Public Health 217 (2023) 181–189

Contents lists available at ScienceDirect

Public Health

journal homepage: www.elsevier.com/locate/puhe

Themed Paper – Original Research

The practice of exclusive breastfeeding by region in Indonesia

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ARTICLE INFO

Article history:
Received 26 September 2022
Received in revised form
30 January 2023
Accepted 1 February 2023

Keywords:
Exclusive breastfeeding
Regions
Indonesia
Logistics
Binary

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 1621 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 the Nusa Tenggara region (72.3%), whereas 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 in the 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.

Introduction

Breast milk (ASI) contains nutrients that are essential for the health, growth, and development of a baby.[1] Breastfeeding is one of the public health interventions to reduce the baby mortality,[2] the baby's risk of contracting digestive diseases, respiratory infections, and obesity. On the other hand, the exclusive breastfeeding can improve children's cognitive abilities[3–5] and contribute to prevent mothers from the risk of developing breast and ovarian cancer and to reduce the risk of obesity and chronic diseases such as type II diabetes mellitus.[6] In Indonesia, the infant mortality rate was 21 per 1000 live births in 2018, higher than other developing South-East Asian countries, such as Vietnam (16 per 1000 live births), Thailand (8 per 1000 live births), and Malaysia (7 per 1000 live births).[7] Exclusive breastfeeding is the process of feeding infants during the first 1 h after giving birth. According to the Indonesia Demographic and Health Survey 2017, the coverage of exclusive breastfeeding for children under six months old increased by 10% in the last 5 years, from 42% in 2012 to 52% in 2017. It shows that 48% of children under six months old across Indonesia were not exclusively breastfed. The percentage of children who did not get breast milk at all increased from 8% in the Indonesia Demographic and Health Survey 2012 to 12% in the Indonesia Demographic and Health Survey 2017.[8]

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

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https://doi.org/10.1016/j.puhe.2023.02.002
0033-3506/

Several previous studies in Indonesia have revealed the scope and determinants of exclusive breastfeeding. A national study based on an analysis of the Indonesia Demographic and Health Survey from 2002 to 2017 showed that the proportion of mothers who exclusively breastfed their babies increased significantly between 2002 and 2017, with a greater increase among mothers from the higher wealth quintiles, working in professional sectors, and living in Java and Bali.[10] In general, the factors linked to the exclusive breastfeeding include the child's age, mother's education, occupation, type of delivery, parity, economic status, residence, and early initiation of breastfeeding.[11–14] In addition to the wide geographical, sociodemographic, and cultural diversity in Indonesia, it is important to study exclusive breastfeeding by region. To illustrate, eastern Indonesian socio-economic developments such as industry, housing, public transportation, road facilities, and health facilities are slower than those in western Indonesia, especially in the Java region.[15–18] Therefore, this study aims to analyze the practice of exclusive breastfeeding by region in Indonesia using nationally representative data from the Indonesia Demographic and Health Survey 2017. This study can complete the big picture of the exclusive breastfeeding phenomena in Indonesia, which can resolve the Indonesian exclusive breastfeeding. The purpose of this study is to analyze the practice of exclusive 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 1970 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. Ten percent was excluded due to incomplete data, 1% was due to twins, and 1% was the missing data. Finally, the samples of this study were 1621 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 h before the survey and it is in line with the WHO/UNICEF guidelines to assess the feeding practices of 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 $\geq$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 into two categories, namely $\leq$1 h and >1 h. Postnatal care visits referred to children who were examined at a health facility in the first two months after birth.

