

artikel THE PRACTICE OF EXCLUSIVE BREASTFEEDING BY REGION IN INDONESIA

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Submission date: 10-Feb-2023 03:19PM (UTC+0700)

Submission ID: 2010788498

File name: manuscript.docx (284.08K)

Word count: 7201

Character count: 38846

THE PRACTICE OF EXCLUSIVE BREASTFEEDING BY REGION IN INDONESIA

ABSTRACT

Objective: Exclusive breastfeeding has important benefits for both children and mothers. However, the proportion of exclusive breastfeeding is still not evenly distributed among regions, including in Indonesia. The purpose of this study was to analyze the practice of exclusive breastfeeding by region in Indonesia and its influencing factors.

Study Design: This study was cross sectional study.

Methods: This study used secondary data from the Indonesia Demographic and Health Survey 2017. The total sample was 1,621 respondents which consisted of mothers whose last child was under six months old and was still alive; the mothers did not have twins and lived with their child. Data were analyzed by using Quantum GIS and binary logistic regression statistical tests.

Results: This study shows that 51.6% of respondents gave exclusive breastfeeding in Indonesia. The highest proportion was in Nusa Tenggara region (72.3%), while the lowest was in Kalimantan province (37.5%). Mothers who lived in the regions of Nusa Tenggara, Sulawesi, Java-Bali, and Sumatra had a higher chance of exclusive breastfeeding compared to those of in Kalimantan region. The factors associated with the exclusive breastfeeding vary widely across all regions, and the child's age is the only common factor associated with the exclusive breastfeeding in all regions, except Kalimantan.

Conclusion: This study shows wide variation in regional proportions and determinants of exclusive breastfeeding in Indonesia. Therefore, appropriate policies and strategies are needed to increase equitable exclusive breastfeeding practices across all regions in Indonesia.

Keywords: Exclusive breastfeeding, regions, Indonesia, logistics, binary

1 INTRODUCTION

2 Breast milk (ASI) contains nutrients that are essential for the health, growth, and
3 development of a baby [1]. Breastfeeding is one of the public health interventions to reduce the
4 baby mortality, [2] the baby's risk of contracting digestive diseases, respiratory infections, and
5 obesity. On the other hand, the exclusive breastfeeding can improve children's cognitive abilities
6 [3–5] and contribute to prevent mothers from the risk of developing breast and ovarian cancer and
7 to reduce the risk of obesity and chronic diseases such as type II diabetes mellitus [6]. In Indonesia,
8 the infant mortality rate was 21 per 1,000 live births in 2018, higher than other developing South-
9 East Asian countries, such as Vietnam (16 per 1,000 live births), Thailand (8 per 1,000 live births),
10 and Malaysia (7 per 1,000 live births) [7]. Exclusive breastfeeding is the process of feeding infants
11 during the first 1 hour after giving birth. According to the Indonesia Demographic and Health
12 Survey 2017, the coverage of exclusive breastfeeding for children under six months old increased
13 by 10% in the last 5 years, from 42% in 2012 to 52% in 2017. It shows that 48% of children under
14 six months old across Indonesia were not exclusively breastfed. The percentage of children who
15 did not get breast milk at all increased from 8% in the Indonesia Demographic and Health Survey
16 2012 to 12% in the Indonesia Demographic and Health Survey 2017 [8].

17 The achievement of exclusive breastfeeding in Indonesia has met the minimum target of
18 50% set in the national development plan for the last five years. Some regulations implemented
19 support exclusive breastfeeding in Indonesia. However, the proportion of exclusive breastfeeding
20 decreases as the children get older. The proportion of children receiving exclusive breastfeeding
21 varies. Around 67% were children aged under one month, 55% were aged 2-3 months, and 38%
22 were aged 4-5 months [8]. The proportion of exclusive breastfeeding in Indonesia is still not evenly
23 distributed among provinces and even gaps exist among them. The five provinces with the highest
24 rates of exclusive breastfeeding were West Nusa Tenggara, East Kalimantan, East Java, the Special
25 Region of Yogyakarta, and East Nusa Tenggara, whilst other five lowest-achievement provinces
26 were North Sumatra, Gorontalo, Maluku, Papua, and West Papua [9].

