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THE ROLE OF PRENATAL CLASSES IN EXCLUSIVE BREASTFEEDING: EVIDENCE FROM PAPUA, INDONESIA

Peran Kelas Ibu Hamil dalam Keberhasilan ASI Eksklusif: Bukti dari Papua, Indonesia

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Abstract

Background: Exclusive breastfeeding (EBF) is a lifesaving practice for infants in vulnerable conditions. Therefore, it is crucial to ensure the optimization of EBF coverage in disadvantaged areas. One of the barriers to EBF is limited maternal knowledge, and prenatal classes are designed to improve maternal health knowledge and practices.
Aims: The study aimed to analyze the role of prenatal classes in supporting EBF in Papua.
Methods: The cross-sectional study examined 640 mothers with children aged 0-5 months from the Papua Region. Prenatal classes were an exposure variable, while EBF practice served as an outcome variable. Nine control variables, including age, marital status, education, work, wealth, sex, infant age, and early initiation of breastfeeding (EIBF), were incorporated into the analysis. Binary logistic regression test was used for analysis.
Results: The proportion of EBF in Papua is 50.7%. Mothers who participated in prenatal classes were 1.560 times more likely to practice EBF than those who did not (AOR = 1.560; 95% CI [1.476-1.649]). Additionally, the study identified nine control variables related to EBF in the Papua Region: type of residence, maternal age group, maternal marital status, education level, employment status, wealth status, infant age, infant sex, and EIBF.
Conclusion: Participation in prenatal classes is positively associated with the achievement of EBF practice in the Papua Region. Additional characteristics associated with a higher likelihood of EBF among Papuan mothers included having a higher level of education and employment, living in rural regions, experiencing poverty, being married, and achieving successful EIBF.

Keywords: exclusive breastfeeding, Papua, prenatal classes, public health, public health nutrition

Abstrak

Latar Belakang: *Pemberian ASI Eksklusif (EBF) berfungsi sebagai penyelamat bagi bayi dalam kondisi rentan; oleh karena itu sangat penting untuk memastikan optimalisasi cakupan EBF di daerah tertinggal. Salah satu hambatan terhadap EBF adalah kurangnya pengetahuan ibu, dan kelas prenatal merupakan program yang bertujuan untuk meningkatkan pengetahuan dan praktik kesehatan ibu.*
Tujuan: *Penelitian ini bertujuan untuk menganalisis peran kelas ibu hamil (KIH) terhadap pemberian ASI eksklusif di wilayah Papua.*
Metode: *Studi cross-sectional dilakukan terhadap 640 ibu dengan bayi berusia 0-5 bulan dari wilayah Papua. KIH merupakan variabel paparan, dan pemberian ASI ekslusif adalah variabel hasil. Sembilan variabel kontrol, termasuk usia, status perkawinan, pendidikan, pekerjaan, kekayaan, jenis kelamin, usia bayi, dan Inisiasi Menyusu Dini (IMD), dimasukkan ke dalam analisis. Penelitian ini menggunakan uji regresi logistik biner.*
Hasil: *Proporsi ASI eksklusif di Papua adalah 50,7%. Ibu yang mengikuti KIH memiliki peluang 1,560 kali lebih besar untuk memberikan ASI eksklusif dibandingkan dengan ibu yang tidak mengikuti KIH (AOR = 1,560; 95% CI [1,476-1,649]). Selain itu, penelitian ini juga menemukan terdapat sembilan variabel kontrol yang terkait dengan ASI eksklusif di wilayah Papua: wilayah tempat tinggal, kelompok usia ibu, status pernikahan ibu, tingkat pendidikan, status pekerjaan, status ekonomi, usia bayi, jenis kelamin bayi, dan IMD.*
Kesimpulan: *Partisipasi dalam kelas ibu hamil meningkatkan potensi keberhasilan pemberian ASI eksklusif di Wilayah Papua. Karakteristik lain terkait dengan peningkatan pemberian ASi eksklusif di Papua adalah tingkat pendidikan dan pekerjaan yang lebih tinggi, tinggal di daerah pedesaan, miskin, sudah menikah, dan berhasil IMD.*

Kata kunci*: ASI eksklusif, gizi kesehatan masyarakat, kelas ibu hamil, kesehatan masyarakat, Papua*

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Introduction

Exclusive breastfeeding (EBF) refers to the practice of solely providing breast milk to infants for the initial six months of life. EBF is universally acknowledged as the most effective and best means of delivering nutrients to infants during this period (Alayón *et al.*, 2022). It provides numerous benefits for health, growth, and development, while also strengthening the physical and emotional bond between mother and infant. In addition, EBF also serves as a lifesaving intervention for infants in vulnerable and impoverished circumstances (Felipe-Dimog, Dumalhin and Liang, 2023; Karthigesu, Balakumar and Arasaratnam, 2023; Dharmaraj, Ghimire and Chinnaiyan, 2024).