Data analysis

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

Results

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

Respondents characteristics

Table 1 shows that the proportion of mothers who give exclusive breastfeeding in Indonesia is 51.6%. The highest proportion of exclusive breastfeeding was in the Nusa Tenggara region (72.3%) and the lowest was in the Kalimantan region (37.5%). The majority

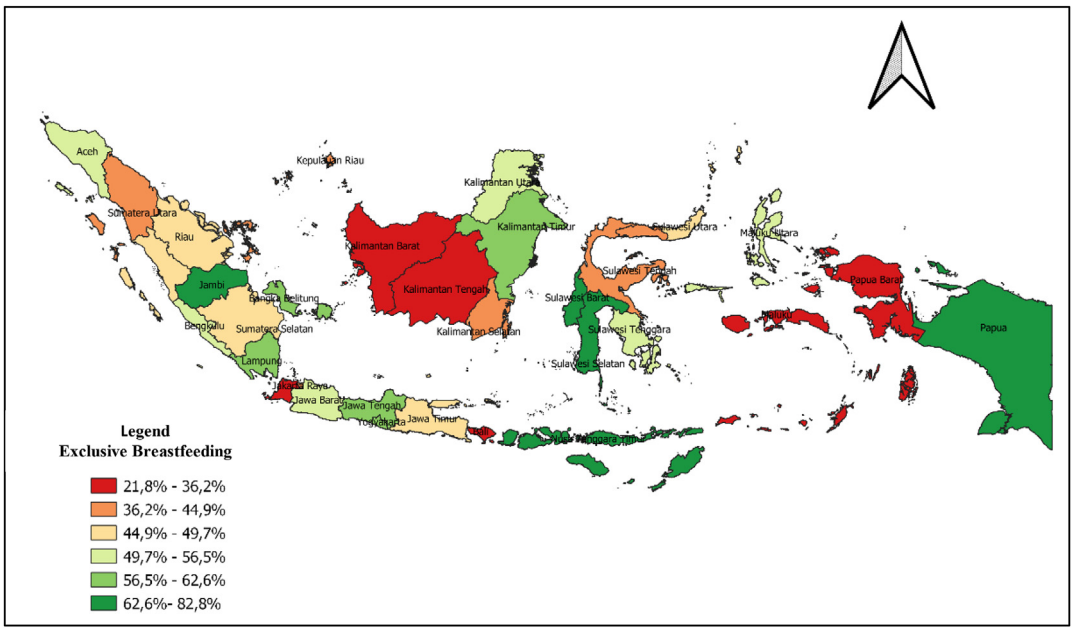

Fig. 1. Distribution of exclusive breastfeeding by province in Indonesia.

of mothers were in the age group of 20–34 years. The majority of children were in the age group of 2–3 months and 4–5 months. The Java-Bali region was dominated by women who lived in urban areas and other areas were dominated by women who lived in rural areas. The majority of mothers were secondary school graduates and they did not work, except the Papua region whose majority of mothers actively worked. All regions were dominated by women with poor economic status, except the Java-Bali region which was dominated by women with rich economic status. All regions were dominated by mothers who had ≥1 parity, making ≥ 4 times antenatal care visits during their pregnancy, and gave birth in health facilities, except Maluku regions where the majority of deliveries were still carried out in non-health facilities. The type of delivery was mostly done by vaginal delivery. Early initiation of breastfeeding was mostly done within ≤1 h, but it took ≥1 h of breastfeeding in Sumatera and Sulawesi. The majority of mothers made postnatal care visits.

Table 2 shows the results of the binary logistic regression test for regional disparities of exclusive breastfeeding in Indonesia. This analysis used the Kalimantan region as a reference because it had the lowest percentage of exclusive breastfeeding. Mothers in the Nusa Tenggara region had a 4348 times higher chance of exclusive breastfeeding than those in the Kalimantan region (OR 4348; 95% CI 2423–7800). Mothers in the Sulawesi region had a 2286 times higher chance of exclusive breastfeeding than those in the Kalimantan region (OR 2286; 95% CI 1380–3788). Mothers in the Sumatra region had a 1610 times higher chance of exclusive breastfeeding than those in the Kalimantan region (OR 1.610; 95% CI 1.011–2565). Similarly, mothers in the Java-Bali region had a 1.773 times higher chance of exclusive breastfeeding than those in the 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 the Sumatra region who were secondary school graduates had a 1772 times higher chance of exclusive breastfeeding than those with lower education (OR 1772; 95% CI 1077–2916). Mothers in the Java-Bali region who did not work had a 2500 times higher chance of exclusive breastfeeding than those who worked (OR 2500; 95% CI 1.591–3928). 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).