27 Several previous studies in Indonesia have revealed the scope and determinants of
28 exclusive breastfeeding. A national study based on an analysis of the Indonesia Demographic
29 and Health Survey from 2002 to 2017 showed that the proportion of mothers who exclusively
30 breastfed their babies increased significantly between 2002 and 2017, with a greater increase
31 among mothers from the higher wealth quintiles, working in professional sectors, and living in
32 Java and Bali [10]. In general, the factors linked to the exclusive breastfeeding include the child's
33 age, mother's education, occupation, type of delivery, parity, economic status, residence, and
34 early initiation of breastfeeding [11–14]. In addition to the wide geographical,
35 sociodemographic, and cultural diversity in Indonesia, it is important to study exclusive
36 breastfeeding by region. To illustrate, eastern Indonesian socio-economic developments such as
37 industry, housing, public transportation, road facilities, and health facilities are slower than those
38 in western Indonesia, especially in Java region [15–18]. Therefore, this study aims to analyze the
39 practice of exclusive breastfeeding by region in Indonesia using nationally representative data
40 from the Indonesia Demographic and Health Survey 2017. This study can complete the big
41 picture of the exclusive breastfeeding phenomena in Indonesia which can resolve the Indonesian
42 exclusive breastfeeding. The purpose of this study is to analyze the practice of exclusive
43 breastfeeding by region in Indonesia and factors that influence it.

METHODS

Data Source

This study performed secondary data analysis. Data were taken from the Indonesia Demographic and Health Survey (IDHS) 2017. IDHS is part of the International Demographic and Health Survey (DHS) program organized by the Inner-City Fund (ICF) to provide a comprehensive picture of the population as well as maternal and child health in Indonesia. The sample from IDHS 2017 was designed to present national and provincial estimates. It covered 1,970 census blocks covering both urban and rural areas.

This survey used a two-stage stratified cluster sampling method. The first stage was the selection of several census blocks using a systematic probability proportional to measure (PPS) the number of households obtained from the SP2010 listing. The second stage selected 25 ordinary households using systematic sampling from the list. The population of this study was 49,692 Indonesian women of childbearing age (15-49 years) - data was from the 2017 IDHS. The sample used in this study was part of the population with some inclusion criteria, namely mothers whose last child was under six months old and still alive, they did not have twins and lived with their child. 10% was excluded due to incomplete data, 1% was due to twins and 1% was the missing data. Finally, the samples of this study were 1,621 altogether. The mothers with incomplete data were not included in the analysis [8].

Result Variables

The proportion of exclusive breastfeeding refers to infants under six months old who receive not only breast milk as their source of food, but also oral rehydration solutions, vitamin drops or syrup, and medications). The data were collected from the mother's memory of the food given to her baby in the last 24 hours prior to the survey and it is in line with the WHO/UNICEF guidelines to assess the feeding practices to infants and children [19]. Result variables were defined in binary categories, exclusive breastfeeding and unexclusive breastfeeding.

Research Factor

Research factors were adapted from previous studies [11,13,14]. These included predisposing factors and enabling factors. Predisposing factors include maternal age, child age, education, employment status, economic status, residence, parity, and early initiation of breastfeeding. Enabling factors include the number of antenatal care visits, place of delivery, type of delivery, and a number of postnatal care visits.

Maternal age was divided into three age groups, namely 15-19 years, 20-34 years, and 35-49 years. Children's age was divided into three age groups, all of which are 0-1 month, 2-3 months and 4-5 months, and mother's education was divided into three groups; low (no school or elementary school graduates), middle (secondary school graduates), and higher (college graduates). Mother's occupation was divided into employed (e.g., professional, technician, manager and administration, clerk, sales, service, agricultural or industrial worker) and non-employed. Residence was divided into rural and urban. Using the wealth index, economic status in this study was classified into three groups, namely poor (poor and poorest), middle, and rich (rich and richest). Parity referred to the number of children born to the mothers and was categorized into 1 and >1. The number of antenatal care visits made by the mothers during pregnancy was categorized into ≥ 4 and < 4 . Place of delivery was categorized into health facilities and non-health facilities. The type of delivery was categorized into vaginal delivery and cesarean section. Early initiation of breastfeeding was divided

94 into two categories, namely ≤ 1 hour and > 1 hour. Postnatal care visits referred to children who
95 were examined at a health facility in the first two months after birth.