Notwithstanding its extensively recorded advantages, the worldwide prevalence of EBF remains inadequate. Approximately 40% of moms globally do not exclusively breastfeed their kids during the first six months of life. The prevalence of EBF among infants up to six months of age in Indonesia declined from 64.5% in 2018 to 52.5% (UNICEF and WHO, 2023). This figure of EBF increases to 68% in 2023 (Unicef, 2023). Furthermore, more than half of first-time mothers lack adequate knowledge about EBF, often leading them to combine breastfeeding with other feeding methods during this critical period (Karthigesu, Balakumar and Arasaratnam, 2023; Dharmaraj, Ghimire and Chinnaiyan, 2024).

Prior research has indicated that insufficient EBF can be attributed to a variety of maternal factors. These include biological factors, such as a gestation period of less than nine months and the method of delivery, as well as maternal demographic factors, including employment, maternal education, and socio-economic status (Felipe-Dimog, Dumalhin and Liang, 2023; Sharma *et al.*, 2023; UNICEF and WHO, 2023; Dharmaraj, Ghimire and Chinnaiyan, 2024)

These determinants are particularly pronounced in disadvantaged regions such as Papua. Papua has consistently ranked lowest in national development indicators for the last five years (Badan Pusat Statistik, 2023). Human Development Index (HDI) measures a nation's average achievement in three basic dimensions of human development, which are a long and healthy life, knowledge, and a decent standard of living (United Nations Development Programme, 2025). In both 2023 and 2024, all the provinces in Papua remained below the national HDI average, with Highland Papua being the lowest in Indonesia. South Papua, West Papua, and Central Papua also rank among the bottom five provinces (Badan Pusat Statistik Provinsi Papua, 2024, 2025). HDI scores have a strong correlation with maternal and infant health. Raising HDI metrics could lower global infant mortality and enhance infant health (Alijanzadeh, Asefzadeh and Moosaniaye Zare, 2016; García-Tizón Larroca *et al.*, 2020).

Additionally, the Indonesian Ministry of Health has launched the Public Health Development Index (PHDI) in Indonesia. PHDI comprises thirty health indicators organized into seven categories. The first category is reproductive and maternal health, the second is infant and child health, the third is infectious disease, the fourth is environmental health, the fifth is non-communicable disease, the sixth is health risk behavior, and the seventh is health services (Suparmi *et al.*, 2018). Similar to the HDI, the PHDI in Papua provinces specifically has been ranked among the lowest provinces in PHDI. The 2018 PHDI scores ranged from 43.9 in Papua to 65.0 in Bali (Laksono *et al.*, 2023). These findings highlight Papua as a region with substantial health inequalities compared to other parts of Indonesia, emphasizing the importance of studies on maternal and child health in Papua, including the determinants of exclusive breastfeeding.

The Indonesian program for pregnant women, primarily delivered through the Antenatal Care (ANC) program, focuses on comprehensive care to improve maternal and child health outcomes. This includes regular visits, health risk assessments, prenatal class or *Kelas Ibu Hamil* (KIH), and screenings for various infections (Denny *et al.*, 2022; Azhali, Setiabudi and Alam, 2023; Kusumawardani *et al.*, 2024). Previous research has shown that the coverage for

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ANC in Papua is significantly lower than any other region in Indonesia, except for the Maluku island regions, thereby increasing health risk for both mothers and infants (Laksono, Rukmini and Wulandari, 2020).

Exclusive breastfeeding coverage in Papua remains significantly lower than in other regions of Indonesia, contributing to high rates of infant malnutrition and mortality (Maviso *et al.*, 2022). Systemic challenges, including resource constraints, education (Wulandari *et al.*, 2022), cultural barriers (Aurellia *et al.*, 2022), hinder EBF in Papua. Unique socio-cultural dynamics, including strong kinship systems and limited paternal involvement in infant care, influence EBF practices in Papua. To improve exclusive breastfeeding rates in Papua, it is essential to consider socio-cultural norms. However, challenges such as restricted access to health services, traditional gender roles, and geographic isolation require culturally adapted strategies (Sugino, Rantetampang and Pongtiku, 2016; Hidayat, Wiarsih and Nurkhayati, 2024).

