.92 |
| 32-34 wks (Moderate preterm) | 111 | 27.68 |
| 34-36 +6 wks (Late preterm) | 158 | 39.4 |
| **Birth weight** | | |
| 1000 – 1499 (VLBWT) | 152 | 37.91 |
| 1500 – 2499 (LBWT) | 249 | 62.09 |
| **Post-natal feeding time** | | |
| Birth - 6 hrs | 59 | 14.71 |
| >6hrs | 342 | 85.29 |
| **Can ably Suck neonate** | | |
| Yes | 140 | 34.91 |
| No | 261 | 65.09 |
| **Method of feeding** | | |
| Directly breastfeed | 87 | 21.7 |
| NG tube | 204 | 50.87 |
| Bottle | 77 | 19.2 |
| Other (Cup, Syringe) feeding | 33 | 8. 23 |
| **Post-natal age of the neonate** | | |
| Early neonatal period | 185 | 46.13 |
| Late neonatal period | 216 | 53.87 |
| **Health status of the neonate** | | |
| Stable | 161 | 40.65 |
| Fair | 154 | 153 |
| Critical | 86 | 21.2 |

**Table 4:** Psychological factors of the respondents on the Initiation of breast milk expression among mothers of preterm neonate admitted at NICU in Amhara region CSH, Ethiopia, 2023 (n=401).

| Variable | Frequency | Percent |
|---|---|---|
| **Family support during the expression of breast milk** | | |
| Yes | 236 | 58.85 |
| No | 165 | 41.15 |
| **Worry about the amount of milk to express milk the first time** | | |
| Yes | 109 | 27.18 |
| No | 292 | 72.82 |
| **KMC (kangaroo mother care)** | | |
| Yes | 195 | 48.63 |
| No | 206 | 51.37 |
| **Feeling about separation from neonate** | | |
| Yes | 42 | 10.47 |
| No | 359 | 89.53 |

hours of delivery) and 15.21% (61) with [95% CI (12.00,19.08)] were early initiation of breast milk expression (expressed within 6 hours of delivery) (Figure 1).

### Factors associated with initiation of breast milk expression

On bivariable analysis, variables that have a p-value <0.25 were taken as candidates for multivariable logistic regression analysis. In multivariable logistic regression analysis, mothers who did not get instruction within the first 6 hours after delivery, mothers who did not know the importance of mother's milk for preterm neonates, mothers who did not get family support, and GA <32 weeks had p-value <0.05 with a 95% confidence interval of the odds ratio were the results express factors that negatively impact breast milk expression initiation. Respondents (neonates) with GA <32 weeks were 3.59 times late to initiate breast milk expression compared to GA >34 weeks (AOR = 3.59; 95% CI: 1.21, 10.61). The other factor identified

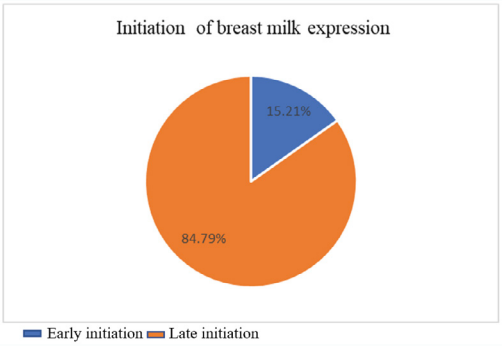


**Figure 1**: Initiation of breast milk expression among mothers of preterm neonates admitted at NICU in Amhara region CSH, Ethiopia 2023 (n=401).

was that respondents who did not get instruction within the first 6 hours of delivery to express milk from NICU staff were 2.48 times late to initiate breast milk expression as compared with those who got instruction within the first 6 hours of delivery (AOR = 2.48; 95% CI: 1.06, 5.79). Similarly, respondents who did not get family support were 2.19 times late to initiate breast milk expression as compared with those who got family support (AOR = 2.19; 95% CI: 1.10, 4.36). Finally, respondents who do not know the importance of mother's milk for preterm neonates were 2.36 times late to initiate breast milk expression as compared with those who know the importance of mother's milk for preterm neonates (AOR = 2.36; 95% CI: 1.24, 4.47) (Table 5).