Discussion

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

West Nusa Tenggara was the province with the highest coverage of exclusive breastfeeding in Indonesia, even in the last 5 years.[9] West Nusa Tenggara province has implemented Early Breastfeeding Initiation (IMD) and exclusive breastfeeding programs since 2010. It also has initiated Regional Regulation No. 7 of 2011 concerning the Protection and Improvement of Maternal and Child Health which requires IMD and exclusive breastfeeding. This exclusive breastfeeding was even conducted before the enactment of Government Regulation of the Republic of Indonesia No. 33 of 2012 concerning Exclusive Breastfeeding. After the regional regulations were enacted, the regional government had to disseminate the information to the community and related parties, such as hospitals and health centers. It is recommended that health services should develop written policies to support exclusive

Table 1
Respondent characteristics ($n = 1621$).

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																
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
Non-exclusive breastfeeding	784	48.4	205	50.9	415	48.5	22	27.7	57	62.5	56	42.2	13	58.9	16	43.9
Maternal age (years)																
35–49	315	19.4	80	19.8	159	18.6	17	21.2	19	21.3	32	24.1	2	10.6	6	15.4
20–34	1191	73.5	293	72.7	637	74.4	57	72.9	63	68.9	94	70.5	17	73.9	30	83.7
15–19	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)																
0–1	404	24.9	114	28.2	200	23.4	21	26.5	22	24.1	34	25.7	5	20.0	9	23.2
2–3	618	38.1	154	38.2	331	38.7	28	36.8	35	38.1	47	35.3	8	37.7	15	40.3
4–5	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																
Rural	870	53.6	279	69.2	333	38.8	60	76.3	59	64.4	96	72.4	15	64.2	29	78.9
Urban	751	46.4	124	30.8	523	61.2	18	23.7	32	35.6	37	27.6	8	35.8	8	21.1
Education																
Higher	254	15.7	72	17.8	117	13.7	11	13.9	11	11.5	32	23.8	5	21.3	7	19.0
Secondary	968	59.7	228	56.5	552	64.5	39	49.5	47	51.9	67	50.2	15	64.9	21	55.8
Primary	399	24.6	103	25.6	187	21.8	28	36.6	33	36.6	34	25.9	3	13.8	9	25.2
Occupation																
Not working	961	59.3	229	56.9	527	61.5	50	63.7	57	62.3	68	51.4	15	63.9	17	44.5
Working	659	40.7	174	43.1	329	38.5	28	36.3	34	37.7	65	48.6	8	36.1	20	55.5
Economic status																
Upper	599	36.9	122	30.3	408	47.7	8	10.2	21	23.3	29	22.0	3	12.8	7	19.0
Middle	341	21.0	89	22.1	198	23.1	5	6.9	20	22.2	23	16.8	3	14.3	3	7.4
Lower	681	42.0	192	47.6	250	29.2	65	82.9	50	54.6	81	61.2	17	72.9	27	73.6
Parity																
>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
Number of antenatal care visits																
≥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
<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
Place of delivery																
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 breast feeding																
<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
Postnatal care visit within 2 months																
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	*Ref.*		

breastfeeding, provide early initiation of breastfeeding services, and provide training for health workers to encourage and assist mothers to give exclusive breastfeeding either directly or indirectly, in maternity clinics or general hospitals.[21]

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

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

Various government policies related to exclusive breastfeeding have been established, including Law Number 36 of 2009, Article

Table 3
The relationship between independent variables and the practice of exclusive breastfeeding by region in Indonesia.