96

97 Data Analysis

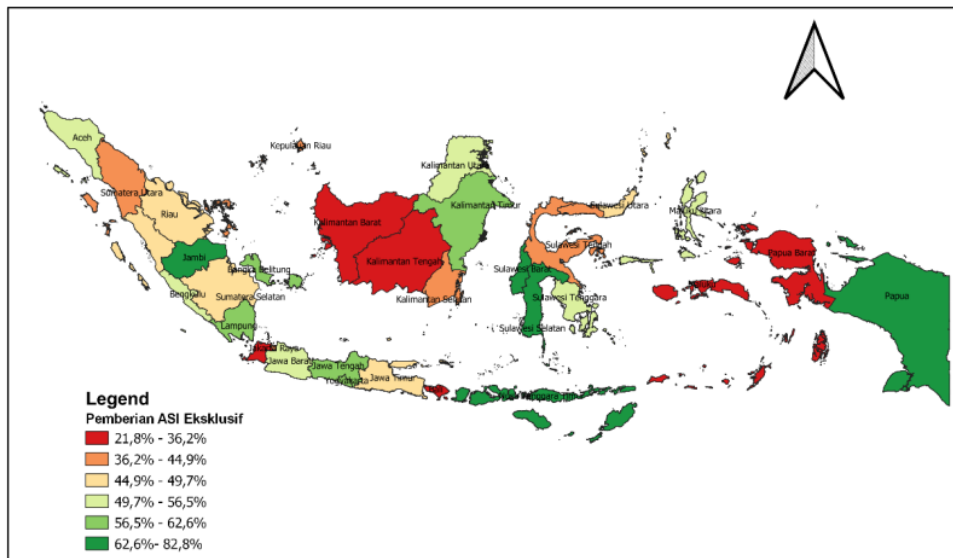
98 ² Data analysis was done by regions grouped based on the largest islands, namely Sumatra,
99 Java-Bali, Nusa Tenggara, Kalimantan, Sulawesi, Maluku Islands, and Papua [18,20]. Sample
100 weights were used to analyze the data from the IDHS. All data were analyzed with a complex
101 sample design. Statistical analyses i.e., univariate analysis and bivariate analysis were performed
102 through binary logistic regression. The relationship between the independent and dependent
103 variables was classified based on the p-value of the binary logistic regression test results, with $p <$
104 0.05 for statistically significant relationships. The direction of the relationship between the
105 independent and dependent variables was seen based on the odd ratio value of the binary logistic
106 regression test results, with a reference value of 1. Meanwhile, a spatial analysis was to find out the
107 distribution map of exclusive breastfeeding by province in Indonesia. The analysis used the
108 Statistical Product and Service Solutions (SPSS) software and Quantum GIS.

109

110 RESULTS

111 Figure 1 shows the distribution of exclusive breastfeeding in 34 provinces of Indonesia.
112 Kalimantan region (West Kalimantan and Central Kalimantan), Maluku Island region (Maluku),
113 and Papua region (West Papua) had the lowest distribution of exclusive breastfeeding. Meanwhile,
114 the highest distribution of exclusive breastfeeding was in Nusa Tenggara region.
115

116



117

Figure 1. Distribution of Exclusive Breastfeeding by Province in Indonesia

118 Respondents Characteristics

119 Table 1 shows that the proportion of mothers who give exclusive breastfeeding in Indonesia is
120 51.6%. The highest proportion of exclusive breastfeeding was in the Nusa Tenggara region (72.3%)
121 and the lowest was in the Kalimantan region (37.5%). The majority of mothers were in the age
122 group of 20-34 years. The majority of children were in the age group of 2-3 months and 4-5
123 months. The Java-Bali region was dominated by women who lived in urban areas and other areas

124 were dominated by women who lived in rural areas. The majority of mothers were secondary
125 school graduates and they did not work, except the Papua region whose majority of mothers
126 actively worked. All regions were dominated by women with poor economic status, except the
127 Java-Bali region which was dominated by women with rich economic status. All regions were
128 dominated by mothers who had ≥ 1 parity, making ≥ 4 times antenatal care visits during their
129 pregnancy, and gave birth in health facilities, except Maluku regions where the majority of
130 deliveries were still carried out in non-health facilities. The type of delivery was mostly done by
131 vaginal delivery. Early initiation of breastfeeding was mostly done within ≤ 1 hour, but it took ≥ 1
132 hour of breastfeeding in Sumatera and Sulawesi. The majority of mothers made postnatal care
133 visits.
134

Table 1. Respondent Characteristics (n = 1,621).

