

# Barrier Factors In Maintaining Breastmilk Volume

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## Abstract

**Objective:** Breast milk (ASI) is a nutrient that is produced from cellular secretion and transportation activities in the breast organs. The development cycle of the organ of ASI secretion begins to form from the neonate, puberty to pregnancy<sup>1</sup>. Until now, several assumptions that state that the production of breastfeeding of a nursing mother are influenced by various external and internal factors. External factors involve the environment, sociodemography, and even sociocultural<sup>2</sup>.

**Method:** The volume of milk assessed on days 7th, 8th, 9th, postpartum. Milk volume measured through pumping using a Medela Swing Double Pump electric breast pump for 15 minutes, the weighted milk is then returned for drinking to the baby using new media (spoon or cup feeding). Sociodemographic variables, obstetric history, and lactation history were measured using an observation form, postpartum is then grouped into two groups; breastfeeding mothers with optimal and sub-optimal milk production. The relationship between variables was tested by the chi-square test and logistic regression test.

**Results:** Occupational variables ( $p < 0.049$ ; OR = 2.61), initiation of early breastfeeding ( $p < 0.022$ ; OR = 2.73), frequency of breastfeeding ( $p < 0.003$ ; OR = 4.62), duration of breastfeeding ( $p < 0.018$ ; OR = 2.76) demonstrates relationship with milk volume.

**Conclusion:** This research succeeded in proving several external factors such frequent and timing that supported the mechanical mechanism of breast milk production.

**Keywords:** *Early Breastfeeding Initiation; Breastfeeding Barrier; Breastfeeding Duration; Milk Volume.*

## Introduction

Breast milk is a nutrient produced from the activity of cellular secretions and transportation of the breast

organs. The development cycle of the organ of ASI secretion begins to form from the neonate, puberty to pregnancy.<sup>1</sup> Several assumptions state that various external and internal factors influence the production of breast milk for a nursing mother. External factors involve the environment, sociodemography, and even sociocultural.<sup>2</sup> Internal factors involve psychosocial, cognitive, affective, obstetric, and biological history.<sup>3</sup>

Extensive work to establish factors that affect timing and initiation of breastfeeding. Various studies have shown that breastfeeding predictors differ around

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the world. Notice in Australia, Iceland, Ireland, Scotland, and the US that breastfeeding rates are higher among older women with higher education.<sup>4</sup> Besides, higher-income is also associated with high rates of breastfeeding in countries such as Sweden<sup>5</sup>, and rural Jamaica.<sup>6</sup> By comparison, a study in Zhejiang China that examined breastfeeding initiation and prevalence found that younger mothers with lower education and family income were more likely to breastfeed.<sup>7</sup> According to Kogan, breastfeeding rates depend on multiple factors, including socio-economic and demographic factors. Mother's age, employment, income and not smoking contribute to higher breastfeeding rates.<sup>8</sup>

There are many reasons mothers chose not to breastfeed their children. Fear of pain, physical distress, lifestyle constraints, and embarrassment have all

described as reasons a woman prefers not to breastfeed.<sup>9</sup> The most common reason that is also a factor for mothers not giving breast milk is the lack of milk production. Mother's causes before age 6 could be more linked to maternal factors. Community factors constitute 20% of mothers' reasons to avoid exclusive breastfeeding. Community help is one reason mothers avoid early breastfeeding. Some studies also shown that mothers consider social support as a more important factor than health care.<sup>10</sup> Often, insufficient support from family, friends, and health providers may be a cause for women to choose not to breastfeed or quit breastfeeding.<sup>11</sup> Therefore, this study aims to see whether there is a difference in milk production between all the risk factors mentioned, namely, sociodemographics, obstetrics, and lactation history.