Variables	Exclusive breastfeeding																			
	Indonesia				Sumatera				Java-Bali				Nusa Tenggara				Kalimantan			
	OR	95% CI		*P*-value	OR	95% CI		*P*-value	OR	95% CI		*P*-value	OR	95% CI		*P*-value	OR	95% CI		*P*-value
		Lower	Upper			Lower	Upper			Lower	Upper			Lower	Upper			Lower	Upper	
Maternal age (years)																				
35–49	0.965	0.530	1.756	0.906	1.194	0.439	3.246	0.727	0.943	0.340	2.613	0.910	0.688	0.055	8.676	0.770	0.552	0.106	2.874	0.476
20–34	1.115	0.680	1.828	0.665	1.011	0.445	2.299	0.979	0.923	0.416	2.052	0.845	2.710	0.272	27.051	0.391	3.140	0.597	16.521	0.174
15–19	*Ref.*				*Ref.*				*Ref.*				*Ref.*				*Ref.*			
Child's age (months)																				
0–1	**3.359**	**2.396**	**4.710**	**0.000**	**3.128**	**1.686**	**5.806**	**0.000**	**3.592**	**2.016**	**6.401**	**0.000**	**27.181**	**4.884**	**151.282**	**0.000**	1.722	0.539	5.501	0.354
2–3	**2.019**	**1.507**	**2.704**	**0.000**	**1.958**	**1.110**	**3.455**	**0.021**	**1.885**	**1.182**	**3.005**	**0.008**	**3.916**	**1.611**	**9.520**	**0.003**	1.255	0.367	4.292	0.714
4–5	***Ref.***				***Ref.***				***Ref.***				***Ref.***				*Ref.*			
Residence																				
Rural	1.238	0.929	1.651	0.145	1.315	0.811	2.134	0.266	1.218	0.760	1.952	0.411	1.703	0.364	7.963	0.494	1.639	0.638	4.209	0.300
Urban	*Ref.*				*Ref.*				*Ref.*				*Ref.*				*Ref.*			
Education																				
Higher	1.460	0.919	2.319	0.109	1.371	0.590	3.187	0.462	1.575	0.695	3.571	0.276	2.150	0.491	9.410	0.305	3.543	0.531	23.621	0.188
Secondary	1.210	0.864	1.694	0.266	**1.772**	**1.077**	**2.916**	**0.025**	1.116	0.609	2.045	0.722	0.622	0.211	1.833	0.385	0.858	0.240	3.062	0.811
Primary	*Ref.*				***Ref.***				*Ref.*				*Ref.*				*Ref.*			
Occupation																				
Not working	**1.578**	**1.198**	**2.078**	**0.001**	0.864	0.514	1.453	0.580	**2.500**	**1.591**	**3.928**	**0.000**	1.536	0.571	4.130	0.390	2.308	0.670	7.955	0.182
Working	***Ref.***				*Ref.*				***Ref.***				*Ref.*				*Ref.*			
Economic status																				
Upper	**0.662**	**0.457**	**0.958**	**0.029**	0.802	0.443	1.453	0.466	0.571	0.301	1.083	0.086	0.763	0.153	3.808	0.739	1.783	0.347	9.171	0.484
Middle	**0.481**	**0.341**	**0.678**	**0.000**	**0.472**	**0.257**	**0.869**	**0.016**	**0.415**	**0.230**	**0.746**	**0.003**	1.190	0.125	11.355	0.878	0.659	0.190	2.287	0.507
Lower	***Ref.***				***Ref.***				***Ref.***				*Ref.*				*Ref.*			
Parity																				
>1	1.286	0.937	1.766	0.120	1.260	0.677	2.343	0.464	1.136	0.692	1.866	0.613	1.443	0.397	5.254	0.574	1.021	0.347	3.005	0.970
1	*Ref.*				*Ref.*				*Ref.*				*Ref.*				*Ref.*			
Number of antenatal care visits																				
≥4	1.409	0.962	2.064	0.078	1.491	0.807	2.754	0.202	1.501	0.699	3.223	0.297	**19.400**	**4.549**	**82.743**	**0.000**	0.704	0.173	2.859	0.620
<4	*Ref.*				*Ref.*				*Ref.*				***Ref.***				*Ref.*			
Place of delivery																				
Health facilities	0.898	0.629	1.283	0.556	0.641	0.342	1.201	0.164	0.972	0.420	2.246	0.947	0.622	0.239	1.623	0.328	0.519	0.156	1.732	0.282
Non-health facilities	*Ref.*				*Ref.*				*Ref.*				*Ref.*				*Ref.*			
Type of delivery																				
Vaginal	1.217	0.837	1.769	0.303	1.193	0.638	2.230	0.579	1.397	0.772	2.526	0.268	0.786	0.158	3.909	0.766	0.342	0.084	1.395	0.133
Caesar	*Ref.*				*Ref.*				*Ref.*				*Ref.*				*Ref.*			
Early initiation of breastfeeding																				
<1 Hour	**1.693**	**1.308**	**2.191**	**0.000**	1.602	0.997	2.572	0.051	**1.608**	**1.044**	**2.478**	**0.031**	1.390	0.516	3.744	0.511	**4.792**	**1.738**	**13.213**	**0.003**
>1 Hour	***Ref.***				*Ref.*				***Ref.***				*Ref.*				***Ref.***			
Postnatal care visits within 2 months																				
No	0.974	0.746	1.273	0.849	1.493	0.945	2.360	0.086	0.797	0.499	1.274	0.342	0.753	0.270	2.103	0.584	1.366	0.515	3.623	0.526
Yes	*Ref.*				*Ref.*				*Ref.*				*Ref.*				*Ref.*			