Variable	n	%	Regions															
			Sumatera (n = 403)		Java-Bali (n = 856)		Nusa Tenggara (n = 78)		Kalimantan (n = 91)		Sulawesi (n = 133)		Maluku (n =23)		Papua (n=37)			
			n	%	N	%	n	%	n	%	N	%	n	%	n	%		
The Practice of Exclusive Breastfeeding	837	51.6	198	49.1	441	51.5	56	72.3	34	37.5	77	57.8	10	41.1	21	56.1		
	784	48.4	205	50.9	415	48.5	22	27.7	57	62.5	56	42.2	13	58.9	16	43.9		
	Non-exclusive Breastfeeding																	
Maternal Age	315	19.4	80	19.8	159	18.6	17	21.2	19	21.3	32	24.1	2	10.6	6	15.4		
	35-49	73.5	293	72.7	637	74.4	57	72.9	63	68.9	94	70.5	17	73.9	30	83.7		
	20-34	115	7.1	30	7.4	60	7.0	4	5.9	9	9.8	7	5.4	4	15.4	1	0.9	
Child's Age (Months)	404	24.9	114	28.2	200	23.4	21	26.5	22	24.1	34	25.7	5	20.0	9	23.2		
	0-1	618	38.1	154	38.2	331	38.7	28	36.8	35	38.1	47	35.3	8	37.7	15	40.3	
	2-3	599	37.0	135	33.6	325	38.0	29	37.7	34	37.8	52	38.9	10	42.2	13	36.5	
Residence	870	53.6	279	69.2	333	38.8	60	76.3	59	64.4	96	72.4	15	64.2	29	78.9		
	Rural	751	46.4	124	30.8	523	61.2	18	23.7	32	35.6	37	27.6	8	35.8	8	21.1	
	Urban	254	15.7	72	17.8	117	13.7	11	13.9	11	11.5	32	23.8	5	21.3	7	19.0	
Education	968	59.7	228	56.5	552	64.5	39	49.5	47	51.9	67	50.2	15	64.9	21	55.8		
	Higher	399	24.6	103	25.6	187	21.8	28	36.6	33	36.6	34	25.9	3	13.8	9	25.2	
	Secondary	961	59.3	229	56.9	527	61.5	50	63.7	57	62.3	68	51.4	15	63.9	17	44.5	
Occupation	659	40.7	174	43.1	329	38.5	28	36.3	34	37.7	65	48.6	8	36.1	20	55.5		
	Not Working	599	36.9	122	30.3	408	47.7	8	10.2	21	23.3	29	22.0	3	12.8	7	19.0	
	Working	341	21.0	89	22.1	198	23.1	5	6.9	20	22.2	23	16.8	3	14.3	3	7.4	
Economic Status	681	42.0	192	47.6	250	29.2	65	82.9	50	54.6	81	61.2	17	72.9	27	73.6		
	Lower																	
	Parity																	
Number of Antenatal Care Visits	>1	1120	69.1	289	71.8	567	66.3	59	75.9	64	70.5	96	72.0	14	61.6	30	81.9	
	1	501	30.9	114	28.2	289	33.7	19	24.1	27	29.5	37	28.0	9	38.4	7	18.1	
	>=4	1426	87.9	323	80.2	790	92.3	71	90.3	83	91.0	115	86.7	17	73.6	27	72.5	
Place of Delivery	<4	195	12.1	80	19.8	66	7.7	7	9.7	8	9.0	18	13.3	6	26.4	10	27.5	
	Health Facilities	1373	84.7	323	80.0	792	92.5	63	80.7	64	70.7	102	76.4	9	40.1	20	55.4	
	Non-Health Facilities	248	15.3	80	20.0	64	7.5	15	19.3	27	29.3	31	23.6	14	59.9	17	44.6	
Type of Delivery	Vaginal	1326	81.8	325	80.6	689	80.5	69	88.6	78	85.5	110	82.6	21	93.0	34	91.8	
	Caesar	295	18.2	78	19.4	167	19.5	9	11.4	13	14.5	23	17.4	2	7.0	3	8.2	
	Early Initiation of Breastfeeding																	
Postnatal Care Visit within 2 Months	<1 Hour	858	52.9	175	43.3	486	56.7	56	71.9	47	51.6	62	46.5	12	53.6	20	54.9	
	>1 Hour	763	47.1	228	56.7	370	43.3	22	28.1	44	48.4	71	53.5	11	46.4	17	45.1	
	Yes	1028	63.4	236	58.6	580	67.8	46	59.4	52	56.7	81	60.8	12	52.1	21	55.9	
No	593	36.6	167	41.4	276	32.2	32	40.6	39	43.3	52	39.2	11	47.9	16	44.1		