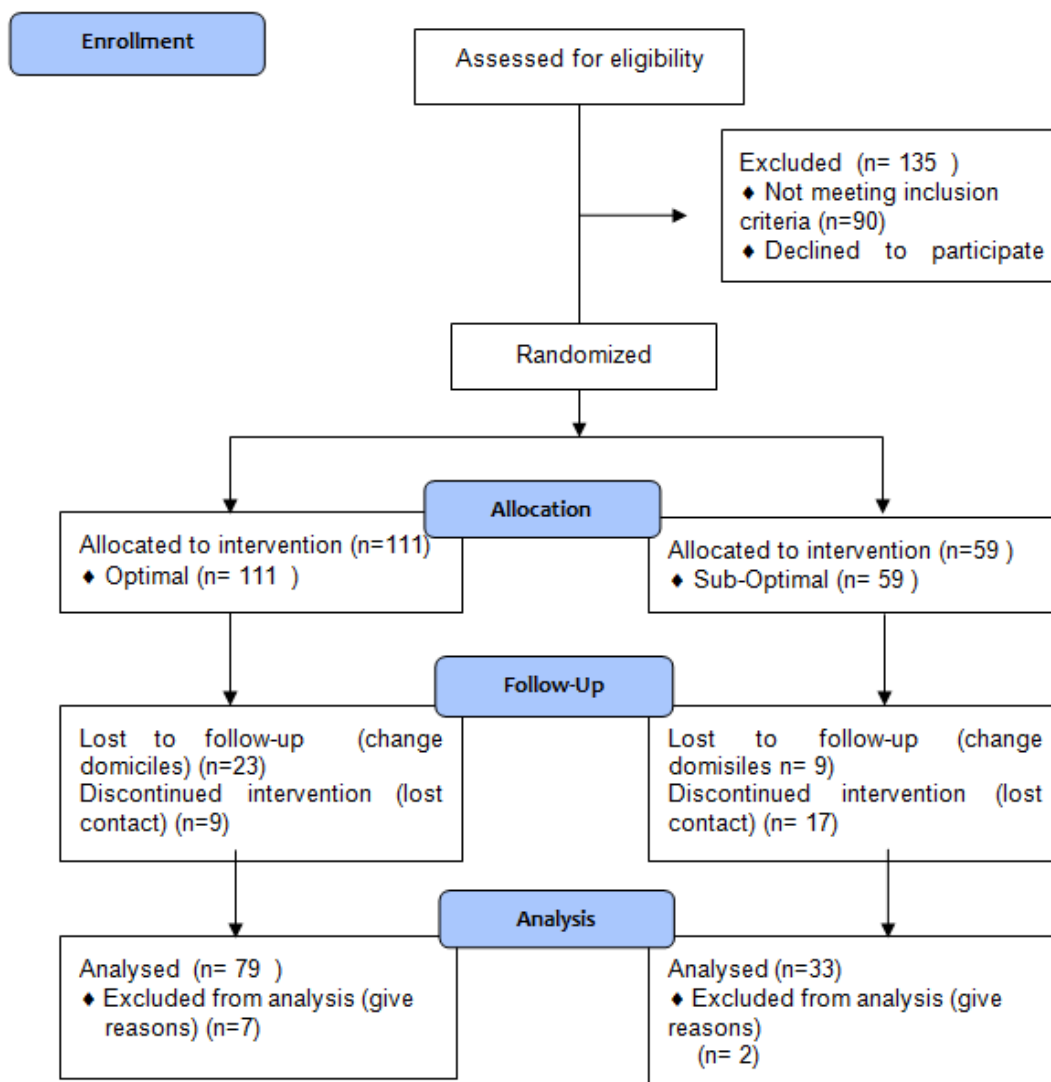


Figure 1: Flow Diagram of the medical research ethics

## Methodology

**Samples:** Mothers who met the inclusion criteria, namely third-trimester vaginal delivery, had no history of pregnancy complications or risky, delivered at the study site, willing to be observed until the study period ended. Mothers who are willing to participate sign an informed consent accompanied by their respective families. Collection of variables, including sociodemographic characteristics, obstetric history, and lactation history, were measured using an observation form at the beginning of recruitment at the final antenatal care examination. The volume of milk assessed on days 7, 8, 9, postpartum.

**Statistical Analysis:** This study uses a cross-sectional study design. A total of 113 research samples were selected purposively at two primary healthcare clinics (Kassi-Kassi and Jongaya Clinic) with a large number of visits of pregnant women with relatively low coverage of exclusive breastfeeding in the city of Makassar, South Sulawesi, Indonesia in the month of April-December 2019.

Milk volume measured through pumping using a Medela Swing Double Pump electric breast pump for 15 minutes, the weighted milk is then returned for drinking to the baby using new media (spoon or cup feeding). The volume of milk is calculated and multiplied by the frequency of breastfeeding for three days and then averaged. The measurement results classified into two; optimal breast milk production  $\geq 440$  ml/day and sub-optimal  $<440$  ml/day<sup>12</sup>.