Variables	Exclusive breastfeeding											
	Sulawesi				Maluku				Papua			
	OR	95% CI		*P*-value	OR	95% CI		*P*-value	OR	95% CI		*P*-value
		Lower	Upper			Lower	Upper			Lower	Upper	
Maternal age (years)												
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.*			

(*continued on next page*)

Table 3 (*continued*)

Variables	Exclusive breastfeeding											
	Sulawesi				Maluku				Papua			
	OR	95% CI		*P*-value	OR	95% CI		*P*-value	OR	95% CI		*P*-value
		Lower	Upper			Lower	Upper			Lower	Upper	
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.*			

Bold value signifies if variable have *P*-value <0.05.

128 paragraphs 2 and 3. The policies state that during breastfeeding, families, regional governments, and the community must fully support mothers by providing time and required facilities. Although some regions have followed up with these regional regulations, a few have ignored them.[26]

To date, the traditional practice of infant feeding among indigenous tribes is still quite high. In eastern Indonesia, babies who are only a few days old are often fed with a liquid called sago solution as a nutritional intake. They are given mashed food when they are 2–3 months old.[27–29] Another study stated that the Javanese tradition gives sugar solution to babies since they are a few 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 sociocultural 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 the 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 socio-economic 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 that 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 Somalia 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 $\geq$ 4 times antenatal care visits during their pregnancy had a higher chance of exclusive breastfeeding than those who had $\leq$4 times antenatal care visits.[45] A study conducted in Sweden found that, during antenatal care visits, most mothers asked for knowledge about the physiology of breastfeeding, signs of adequate milk supply, and ways to increase milk supply.[46] A qualitative study in Bhutan showed that one of the reasons why mothers use formula milk is the belief that they are not producing sufficient breast milk.[47] Therefore, counseling sessions during antenatal care visits are important to increase self-confidence and positive views about breastfeeding. Previous studies have shown that mothers who live in Nusa Tenggara have a 4365 times higher chance ($\geq$4) to make antenatal care visits than those in other regions.[18]

In Java-Bali and Kalimantan, mothers who initiated early breastfeeding within $\leq$1 h after delivery had a higher chance of exclusive breastfeeding than those who initiate within $\geq$1 h 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 h 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. The Nusa Tenggara region had the highest proportion of exclusive breastfeeding, whereas the 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 the 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 governments and public facility operators who do not implement exclusive breastfeeding regulations. Future researchers are expected to examine variables that have not been covered in this study. These variables include sex of the infant, birth weight, birth spacing, cultural perceptions, beliefs, and family support for exclusive breastfeeding.

Author statements

Ethical approval

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

Funding

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

Competing interests

The author declares that no conflicts of interest.