Table 2. Binary Logistics Regression Analysis by Region

Variables	Exclusive Breastfeeding		
	OR	95% CI	P Value
Region			
Sumatera	1.610	1.011-2.565	0.045
Java-Bali	1.773	1.114-2.822	0.016
Nusa Tenggara	4.348	2.423-7.800	0.000
Sulawesi	2.286	1.380-3.788	0.001
Maluku Islands	1.165	0.660-2.057	0.598
Papua	2.133	0.904-5.033	0.084
Kalimantan	<i>Ref.</i>		

Table 2 shows the results of the binary logistic regression test for regional disparities of exclusive breastfeeding in Indonesia. This analysis used Kalimantan region as a reference because it had the lowest percentage of exclusive breastfeeding. Mothers in the Nusa Tenggara region had a 4,348 times higher chance of exclusive breastfeeding than those in Kalimantan region (OR 4,348; 95% CI 2,423-7,800). Mothers in Sulawesi region had a 2,286 times higher chance of exclusive breastfeeding than those in Kalimantan region (OR 2,286; 95% CI 1,380-3,788). Mothers in Sumatra region had a 1,610 times higher chance of exclusive breastfeeding than those in Kalimantan region (OR 1.610; 95% CI 1.011-2,565). Similarly, mothers in Java-Bali region who had a 1.773 times higher chance of exclusive breastfeeding than those in Kalimantan region (OR 1.773; 95% CI 1.114-2.822).

Table 3 presents that the variables of child's age, mother's education, occupation, economic status, number of antenatal care visits, early initiation of breastfeeding, and postnatal care visits had a relationship with exclusive breastfeeding. Children aged 0-1 month and 2-3 months in all regions, except Kalimantan ($p > 0.05$), had a higher chance of exclusive breastfeeding than those aged 4-5 months. Mothers in Sumatra region who were secondary school graduates had a 1,772 times higher chance of exclusive breastfeeding than those with lower education (OR 1,772; 95% CI 1,077-2,916). Mothers in Java-Bali region who did not work had a 2,500 times higher chance of exclusive breastfeeding than those who worked (OR 2,500; 95% CI 1.591-3,928). Mothers with middle to upper economic status had a lower chance of exclusive breastfeeding compared to mothers with poorer economic status in Sumatra (OR 0.472; 95% CI 0.257-0.869) and the Java-Bali region (OR 0.415; 95% CI 0.230-0.746).

Table 3. The Relationship between Independent Variables and The Practice of Exclusive Breastfeeding by Region in Indonesia (continuation)