Sociodemographic variables (age, education, occupation), obstetric history (parity, baby birth weight, sex), and history of lactation (initiation of early breastfeeding, frequency of breastfeeding, and duration of breastfeeding) were analyzed using the chi-square test. Multivariate logistic regression analysis used to assess which risk factors were correlated with the amount of milk. The medical research ethics committee approved all research procedures of the Medical Faculty of Hasanuddin University number 171/UN4.6.4.5.31/PP36/2019.

## Results

A total of 113 participants who were successfully analyzed depicted in table 1. The sociodemographic variables referred to in this study include age, education, and occupation. Education transformed into two categories; higher education equivalent to DIII and S1, low equivalent to elementary, junior high, high school. Work also transformed into two categories into work and non-work. Bivariate analysis demonstrates insignificant relation on several sociodemographic variables, except for job ( $p < 0.049$ ).

Working is one of the common barriers to breastfeeding for many breastfeeding mothers. Parting with the baby will reduce the frequency and duration of breastfeeding. Although alternative milk pumps exist, not all biological reflexes replaced with mechanical stimulation. The odd ratio shows that mothers who do not work have a volume of milk production 2.61 times more than mothers who work.

**Table 1. Correlations between sociodemographic, obstetric, and lactation with milk volume**

Variable	Breastmilk Volume				p*	OR
	Sub-optimum (31)		Optimum (72)			
	n	%	n	%		
<b>Age</b>						
< 20 and >35	7	38.9	11	61.1	1.000	1.14
20-35	34	35.8	61	64.2		
<b>Work</b>						
Working mother	15	53.6	13	46.4	0.049	2.61
Household mother	26	30.6	59	69.4		
<b>Education</b>						
Low	29	41.0	59	59.0	1.461	0.53
High	12	48.0	13	52.0		

Variable	Breastmilk Volume				p*	OR
	Sub-optimum (31)		Optimum (72)			
	n	%	n	%		
<b>Parity</b>						
Primipara	14	42.4	19	57.6	0.511	1.44
Multipara	27	33.8	53	62.2		
<b>Birth Weight (gr)</b>						
<2.500/>4.000	3	50.0	3	50.0	0.666	1.81
2.500-4.000	38	35.5	69	64.5		
<b>Baby sex</b>						
Male	18	37.5	30	62.5	0.973	1.09
Female	23	35.4	42	64.6		
<b>Early Breastfeeding Initiation</b>						
No	21	51.2	20	48.8	0.022	2.73
Yes	20	27.8	52	72.2		
<b>Breastfeeding Frequency</b>						
< 8 times/day	15	65.2	8	34.8	0.003	4.64
≥8 times/day	26	28.9	64	71.1		
<b>Breastfeeding Duration</b>						
< 15 minute/session	25	49.0	26	51.0	0.018	2.76
≥15 minute/session	16	25.8	46	74.2		

\*Chi Square Test alternatif Fisher’s Exact Test

Obstetric variables in this study include parity, baby sex, baby birth weight. These three variables are not significant for milk production. Lactation variables include the history of Early Breastfeeding Initiation, frequency of breastfeeding and duration of breastfeeding. All three showed a positive significance with milk production. Mothers who give birth and get Early Breastfeeding Initiation are at least 2.73 times higher potential to produce more milk volume than those who do not get Early Breastfeeding Initiation. Mothers who breastfeed more often (more or equal to eight times per day) have a potential of 4.62 times to produce more milk volume than mothers who breastfeed less than eight times per day, as well as the duration of each breastfeeding process, has an Odd ratio of 2.76 times higher. The duration reported in this study is an estimate based on the subjective assumptions of the mother and the average results of data collection for seven days analyzed in the transformation of categorical data more/equal to and less than 15 minutes for one breastfeeding session.

**Table 2. Logistic regression risk factor for milk production**

Factors	p	Odds Ratio	95%CI
Working mother	0.034	2.969	1.086-8.114
No Early Breastfeeding Initiation	0.018	0.345	0.143-0.830
Breastfeeding frequency < 8 times per day	0.025	3.390	1.164-9.876
Breastfeeding duration < 15 minute per session	0.041	2.559	1.039-6.303

\*Variable(s) all entered on step 1(based on table 1), after performing 6 step of backward likelihood ratio method, tested correlation and controlling confounder, the last fit model explained milk production among breastfeeding mothers.

After conducting a simultaneous analysis using multiple logistic regression, by entering all the variables at the beginning of the test step to consider the possibility of confounders and intercorrelations between variables,

the results shown in Table 2, which most determine the volume of milk production is the frequency of breastfeeding (OR: 3.390), working mother (OR: 2.969), duration of each breastfeeding session (OR: 2.559), and initiation of early breastfeeding (OR: 0.345).