References

1. Hashim S, Ishak A, Muhammad J. Unsuccessful exclusive breastfeeding and associated factors among the healthcare providers in East Coast, Malaysia. *Kor J Fam Med* 2020;**41**(6):416–21.
2. UNICEF & WHO. Increasing commitment to breastfeeding through funding and improved policies and programmes. *Glob Breastfeed Collect [Internet]* 2019;(3):1–4. Available at: https://www.who.int/nutrition/publications/infantfeeding/global-bf-scorecard-2019/en/.
3. Sankar MJ, Sinha B, Chowdhury R, Bhandari N, Taneja S, Martines J, et al. Optimal breastfeeding practices and infant and child mortality: a systematic review and meta-analysis. *Acta Paediatr [Internet]* 2015;**104**(467):3–13. Available at: https://pubmed.ncbi.nlm.nih.gov/26249674/ (accessed 5 July 2022).
4. Nigatu D, Azage M, Motbainor A. Effect of exclusive breastfeeding cessation time on childhood morbidity and adverse nutritional outcomes in Ethiopia: analysis of the demographic and health surveys. *PLoS One [Internet]* 2019;**14**(10). Available at: https://pubmed.ncbi.nlm.nih.gov/31577821/ (accessed 5 July 2022).
5. Akachi Y, Steenland M, Fink G. Associations between key intervention coverage and child mortality: an analysis of 241 sub-national regions of sub-Saharan Africa. *Int J Epidemiol [Internet]* 2018;**47**(3):740–51. Available at: https://pubmed.ncbi.nlm.nih.gov/29309582/ (accessed 5 July 2022).
6. Dieterich CM, Felice JP, O'Sullivan E, Rasmussen KM. Breastfeeding and health outcomes for the mother-infant Dyad. *Pediatr Clin North Am [Internet]* 2013;**60**(1):31. Available at: PMC3508512 (accessed 5 July 2022).
7. UNICEF: WHO: World Bank: UN DESA. Levels & trends in child mortality 2019. *UN IGME Rep* 2019:52.
8. *National population and family planning board (BKKBN), statistics (BPS) M, (Kemenkes) and I. Indonesia District Health Survey 2017*. 2018. p. 588. Available at: https://dhsprogram.com/pubs/pdf/FR342/FR342.pdf.
9. Ministry of Women Empowerment and Child Protection. *Indonesian children profile 2020*. PPPA; 2020.
10. Saputri NS, Spagnoletti BRM, Morgan A, Wilopo SA, Singh A, McPake B, et al. Progress towards reducing sociodemographic disparities in breastfeeding outcomes in Indonesia: a trend analysis from 2002 to 2017. *BMC Publ Health* 2020;**20**(1):1–15.
11. Karima UQ, Herbawani CK, Puspita ID, Pristya TYR, Choirunisa S. Determinants of exclusive breastfeeding practice in Indonesia: analysis of demographic and health surveys program (DHS) 2017. *Adv Health Sci Res* 2020;**30**:339–46.
12. Putri AAD, Naim S. Determinan Pemberian ASI Eksklusif: Analisis data Sekunder Survei Demografi dan Kesehatan 2017. *Amerta Nutr* 2021;**5**(3):284.
13. Gayatri M. Exclusive breastfeeding practice in Indonesia: a population-based study. *Kor J Fam Med* 2021;**42**(5):395–402.
14. Mastan M, Achadi EL. Factors determining successful exclusive breastfeeding on working mothers in Indonesia: an exploration by using positive deviance concept. *Indones J Public Heal Nutr* 2021;**2**(1):1–11.
15. Riskesdas. *Laporan Riskesdas 2018 [Internet]*. Badan Penelitian dan Pengembangan Kesehatan; 2018. p. 198. Available at: http://labdata.litbang.kemkes.go.id/images/download/laporan/RKD/2018/Laporan_Nasional_RKD2018_FINAL.pdf.
16. Soewondo P. Inspecting primary healthcare centers in remote areas: facilities, activities, and finances. *Indon J Heal Adm* 2019;**7**(1):89–98. Available at: https://e-journal.unair.ac.id/JAKI/article/view/9846 (accessed 20 July 2022).
17. Suparmi, Kusumawardani N, Nambiar D, Trihono, Hosseinpoor AR. Subnational regional inequality in the public health development index in Indonesia. *Glob Health Action [Internet]* 2018;**11**(Suppl. 1). Available at: https://pubmed.ncbi.nlm.nih.gov/30220248/ (accessed 20 July 2022).