A study at the Kalibobo Nabire Health Center reported that the prevalence of exclusive breastfeeding in that area was 26.8%. The low prevalence of exclusive breastfeeding was related to maternal knowledge, maternal employment status, and family support (Salindeho *et al.*, 2023). Another study using a community-representative sample found that mothers attending prenatal classes were more likely to achieve early initiation of breastfeeding (EIBF). At the same time, EIBF is a significant factor in increasing the chance of successful EBF (Kusumawardhani et al., 2024).

Barriers to successful breastfeeding practices in Papua include a shortage of trained health workers, poorly coordinated schedules, and low participation among pregnant women, often due to geographic isolation and socio-cultural constraints. Addressing these issues requires a multifaceted approach that integrates socio-economic data, health indicators, and environmental variables to provide a comprehensive understanding of the factors influencing child health (Caraka *et al.*, 2024).

In addition to formal schooling, prior research on high-risk mothers has highlighted the crucial role of prenatal education in promoting effective breastfeeding (Witten *et al.*, 2020). A recent review of the impact of prenatal classes on EBF after three months revealed that all the trials included in the review, which reported significant positive outcomes, involved time-consuming and costly interventions. While it is encouraging to discover potentially practical approaches, only some of these interventions are feasible for implementation outside of a research environment (Naja *et al.*, 2022; Oggero, Rozmus and LoBiondo-Wood, 2024). Since 2009, Indonesia has implemented a national strategy to implement a program called ‘Kelas Ibu Hamil’ (KIH), which focuses on improving maternal and newborn health (MNH).

Research on Indonesia’s KIH has yielded mixed findings regarding its impact on breastfeeding practices. Some studies indicate positive impacts, such as improved knowledge and attitudes, and increased early EIBF (Kusumawardani *et al.*, 2024). However, a widespread agreement suggests that the implementation of KIH is still weak (Azhar *et al.*, 2020). According to a study on EBF distribution in Indonesia, Papua has the lowest EBF rates among the provinces (Idris and Astari, 2023). Evidence shows that factors affecting KIH implementation include an absence of high-quality health services at the facility level, poor infrastructure, limited information dissemination regarding the KIH to pregnant women in the community, and insufficient program monitoring and evaluation (Azhar *et al.*, 2020).

Several studies have demonstrated that educating mothers plays a crucial role in promoting EBF performance. However, most of these studies were conducted within more restrictive EBF education frameworks. Although previous research with limited samples in Papua shows a relationship between increasing maternal knowledge and EBF behaviour (Salindeho *et al.*, 2023), there has been no research that links the implementation of prenatal

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classes integrated into regular antenatal care and EBF rates among infants aged 0-5 months, specifically among mothers from Papua with regionally representative samples.

This research addresses the theory-practice gap by examining whether an upscaling educational intervention, *Kelas Ibu Hamil* (KIH), is related to the actual practice of EBF in the disadvantaged region of Papua. It also considers that the knowledge mothers gain about EBF from KIH may not translate directly into practice for all mothers. Moreover, it also examines how various factors, including maternal socio-demographics, child's age, and early EIBF, influence the application of EBF.

Method

Study Design and Data Source

This study utilized secondary data from the Indonesian Nutritional Survey (INS) 2021, a cross-sectional survey of households conducted by the National Institute of Health Research and Development (NIHRD) under the Ministry of Health, Indonesia.

The Indonesian Central Bureau of Statistics (ICBS) selected participants using a stratified two-stage sampling method. The first stage involves identifying and assigning primary sampling units (PSU). The PSU is a sub-district selected as probability proportional to size (PPS). In the second stage, the Census Block (CB) is determined using the PPS method. The ICBS provided a CB map and household sampling list for each CB.

The next step is to update the CB map and household sampling list using ICBS data. Trained nutritionists from the Public Health Center (PHC) performed direct data validation on household samples of toddlers at the CB location. As a result of the data updating process, we obtained the latest CB map and sample list of households with children under five.

CB sample selection was randomly selected using the Epicollect application, yielding ten samples of under-five households and three reserve under-five households in each CB. All households were defined as those that had lived in the exact location for at least six months and shared the same financial resources for food. All selected households were asked if they would participate in the survey. Before the structured questionnaire-based data collection interview, participants were explained to and informed consent was obtained directly from trained nutritionist fieldworkers. The response rate for INS 2021 was 91.4%. For the Papua Region, 14,685 samples of households with children under five were obtained, as well as 640 samples of households with infants under six months of age.