Variables	Exclusive Breastfeeding								
	Sulawesi			Maluku			Papua		
	OR	95%CI Lower Upper	P Value	OR	95%CI Lower Upper	P Value	OR	95%CI Lower Upper	P Value
Maternal Age									
35-49	0.344	0.054 2.199	0.258	0.398	0.029 5.506	0.486	1.417	0.123 1.631	0.895
20-34	0.768	0.132 4.463	0.768	1.287	0.276 6.012	0.745	0.848	0.110 6.541	0.914
15-19	Ref.	.	.	Ref.	.	.	Ref.	.	.
Child's Age (Months)									
0-1	2.035	0.876 4.726	0.098	3.489	1.003 12.136	0.049	4.948	0.564 43.391	0.142
2-3	2.850	1.417 5.730	0.004	3.912	1.328 11.520	0.014	7.715	1.401 42.470	0.021
4-5	Ref.	.	.	Ref.	.	.	Ref.	.	.
Residence									
Rural	1.664	0.847 3.269	0.138	1.054	0.329 3.378	0.928	0.083	0.001 6.516	0.252
Urban	Ref.	.	.	Ref.	.	.	Ref.	.	.
Education									
Higher	0.937	0.336 2.614	0.901	1.641	0.402 6.696	0.485	0.350	0.013 9.231	0.516
Secondary	1.522	0.691 3.352	0.295	1.506	0.429 5.279	0.517	1.012	0.175 5.850	0.989
Primary	Ref.	.	.	Ref.	.	.	Ref.	.	.
Occupation									
Not Working	0.751	0.377 1.496	0.413	1.444	0.606 3.443	0.402	0.428	0.109 1.688	0.215
Working	Ref.	.	.	Ref.	.	.	Ref.	.	.
Economic Status									
Upper	0.808	0.327 1.996	0.642	0.711	0.181 2.790	0.620	0.091	0.000 24.012	0.385
Middle	0.572	0.234 1.400	0.220	0.584	0.150 2.279	0.433	0.108	0.002 6.133	0.268
Lower	Ref.	.	.	Ref.	.	.	Ref.	.	.
Parity									
>1	1.622	0.703 3.745	0.255	1.845	0.681 4.999	0.225	1.308	0.078 21.815	0.846
1	Ref.	.	.	Ref.	.	.	Ref.	.	.
Number of Antenatal Care Visits									
>=4	0.991	0.417 2.355	0.984	1.807	0.589 5.547	0.296	0.966	0.121 7.710	0.973
<4	Ref.	.	.	Ref.	.	.	Ref.	.	.
Place of Delivery									
Health Facilities	0.759	0.370 1.558	0.450	0.708	0.240 2.092	0.527	2.366	0.162 34.460	0.515
Non-health Facilities	Ref.	.	.	Ref.	.	.	Ref.	.	.
Type of Delivery									
Vaginal	0.660	0.254 1.711	0.390	3.607	0.236 55.059	0.351	2.614	0.273 25.030	0.525
Caesar	Ref.	.	.	Ref.	.	.	Ref.	.	.
Early Initiation of Breastfeeding									
<1 Hour	1.727	0.893 3.340	0.104	1.024	0.401 2.615	0.959	0.900	0.160 5.083	0.902
>1 Hour	Ref.	.	.	Ref.	.	.	Ref.	.	.
Postnatal Care Visits within 2 Months									
Yes	0.432	0.224 0.830	0.012	0.407	0.179 0.924	0.032	0.595	0.112 3.150	0.528
No	Ref.	.	.	Ref.	.	.	Ref.	.	.

1 DISCUSSION

2 This study shows that there are substantial variations in exclusive breastfeeding in all
3 regions in Indonesia. This study reported that certain regions have diverse socio-economic,
4 religious, cultural, and geographical conditions. Mothers living in Nusa Tenggara region had the
5 highest prevalence of exclusive breastfeeding, while those in Kalimantan region was the lowest.
6 The results of the binary logistic regression analysis revealed that all regions, except Maluku
7 Islands and Papua, had significant differences in exclusive breastfeeding compared to Kalimantan
8 region servings as a reference. However, the differences were not significant in Maluku Islands,
9 Papua, and the Kalimantan regions. In other words, mothers who lived in Nusa Tenggara, Java-
10 Bali, Sulawesi, and Sumatra regions had a higher chance of exclusive breastfeeding compared to
11 those in Kalimantan regions.

12 West Nusa Tenggara was the province with the highest coverage of exclusive breastfeeding
13 in Indonesia, even in the last 5 years [9]. West Nusa Tenggara province has implemented Early
14 Breastfeeding Initiation (IMD) and exclusive breastfeeding programs since 2010. It also has
15 initiated Regional Regulation No. 7 of 2011 concerning the Protection and Improvement of
16 Maternal and Child Health which requires IMD and exclusive breastfeeding. This exclusive
17 breastfeeding was even conducted before the enactment of Government Regulation of the Republic
18 of Indonesia No. 33 of 2012 concerning Exclusive Breastfeeding. After the regional regulations
19 were enacted, the regional government had to disseminate the information to the community and
20 related parties, such as hospitals and health centers. It is recommended that health services should
21 develop written policies to support exclusive breastfeeding, provide early initiation of breastfeeding
22 services, and provide training for health workers to encourage and assist mothers to give exclusive
23 breastfeeding either directly or indirectly, in maternity clinics or general hospitals [21].

24 This study also shows that mothers living in Kalimantan were less likely to exclusively
25 breastfeed their babies than those living in Java-Bali known as urban islands. In general, people
26 who lived in urban areas had a better education than those living in rural areas. For this reason,
27 mothers living in urban areas tend to have a better access to health facilities and information, such
28 as lactation consultation and support. [22,23].