Even though a working mother gives birth without early breastfeeding initiation, she still able to maintain the volume by breastfeeding more frequent and extended duration of each session. Two mechanical factors frequency of sucking and duration of sucking will ensure emptying of the breast and increase production supplies. Both activity as if perfect rhythm between the need and availability of milk with infants.

### Discussion

The ratio of mothers who produce optimal milk volume is 2.3 to sub-optimal; this means that more than 113 research subjects can breastfeed optimally. Sociodemographic factors occupy an obvious path within the conceptual framework of milk production, such as age, education, and employment. This study shows that more than half of mothers in the age range of 20-30 years have optimal milk production, but mothers aged over 30 years also record similar facts. Research conducted at the Department of Nutrition at the University of California shows that "older" primiparous mothers (24 years or more) produce less milk in the first week of postpartum than younger primiparas (16-23 years). This research assumes that breast milk produced "depends on the amount of functional tissue in the breast," which may decrease with age. In Sweden, reporting that breastfeeding rates are declining, one of the factors that inhibit exclusively breastfeeding mothers for more than two months is primipara under the age of 25 years.<sup>13</sup>

In another study also revealed that young age and marriage at less than 20 years not only have an impact on the maturity of the mother's soul in babysitting but affect the mother's performance starting initiation of breastfeeding faster.<sup>2</sup>

Education, in many studies, is a favorable variable to study. Education assumed as the basis for everyone to form normative behavior. This research shows that mothers are generally highly educated (equivalent to D3, S1-2), meaning that mothers have sufficient intellectual power to support their skills in breastfeeding and caring for babies. Although statistically, there is no difference between mothers with high and low education in terms

of milk production, this is because traditions and habits heavily influence the context of breastfeeding in a particular family or culture. The element of milk production is in the body and breast tissue, which logically has nothing to do with the external aspects of education.

One study showed that the context of breastfeeding practice is influenced by traditional practices even though they (mothers) lack education or lack understanding of the ins and outs of milk production. Breastfeeding is a derivative of habits passed down from generation to generation, views on breast function and the quality of milk produced and the standards of behavior that exist in a community or tribe to be determinants of breastfeeding can be well accepted and implemented or not.<sup>14</sup> However, in other studies, data found that mothers with high status have higher production than those with low education.<sup>15</sup> In various searches, it is rather difficult to find studies that specifically study the relationship between education and milk production. However, studies examining the relationship between a mother's knowledge and the success of breastfeeding for up to six months are numerous. Some of them prove that educated mothers (72% secondary and 90.9% graduated) are more likely to give colostrum to their babies than those who are illiterate (38.9%). Although the duration of exclusive breastfeeding and breastfeeding is not related to mother's education, knowledge about breastfeeding is very important for parents with higher education (63.6% and 52.8%) compared to parents who are illiterate or have low education. Other studies in developed countries also show the fact that highly educated mothers (62.0%) more exclusively breastfeed for up to two months than low education (38.0%) (Cato et al., 2017). In Europe, a comparison of cross-sectional studies conducted between 2006-2016 revealed that early breastfeeding initiation and shorter breastfeeding duration found in mothers with less education than those with higher education based on the ISCED (International Standard Classification of Education) education classification.<sup>16</sup>

The provision of breast milk for six months requires high commitment. One of the most challenging commitments fulfilled for mothers is the attachment of time between themselves and their babies. Everyone will naturally experience boredom in the same activities every day, especially for six months. The most significant barrier is working mothers. Work reported as the most frequent reason to stop breastfeeding.<sup>17</sup> Breastfeeding and working require more effort and commitment.

Many workplace policies that are not in line with the extended maternity leave policy make this situation more difficult.<sup>18</sup> In this study, significant work related to milk production. The Odd ratio shows that working mothers are 2.62 times lower risk of producing milk compared to mothers who do not work. This pathway can be explained through separate time-feeding scenarios starting when the mother returns to work. Maintenance of milk production can be done by breastfeeding on demand, breastfeeding periodically, and pumping periodically. Leaving baby with grandmothers appears in a different situation in feeding style. Grandma does not have superior soothing ability compared to their mother with her breasts. Choices that can be taken by working mothers are pumping milk. Dairy milk requires a storage medium, care that is more troublesome than direct breastfeeding. Grandma also certainly is not always painstaking in preparing dairy milk. If the workplace situation does not allow mothers to leave the office more often for breastfeeding purposes, then direct breastfeeding will be replaced by alternative dairy milk.