This study was conducted in the Papua region, which comprises six provinces: Papua, West Papua, Central Papua, Papua Highlands, South Papua, and Southwest Papua.The study employed the EBF practices of mothers with infants under six months old. The study categorized the EBF as either *Yes* (1) or *No* (0). Mothers who reported giving their child food other than breast milk were labeled as "No," while those who reported not feeding their child anything other than breast milk were labeled as "Yes."

Exposure Variables

The exposure variable for this research is prenatal class. In this research, a prenatal class refers to KIH, a program designed by the Indonesian Ministry of Health for pregnant women. The program aims to increase mothers' knowledge about pregnancy, prenatal care, childbirth, postpartum care, newborn care, including the early initiation of breastfeeding and exclusive breastfeeding. It is designed as a class for students to learn alongside midwives or health workers who have previously received training. The courses for pregnant women are held at least four times during pregnancy, or according to the agreement between the facilitator and the participants (Ministry of Health Republic of Indonesia, 2019). The study classified participation in prenatal classes as either *Yes* (1) or *No* (0). Mothers who reported attending prenatal courses (based on records in the maternal and child health book or the mother's report) were marked as "Yes." Those who did not participate in

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the prenatal class (answering no or not knowing) were marked as "No."

Control Variables

The type of residence, the infant's age and sex, the mother's marital status, education level, employment status, wealth status, and the EIBF were the nine parameters we used as control variables. There are two types of residences: urban and rural. Maternal ages were classified into eight groups: <20, 20–24, 25–29, 30-34, 35–39, 40–44, and >44. Furthermore, we classified mothers' education into primary, secondary, and higher education. Maternal marital status consists of being married/cohabiting and divorced/widowed. Maternal employment status divided the mothers into two groups: employed and unemployed. The employed status is defined as activities related to financially rewarding work.

The household's wealth was calculated by assessing the wealth quintile of its possessions. When assigning a score, the survey took into account the quantity and variety of goods in a household. The survey also considered the house's characteristics and various items to determine wealth, such as televisions, vehicles, and bicycles. The survey considered the primary materials used for constructing floors, the sources of drinkable water, and sanitation facilities. The study utilized principal component analysis (PCA) to ascertain the amount of wealth. The household questionnaire categorized the national wealth quintiles into five categories, each representing 20% of the population. The survey categorized wealth status into five groups: poorest, poorer, middle, more prosperous, and most affluent.

Infant age was categorized into three groups: 0–1 months, 2-3 months, and 4-5 months. Infants sex was recorded as male or female. In addition, we defined EIBF as the start of breastfeeding within the first hour after birth, ensuring that the infant receives colostrum (UNICEF and WHO, 2018). EIBF is identified as *Yes* or *No*.

Data Analysis

We employed statistical techniques to control and account for the effects of covariates. Therefore, we may independently separate and investigate the impact of the significant research factors. Due to the large number of potential covariates and the numerous levels of grouping, a multivariate logistic regression model was employed. Furthermore, we used a random sample to reduce the likelihood of confounding variables influencing the study's outcomes.

We utilized the chi-squared test to describe subject characteristics. We conducted a collinearity test to ensure that there was no significant correlation among the independent variables. The final stage involved a binary logistic regression with an entry procedure test utilized. The statistical significance was ascertained using a p-value of 0.05 and a 95% confidence interval (CI) for adjusted odds ratio (AOR). To do all the statistical computations for the analysis, we used the IBM SPSS Statistics 26 program.

Furthermore, we utilized ArcGIS 10.3 (ESRI Inc., Redlands, CA, USA) to generate a distribution map of the prevalence of EBF in the Papua Region. Indonesian Statistics provided a shapefile that included administrative border polygons for this investigation.

Results and Discussion

The analysis results indicate that the exclusive breastfeeding rate in Papua is 50.7%, falling short of the global objective of 70% set for the year 2030 by 20%. Hence, it is imperative to implement ongoing enhancements to bolster the facilitating factors contributing to the achievement of exclusive breastfeeding (UNICEF and WHO, 2023). The Indonesian government has implemented EBF rules for the first half of the year according to the rule (Government Regulation no. 33 of 2012 concerning Exclusive Breastfeeding). Certain situations are exempt from the legislation, such as those involving medical necessity, the absence of the mother, or when the mother and baby are separated. The exclusive breastfeeding program relies on provincial and district/city

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administrations to effectively implement national policies. Figure 1 depicts the EBF distribution map by regency/city in the Papua Region, Indonesia, in 2021. The map indicates that most of Papua Highlands and half of the Central Papua region have a higher prevalence of EBF compared to other areas in the Papua Region.