18. Laksono AD, Rukmini R, Wulandari RD. Regional disparities in antenatal care utilization in Indonesia. *PLoS One [Internet]* 2020;**15**(2):1–13. Available at: https://doi.org/10.1371/journal.pone.0224006.
19. World Health Organization. *Indicators for assessing infant and young child feeding practices Part 1 definitions*. 2008.
20. Kusrini I, Laksono AD. Regional disparities of stunted toddler in Indonesia. *Ind J Forens Med Toxicol* 2020;**14**(3):1916–20.
21. Galina R. ASI Eksklusif di Indonesia: Analisis Menggunakan Run Chart dan Control Chart. *J Dharma Praja* 2017;**4**(1):55–9.
22. Al-Darweesh F, Al-Hendyani R, Al-Shatti K, Abdullah A, Taqi M, Abbas A, et al. Knowledge, intention, practice, and perceived barriers of breastfeeding among married working women in Kuwait. *Int J Commun Fam Med* 2016;**1**(1):1–6.
23. Logan C, Zittel T, Striebel S, Reister F, Brenner H, Rothenbacher D, et al. Changing societal and lifestyle factors and breastfeeding patterns over time. *Pediatrics* 2016;**137**(5).
24. Henderawati R, Kartasurya MI, Suparwati A. Analisis Implementasi Kebijakan Pemberian ASI Eksklusif Bagi Ibu Bekerja di Provinsi Kalimantan Selatan. *J Manaj Kesehat Indones* 2014;**2**(1):36–43.
25. Deniati EN, Hanafi AS. Factors associated with exclusive breastfeeding among mothers in Banjarmasin. *South Kalimantan* 2017;**9**(2):215.
26. Safitri A, Puspitasari DA. Upaya peningkatan pemberian ASI Eksklusif dan Kebijakannya di Indonesia (effort of implementation of exclusive assembly and policy in Indonesia). *Penelit Gizi dan Makanan* 2018;**41**(1):13–20.
27. Kurniawan A, Ayomi I, Keliduan P, Lokobal E, Laksono AD. *The 2012 ethnographic series of maternal and child health books, Ngalum Ethnic, Oksibil district, Pegunungan Bintang Regency, Papua Province*. 2012. p. 85–8.
28. Laksono AD, Faizin K, Raunsay E, Soerachman R. *Perempuan Muyu dalam pengasingan [Internet]*. 2014. Available at: https://www.academia.edu/download/52563112/BOVEN_DIGOEL_2.pdf.
29. Laksono AD. *Anyiman Studi Etnografi Makanan Suku Muyu*. 2015.
30. Maghfiroh MS, Laksono AD. "Diberi air gula…awalnya nangis menjadi diam, karena kenyang, gak lemas, daya tahan tubuhnya meningkat"; Studi Pola Asupan pada Bayi. *Amerta Nutr* 2020;**4**(2):116–22.
31. Pratiwi NL, Fitrianti Y, Nuraini S, Rachmawati T, Laksono AD. Ibu Hamil "Kemel" pada Etnis Gayo di Kecamatan Blang pegayon Kabupaten Gayo Lues. *Aceh Bul Penelit Sist Kesehat* 2019;**22**(2):81–90.
32. Wulandari RD, Laksono AD. Does the place of residence affect the achievement of exclusive breastfeeding? A study in Eastern Indonesia. *Syst Rev Pharm* 2020;**11**(9):872–6.
33. Rollins NC, Bhandari N, Hajeebhoy N, Horton S, Lutter CK, Martines JC, et al. Why invest, and what it will take to improve breastfeeding practices? *Lancet* 2016;**387**(10017):491–504.
34. Laksono AD, Wulandari RD, Ibad M, Kusrini I. The effects of mother's education on achieving exclusive breastfeeding in Indonesia. *BMC Publ Health* 2021;**21**(1):1–7.
35. Tan KL. Factors associated with exclusive breastfeeding among infants under six months of age in peninsular Malaysia. *Int Breastfeed J* 2011;**6**:1–7.
36. Adugna B, Tadele H, Reta F, Berhan Y. Determinants of exclusive breastfeeding in infants less than six months of age in Hawassa, an urban setting, Ethiopia. *Int Breastfeed J* 2017;**12**(1):4–11.
37. Rahman MA, Khan MN, Akter S, Rahman A, Alam MM, Khan MA, et al. Determinants of exclusive breastfeeding practice in Bangladesh: Evidence from nationally representative survey data. *PLoS One [Internet]* 2020;**15**(7):1–14. Available at: https://doi.org/10.1371/journal.pone.0236080.
38. Dun-Dery EJ, Laar AK. Exclusive breastfeeding among city-dwelling professional working mothers in Ghana. *Int Breastfeed J [Internet]* 2016;**11**(1):1–9. Available at: https://doi.org/10.1186/s13006-016-0083-8.