29 Kalimantan regions had a lower rate of exclusive breastfeeding compared to other regions.
30 Several studies conducted in Kalimantan showed that a strong predictor of non-exclusive
31 breastfeeding was low education. Mothers were less aware of the benefits of exclusive
32 breastfeeding, most of whom believed that additional food could make their babies grow faster.
33 The regional government contributed to this unfortunate situation since guidelines, information,
34 socialization on the exclusive breastfeeding were not promoted to local mothers. Even, sanctions
35 for public operators who failed to support the exclusive breastfeeding facilities were not upheld. As
36 a result, the implementation of exclusive breastfeeding in the Kalimantan regions was less optimum
37 [24,25].

38 Various government policies related to exclusive breastfeeding have been established,
39 including Law Number 36 of 2009, Article 128 paragraphs 2 and 3. The policies state that during
40 breastfeeding, families, regional governments, and the community must fully support mothers by
41 providing time and required facilities. Although some regions have followed up with these regional
42 regulations, a few have ignored them. [26].

43 To date, the traditional practice of infant feeding among indigenous tribes is still quite
44 high. In eastern Indonesia, babies who are only a few days old are often fed with liquid called sago
45 solution as a nutritional intake. They are given mashed food when they are 2-3 months old [27–29].
46 Another study stated that the Javanese tradition gives sugar solution to babies since they are a few
47 days old [30], and Gayo people have a tradition of applying honey to the lips of newborn babies

[31]. This traditional practice, on the other hand, is a challenge for health workers who have to promote exclusive breastfeeding [32]. Women living in different areas with different cultural backgrounds and beliefs may have different nutritional behaviors, including the practice of exclusive breastfeeding [33]. Therefore, efforts to promote exclusive breastfeeding must consider the socio-cultural and environmental conditions of the target population.

This study shows that there was a significant relationship ($p < 0.05$) between maternal education and exclusive breastfeeding in Sumatra region. Mothers who graduated from secondary school had a higher chance of exclusive breastfeeding than those with lower education. In line with previous studies, holding higher education degree tends to make mothers more likely to exclusively breastfeed their babies [34]. Higher education opens more access to information and thus allows mothers to think more rationally about the benefits of exclusive breastfeeding. Although it has a positive effect, higher education also opens wider access for mothers to work. In this study, the absence of a significant relationship between education and exclusive breastfeeding in other regions could cause constraints such as short maternity leave that requires mothers to return to work before the exclusive breastfeeding period ends [35].

In Java-Bali, mothers who did not work had a higher chance of exclusive breastfeeding than those who worked. This is in line with several previous studies which found a positive relationship between non-working mothers and exclusive breastfeeding [13,35–37]. Mothers who do not work tend to have more time with their babies. On the other hand, working mothers tend to have less time with their babies due to work, resulting in shorter breastfeeding durations which in turn inhibits exclusive breastfeeding [35]. In this case, working mothers face several challenges such as conflicting commitments at work, limited support from the workplace, and a lack of breastfeeding facilities [38]. It may be caused the women's ability to balance their family and work- women breastfeed for as long as possible while also working to provide an income for themselves and their children.

This study shows that it is important to provide breastfeeding support to working mothers. The workplace should provide a private and safe place (such as a lactation room) for pumping, equipment needed for milk preservation, and breastfeeding breaks. In addition, previous studies have shown that longer maternity leave contributes to a longer duration of exclusive breastfeeding among working mothers [38,39].

Mothers from low socioeconomic groups in Sumatra and Java-Bali were more likely to give exclusive breastfeeding than those from upper middle economic groups. This finding is in line with several previous studies [40–42]. This finding, however, surprisingly showed low-income families have more limited resources to buy alternative foods for their babies and it causes breastfeeding the only option. In addition, high-income households have a better access to education and hence a greater opportunity for professional work. Meanwhile, working mothers tend to be less likely to give exclusive breastfeeding, especially if they do not receive support from the workplace [41,42]. However, this study is not in line with several previous studies conducted in Somali and Ethiopia which stated that high-income households tend to have a positive relationship with exclusive breastfeeding because they have a greater chance of being exposed to various media and better knowledge of exclusive breastfeeding [43,44].