## Discussions

In this study, the late initiation of breast milk expression, 340 (84.79%) were expressed breast milk after 6 hours of delivery. Which was higher than studies conducted in Finland, Germany, England, and Australia (64%, 58.6%, 32%, and 15%, respectively) [7,30,37,38]. This discrepancy could be the result of differences in the nation's level of development, the concern of health professionals regarding milk expression and strategies for the care of premature newborns, and differences in study design. In Germany, the study was conducted using the survey method, and in Australia, the study was conducted using a systematic review study design. However, the current study findings were slightly lower than reported in Addis Ababa [7]. These disparities are likely due to differences in the study population, sample size, and study area. This might lead to a variation. This finding revealed that the odds of neonates who had GA <32 weeks were 3.59 times more likely late to initiate breast milk expression as compared with those with GA >34 weeks (AOR = 3.59; 95% CI: (1.21, 10.61). This finding was supported by previous studies [6,24,30,31,35]. The possible explanations are that newborns <32 weeks GA need orogastric or NG tube feeding, which should start within 24 hours of birth, depending on the clinical condition [1,39,40]. Due to this reason instructing mothers to express milk might be based on the neonates' clinical condition. The odds of mothers who do not get instruction within the first 6 hours of delivery to express milk from NICU staff were 2.48 times late to initiate breast milk expression as compared with those who got instruction within the first 6 hours of delivery (AOR = 2.48; 95% CI: 1.06, 5.79). This finding was supported by studies conducted in Ethiopia [6]. Prematurity is associated with acute or chronic maternal illness and obstetric factors [1]. Mothers are observed in the maternity department for the first six hours following delivery. Due to this reason, it might be too late to advise the woman to express breast milk [6]. Implementation of breast

**Table 5:** Multivariable analysis of factors associated with the Initiation of breast milk expression among mothers of preterm neonate admitted at NICU in Amhara region CSH, Ethiopia, 2023 (n=401).

| | | | | | |
|---|---|---|---|---|---|
| **Get instruction to express breast milk within 6 hrs of delivery, from NICU staff** | | | | | |
| Yes | 243 (73.82) | 53 (86.89) | 1 | 1 | |
| No | 97 (28.53) | 8 (13.11) | 2.64(1.21,5.76) | 2.48(1.06,5.79) | 0.03** |
| **Know the importance of Breast milk for the preterm neonate** | | | | | |
| Yes | 141 (41.47) | 41 (67.21) | 1 | 1 | |
| No | 199 (58.53) | 20 (32.79) | 2.89 (1.62,5.14) | 2.36(1.24,4.47) | 0.00** |
| **Gestational age in wks** | | | | | |
| >34 wks | 119 (35.00) | 39 (63.93) | 1 | 1 | |
| 32-34 wks | 95 (27.94) | 16 (26.23) | 1.94 (1.02,3.69) | 1.99(0.97,4.07) | 0.058* |
| < 32 wks | 126 (37.06) | 6 (9.84) | 6.88(2.81,16.84) | 3.59(1.21,10.61) | 0.02** |
| **Family support** | | | | | |
| Yes | 191 (56.18) | 45 (73.77) | 1 | 1 | |
| No | 149 (43.82) | 16 (26.23) | 2.19 (1.19,4.03) | 2.19(1.10,4.36) | 0.02** |

milk information and staff education led to improvements in the milk expression practices of mothers who had preterm neonates [7]. The odds of mothers who do not get family support during breast milk expression were 2.19 times late to initiate breast milk expression as compared with those who got family support during breast milk expression (AOR = 2.19; 95% CI: 1.10, 4.36). This report was supported by previous studies [20,33]. As soon as the infants' and mothers' conditions permit, parents of newborns in the NICU are given the proper support with milk expression. A supporter who motivates mothers, emotionally and psychologically to increase milk production [1]. The odds of mothers who do not know the importance of mother's milk for preterm neonates were 2.36 times more likely late to initiate breast milk expression as compared with those who know the importance of mother's milk for preterm neonates (AOR = 2.36; 95% CI: 1.24, 4.47). This finding was supported by a previous study [35]. Breast milk is the main dietary source for preterm neonates. The value and significance of human milk for neonates' health should be explained to mothers [1,40].

## Limitations of the Study

Due to the cross-sectional nature of the study, it is difficult to determine the association between outcome and independent variable.

## Conclusion and Recommendations

In conclusion, the initiation of breast milk expression was poor; 15.21% of mothers expressed within the first 6 hours of delivery; respondents didn't get instruction within the first 6 hours of delivery; respondents didn't know the importance of mother's milk for preterm neonates; respondents didn't get family support; and neonates with GA <32 weeks were significantly associated with late initiation of breast milk expression. In the delivery room, it is better to encourage mothers to express breast milk who give preterm birth, especially <32 weeks.

## Competing Interests

All authors declared no conflicts of interest in this work.

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## Authors' Contributions

TN conceptualized the study and was involved in title selection, design, analysis, interpretation, report writing, and manuscript writing. YG: involved in analysis, interpretation, reporting, and manuscript writing. MAd: was involved in analysis, interpretation, reporting, and manuscript writing. MA: involved in analysis, interpretation, and reporting.

## Availability of Data and Materials

The datasets generated and/or analyzed during the current study are available/ accessible from authors on reasonable request.

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