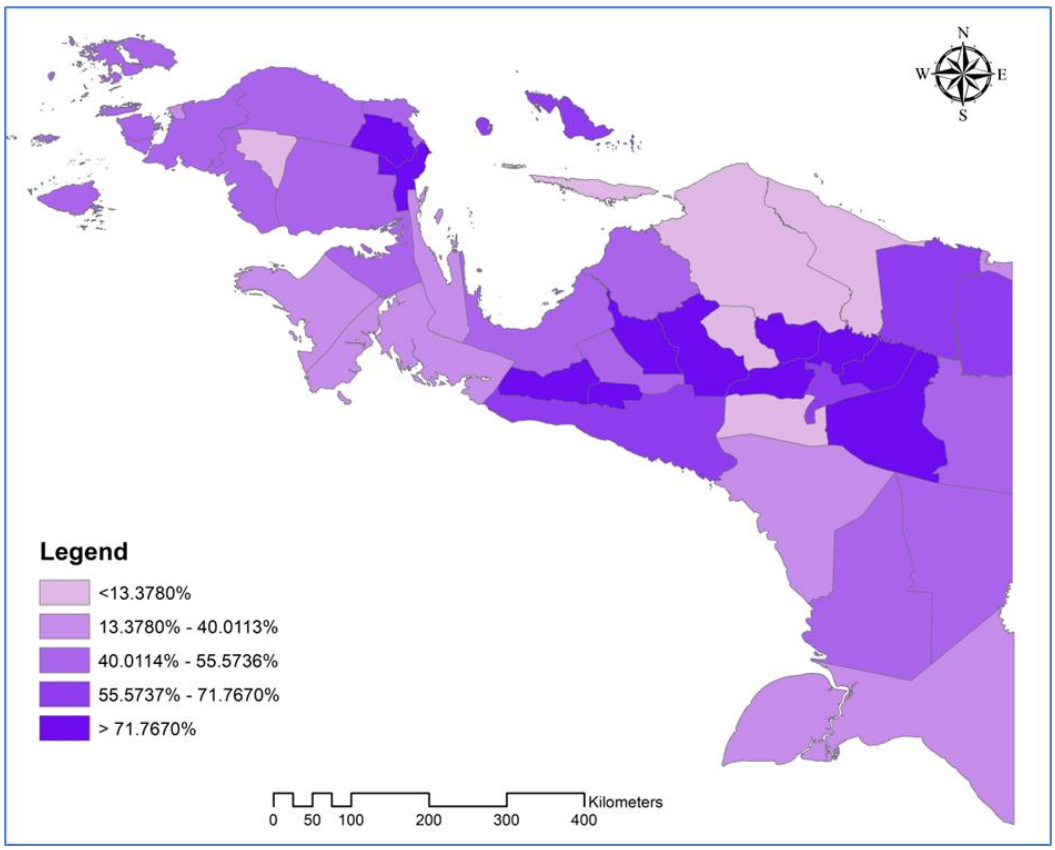
Table 1 presents descriptive statistics of prenatal classes and the characteristics of Papuan mothers. The results indicate that Papuan mothers who attended prenatal courses had a higher proportion of EBF.

According to residence type, Table 1 indicates that the proportion of Papuan mothers attending prenatal classes in rural areas is twice as high as in urban areas. Meanwhile, the proportion of Papuan mothers aged 30 – 34 is the highest in the prenatal classes group. Moreover, based on maternal marital status, the prenatal classes are filled with married mothers.

Table 1 also shows that Papuan mothers with primary education comprise most of the prenatal classes group. Unemployed mothers are nearly twice as many as employed mothers in the prenatal classes group. Furthermore, the poorest group has the highest proportion of prenatal classes.

Based on the infants' age, Table 1 shows that the 4 –5 months group has the highest proportion in the prenatal classes. Meanwhile, regarding the sex of infants, females outnumbered males in the prenatal classes. Moreover, according to EIBF, infants who perform EIBF are almost three times as many as those without in the prenatal classes group.

The following analysis used co-linearity tests. The variance inflation factor (VIF) values for each variable is concurrently more than 10.00, and the tolerance values for each variable are, on average, more significant than 0.10. The study found no strong relation between two or more independent variables in the regression model, as co-linearity tests revealed no evidence of collinearity among the independent variables.