In this study, mothers in Nusa Tenggara who had ≥ 4 times antenatal care visits during their pregnancy had a higher chance of exclusive breastfeeding than those who had ≤ 4 times antenatal care visits [45]. A study conducted in Sweden found that, during antenatal care visits, most mothers asked for knowledge about the physiology of breastfeeding, signs of adequate milk supply, and ways to increase milk supply [46]. A qualitative study in Bhutan showed that one of the reasons why mothers use formula milk is the belief that they are not producing sufficient breast

milk [47]. Therefore, counseling sessions during antenatal care visits are important to increase self-confidence and positive views about breastfeeding. Previous studies have shown that mothers who live in Nusa Tenggara have a 4,365 times higher chance (≥ 4) to make antenatal care visits than those in other regions [18].

In Java-Bali and Kalimantan, mothers who initiated early breastfeeding within ≤ 1 hour after delivery had a higher chance of exclusive breastfeeding than those who initiate within ≥ 1 hour after delivery. This finding is in line with several previous studies [11,48]. The World Health Organization (WHO) explains that early initiation of breastfeeding can increase the chances of exclusive breastfeeding in 1-4 months after delivery [49]. Furthermore, this study shows that, in Sulawesi and Maluku, respondents who visited postnatal care within two months after delivery had a lower chance of exclusive breastfeeding. This may be due to the absence of breastfeeding counseling during postnatal care visits. In this study, the majority of mothers living in Maluku (64%) did not receive counseling about exclusive breastfeeding within the first two days after delivery. In line with the Indonesia Demographic and Health Survey 2017, this study also shows that, from several types of newborn care, only 48-59% of mothers received information about warning signs and breastfeeding counseling [8]. It may be the factors that increase the risk of low supply.

The strength of this study lies in the use of secondary data from the Indonesia Demographic and Health Survey 2017 which covers all data across regions in Indonesia. The use of a large sample and a nationally representative sampling procedure method made it possible to generalize the results of this study to all mothers throughout Indonesia. In addition, data weighting was also carried out during the analysis process to adjust disproportionate sampling techniques. This survey had a high response rate of 97.8% [8]. Data were collected by skilled personnel using standardized questionnaires to ensure the success of the survey and to obtain qualified data. Apart from the strengths, this study also had some limitations, some of which was the use of a small number of variables related to exclusive breastfeeding. Other variables include sex of the infant, birth weight, birth spacing, cultural perceptions, beliefs, and family support. Another limitation was the use of a cross-sectional analytical design that merely studied the relationships between variables without considering the cause-and-effect relationships between variables. Finally, exclusive breastfeeding was measured based on a history of information about food and drink given to infants aged 0-5 months in the last 24 hours before the survey was conducted without considering the previous period. As a result, this may lead to a misclassification bias of exclusive breastfeeding.

CONCLUSION

This study shows substantial variations in proportions and determinants of exclusive breastfeeding across all regions in Indonesia. Nusa Tenggara region had the highest proportion of exclusive breastfeeding, while Kalimantan region had the lowest one. The factors associated with exclusive breastfeeding varied widely in all regions, where the child's age was the only common factor associated with exclusive breastfeeding, except Kalimantan region. Other variables related to exclusive breastfeeding were secondary education in Sumatra region, occupation in Java-Bali region, economic status in Sumatra and Java-Bali regions, early initiation of breastfeeding in Java-Bali and Kalimantan regions, postnatal care visits in Sulawesi and Maluku Island regions, and antenatal care visits in Nusa Tenggara region. Appropriate policies and strategies are needed to increase exclusive breastfeeding in all regions to reduce disparity in exclusive breastfeeding. Optimizing existing policies, the central government can impose strict sanctions on local

141 governments and public facility operators who do not implement exclusive breastfeeding
142 regulations. Future researchers are expected to examine variables that have not been covered in this
143 study. These variables include sex of the infant, birth weight, birth spacing, cultural perceptions,
144 beliefs, and family support for exclusive breastfeeding.

145 **Ethical approval**

146 We used secondary data. ² Ethical clearance was obtained in the 2017 IDHS from the National ethics
147 committee. Respondents provided written approval for their involvement in the study. We have
148 obtained permission to use the data through the following website: [https://dhsprogram.com/
149 data/new-user-registration.cfm](https://dhsprogram.com/data/new-user-registration.cfm).

151 **Funding**

152 The authors should state that they have no funding for the research

153 **Competing Interest**

154 The author declares that no conflicts of interest

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