39. Rimes KA, de Oliveira MIC, Boccolini CS. Maternity leave and exclusive breastfeeding. *Rev Saude Publ* 2019;**53**(1).
40. Chekol DA, Biks GA, Gelaw YA, Melsew YA. Exclusive breastfeeding and mothers' employment status in Gondar town, Northwest Ethiopia: a comparative cross sectional study. *Int Breastfeed J* 2017;**12**(1):1–9.
41. Ogbo FA, Dhami MV, Awosemo AO, Olusanya BO, Olusanya J, Osuagwu UL, et al. Correction to: regional prevalence and determinants of exclusive breastfeeding in India. *Int Breastfeed J* 2019;**14**(1):1–12.
42. Tadesse F, Alemayehu Y, Shine S, Asresahegn H, Tadesse T. Exclusive breastfeeding and maternal employment among mothers of infants from three to five months old in the Fafan zone, Somali regional state of Ethiopia: a comparative cross-sectional study. *BMC Publ Health* 2019;**19**(1):1–10.
43. Jama A, Gebreyesus H, Wubayehu T, Gebregyorgis T, Teweldemedhin M, Berhe T, et al. Exclusive breastfeeding for the first six months of life and its associated factors among children aged 6–24 months in Burao district, Somaliland. *Int Breastfeed J* 2020;**15**(1):1–8.
44. Tariku A, Alemu K, Gizaw Z, Muchie KF, Derso T, Abebe SM, et al. Mothers' education and ANC visit improved exclusive breastfeeding in Dabat health and demographic surveillance system site, northwest Ethiopia. *PLoS One* 2017;**12**(6):1–13.
45. Asemahagn MA. Determinants of exclusive breastfeeding practices among mothers in azezo district, northwest Ethiopia. *Int Breastfeed J [Internet]* 2016;**11**(1):1–7. Available at: https://doi.org/10.1186/s13006-016-0081-x.
46. Blixt I, Johansson M, Hildingsson I, Papoutsi Z, Rubertsson C. Women's advice to healthcare professionals regarding breastfeeding: "offer sensitive individualized breastfeeding support" – an interview study. *Int Breastfeed J* 2019;**14**(1):1–12.
47. Pemo K, Phillips D, Hutchinson AM. Midwives' perceptions of barriers to exclusive breastfeeding in Bhutan: a qualitative study. *Women Birth* 2020;**33**(4):e377–84.
48. Lenja A, Demissie T, Yohannes B, Yohannis M. Determinants of exclusive breastfeeding practice to infants aged less than six months in Offa district, Southern Ethiopia: a cross-sectional study. *Int Breastfeed J [Internet]* 2016;**11**(1):1–7. Available at: https://doi.org/10.1186/s13006-016-0091-8.
49. WHO. *Early initiation of breastfeeding to promote exclusive breastfeeding*. World Heal Organ [Internet]; 2019. Available at: https://www.who.int/elena/titles/early_breastfeeding/en/.