Giving expressed breastmilk has different dimensions for each person. It started with the availability of breast pumps, how to pump, the storing method, the defrosting process, the feeding process after pumped, and many other dimensions that must overcome. Not to mention dealing with the composition of expressed breast milk, which has decreased the quality of macronutrients during storage. Degradation of some macro components of fat and calories observed in frozen milk stored for three months under -20 degrees Celsius.<sup>19</sup> Even, the mechanical obstacles in the process of pumping milk. Some natural reflexes will disappear, such as mother-baby bonding that reinforces neuro-response to hormonal secretions.

The pumping mechanism is different from the suction mechanism in infants; pumping tends to have a constant rhythm. Some milk pumps have developed pumping technology with different rhythms following the baby's suction pattern, suction strength, and adjustable flow. This type of pump is usually much more expensive than pumps in general, and not all mothers can afford to buy or rent. Although the suction technology in a milk pump resembles a baby's suction rhythm, it still leaves several natural scenarios such as skin to skin touch and lactogenesis, which only develop optimally through direct breastfeeding. However, no studies have yet found that review differences in the speed of milk secretion indirect breastfeeding and pumping; the loss

of intimacy between mother-baby interaction during breastfeeding is clearly of different quality.

The phase of lactogenesis is progressive in pregnancy. Lactogenesis in the first is different from the second pregnancy. The process of repetitive Lactogenesis characterized by an increase in the quality of lactation. Primipara is one of the risk factors for inhibition of Lactogenesis II and reported that primipara has a potential 3.16 times more likely to experience delayed lactogenesis II compared to multipara.<sup>20</sup> Hampering the phase of Lactogenesis II, i.e., no discharge of milk beyond 72 hours postpartum, can result in the cessation of breastfeeding before six months.

This study did not show differences between primipara and multipara in the two milk production groups. The number of mothers who had optimal milk production was higher in both groups because the proportion of research subjects belonging to optimal milk was 2.3 times the sub-optimal group. Specific findings in Thailand are specific to other areas of rural northern Thailand.<sup>21</sup> Transferred milk volume and breastfeeding duration did not vary significantly between multipara and primipara. Babies in the primipara community took much longer to get the same amount of milk on day 15 and day 45, but the period of subsequent breastfeeding was shorter and more like that of other partners' babies. Perhaps they need more time before breastfeeding is known. Babies' weights and lengths were identical at each time between classes. Research in Nigeria also found that maternal age, parity or social status did not impact breastfeeding patterns.<sup>22</sup>

Research with different results shows that women who have previously breastfed had significantly different breastfeeding experiences than those who were first. They have a shorter duration of breastfeeding, have a more considerable delay in labour until the first attempt at breastfeeding, are less likely to breastfeed at least eight times in the first 24 hours, and have more breastfeeding problems during their breastfeeding period. These variables might contribute to the finding that first time mother who had received formula milk while still in the hospital, delayed Lactogenesis, and reduced the likelihood of achieving their intended breastfeeding goals, as well as shorter breastfeeding duration.<sup>23</sup>

The percentage of sexes of female babies is higher than male babies. Gender data in this analysis helps to identify the baby's own birth prevalence. Scientifically

found no difference in the amount of milk between the sexes of female and male, because the need for infant nutrition is directly proportional to the increase and growth of baby's weight in the first year. Many myths have also developed among the community that baby boys are stronger at breastfeeding than baby girls; this may connote the nature of the male identic with the power. To some extent, this myth will lead to the natural perception that a baby girl is breastfeeding less than a baby boy. Although empirical evidence illustrates that male babies breastfeed more than female babies is still rarely found, so it is necessary to emphasize the focus of the problem is on the mother and their behaviour.<sup>24</sup>

Infant birth weight is also not related to milk production because birth weight influenced by many things including; maternal factors such as maternal age, parity, teenage pregnancy, smoking history<sup>25</sup>; nutritional factors such as haemoglobin levels and folic acid deficiency, history of HIV infection, abortion and unwanted pregnancy.<sup>26</sup>

Variable early breastfeeding initiation is a decisive contributory factor that affects the amount of milk production. The initiation process carried out as early as possible to provide the broadest possibility for babies after birth to get the best of the skin-to-skin breast crawl process, utilizing all of their instinctive abilities within a period of 30 minutes to 1 hour after delivery. Before the breastfeeding instincts fade after 8 hours, new-borns tend to fall asleep more. Early Breastfeeding Initiation is the right start for mothers and babies to start learning to suckle and breastfeed. Along with the process and time goes to know each other until breastfeeding formed. Early Breastfeeding Initiation ensures that every baby gets colostrum rich in vitamins and protective factors.<sup>27</sup> Neonatal abstinence in early breastfeeding initiation has a higher frequency of NOD2 gene mutation, which causes a decrease in immune function compared to opposite.<sup>28</sup>

The suction on the nipple stimulates the secretion of prolactin and oxytocin so that the initial initiation is a precursor of milk secretion, the faster and more prolonged the process of Early Breastfeeding Initiation takes place, the more consistent the milk produced. In this study, Early Breastfeeding Initiation was significantly related ( $p$ -value  $< 0.02$ ) to milk production. The Odd Ratio reveals that mothers who initiate early breastfeeding 2.73 times more produce milk than mothers who do not initiate early breastfeeding. In the Early Breastfeeding

Initiation intervention study with a combination of direct breastfeeding and regular breast milk pumps, the average volume of milk was higher on the third and seventh days (73.9mL and 225.2mL) compared to the control group that only did direct breastfeeding (25.4mL and 69, 2mL) (Fok et al., 2019). This research will reinforce the previous statement that barriers to working mothers eliminated by regular milk pumping. Early Breastfeeding Initiation also prevents the occurrence of "delayed lactogenesis II" on the third day of postpartum, and significantly precursors of increasing milk volume.<sup>30</sup>

The frequency of breastfeeding a baby is different in each phase of time. At the beginning of the first-third month, babies can suckle 7-9 times per day or more than 12 times. This tight connection dismissed the mother chance to leave her baby even if an several hour. Usually, hungry babies will cry at intervals every 1.5 to 3 hours. However, babies who are getting bigger will have a longer breastfeeding interval. The duration also varies depending on the adaptation of each baby. In this study, the frequency of breastfeeding significant related to milk production, as well as the duration of breastfeeding. Milk production increases 4.62 times more for women who breastfeed more often, and 2.76 times for women who breastfeed longer. Meaning the frequency of breastfeeding and duration of breastfeeding (every one breastfeeding session) is a critical point in increasing milk production, it related to the process of breast drainage. The longer the breastfeeding duration, the more it will ensure each breast is empty, thus increasing the supply of milk volume.<sup>31</sup>

Nevertheless, the nature of breast milk production is quite adaptive to baby. Research reveals that breast adaptability to baby suction compare to no other. Babies who sucking fast rhythms but short time, are having the same quality to suckle slowly and long time. Both of these adaptation models ensure the baby gets the same quality milk composition between the foremilk hindmilk.<sup>31, 12</sup>

In addition to drainage and frequency, lactation techniques will support mother for prolonged breastfeeding. The most important corrected technique regarding to positioning and attachment.<sup>32</sup> These two crucial points, especially in new-borns, need to assist by the midwife. Incorrect position resulted in many problems, such as blister nipples, hard nipples, swollen, and painful sensation when suckled.<sup>33</sup> Each mother's pain adaptation differs depending on prior

knowledge and perception of physiological pain during lactation. Inadequate physiological response during the breastfeeding process adds to the anxiety that will ultimately make the mother vulnerable to falling in postpartum depression cases. The performance of breastfeeding will decrease in women who experience postpartum depression, several factors that contribute include age, working mother, socioeconomic status, number of children, and family support<sup>34</sup>.

Inappropriate lactation management, giving them the opportunity for early breastfeeding cessation. Most women who breastfeed and experience constant nipple pain can achieve normal milk production. Breastfeeding length and frequency are the same as pain-free mothers. The longer period of breastfeeding in pain groups, however, is correlated with lower milk production rates.<sup>35</sup> This study emphasizes that emptying the breast when expressing milk or direct feeding will keep the baby's milk required.<sup>31</sup> Although the sociodemographic barriers addressed in this study are not statistically related to milk production, working mothers, early initiation, frequency and length of breastfeeding are findings that preserved the milk production pathway through external mechanisms.

### Conclusion

This research succeeded in proving several external factors such frequent and timing that supported the mechanical mechanism of breast milk production. Therefore the midwife and all other breastfeeding support program must provide a better assisted education in breastfeeding management, and other feeding alternative among them who still face unavoidable barriers such as working mothers.

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