Source: Visualisation by the Author Based on the 2021 Indonesian National Nutritional Status Survey Data

Figure 1. EBF distribution map by the Regency/City in Papua Region, Indonesia, in 2021

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Table 1. Descriptive statistics of prenatal classes and Papuan mothers' characteristics (n=640)

Mothers' Characteristics	Prenatal Classes		*p*-value
	No (*n*= 318)	Yes (*n*= 312)	
Exclusive Breastfeeding			< 0.001
No	51.6%	41.5%	
Yes	48.4%	58.5%	
Residence type			< 0.001
Urban	38.3%	33.0%	
Rural	61.7%	67.0%	
Maternal age (in years)			< 0.001
< 20	7.4%	1.8%	
20 – 24	22.1%	23.1%	
25 – 29	23.5%	22.3%	
30 – 34	22.1%	27.4%	
35 – 39	16.4%	15.8%	
40 – 44	6.0%	9.3%	
> 44	2.6%	0.2%	
Maternal Marital Status			< 0.001
Married/Living with a partner	99.4%	100.0%	
Divorced/Widowed	0.6%	0.0%	
Maternal Education			< 0.001
No formal education	12.8%	6.4%	
Primary	44.7%	44.4%	
Secondary	29.3%	37.9%	
Higher	13.2%	11.3%	
Maternal Employment Status			< 0.001
Unemployed	68.4%	64.5%	
Employed	31.6%	35.5%	
Wealth status			< 0.001
Poorest	54.0%	42.0%	
Poorer	11.9%	5.7%	
Middle	8.2%	8.6%	
Richer	13.6%	26.3%	
Richest	12.4%	17.4%	
Age of Infant (in months)			< 0.001
0 – 1	25.6%	20.4%	
2 – 3	40.3%	38.4%	
4 – 5	34.1%	41.2%	
Sex of Infant			< 0.001
Boy	52.4%	47.3%	
Girl	47.6%	52.7%	
Early initiation of breastfeeding			< 0.001
No	57.3%	28.4%	
Yes	42.7%	71.6%	

Table 2 presents the results of the binary logistic regression analysis. Regarding prenatal classes, mothers who attend prenatal courses are 1.560 times more likely than those without to carry out EBF (AOR = 1.560; 95% CI [1.476-1.649]). Even after considering the influence of confounding variables, maternal participation in prenatal classes remains significantly associated with a higher probability of successful exclusive breastfeeding (EBF).

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Table 2. Binary logistic regression of exclusive breastfeeding in Papua, Indonesia (n=640)

Predictors	Exclusive Breastfeeding			
	p-value	AOR	95% CI	
			Lower Bound	Upper Bound
Prenatal classes				
No (ref.)	-	-	-	-
Yes	***< 0.001	1.560	1.476	1.649
Residence				
Urban (ref.)	-	-	-	-
Rural	***< 0.001	1.501	1.419	1.587
Maternal age				
< 20 (ref.)	-	-	-	-
20 – 24	***< 0.001	0.657	0.593	0.728
25 – 29	0.416	1.043	0.943	1.154
30 – 34	***< 0.001	1.462	1.322	1.618
35 – 39	0.912	0.994	0.897	1.102
40 – 44	***< 0.001	1.512	1.331	1.718
> 44	**0.003	0.757	0.629	0.912
Maternal Marital				
Married	***< 0.001	1.929	1.367	2.721
Divorced/Widowed (ref.)	-	-	-	-
Maternal Education				
No formal education (ref.)	-	-	-	-
Primary	***< 0.001	1.451	1.347	1.563
Secondary	***< 0.001	1.196	1.100	1.301
Higher	*0.012	1.138	1.028	1.259
Maternal employment				
Unemployed	-	-	-	-
Employed (ref.)	***< 0.001	1.198	1.139	1.259
Wealth				
Poorest (ref.)	-	-	-	-
Poorer	0.879	0.994	0.921	1.073
Middle	***< 0.001	0.732	0.670	0.800
Richer	***< 0.001	0.577	0.535	0.622
Richest	***< 0.001	0.590	0.543	0.642
Age of Infant				
0 – 1 month	***< 0.001	1.446	1.362	1.535
2 – 3 months	***< 0.001	1.647	1.563	1.735
4 – 5 months (ref.)	-	-	-	-
Sex of Infant				
Boy (ref.)	-	-	-	-
Girl	***< 0.001	1.417	1.354	1.482
Early initiation of breastfeeding				
No (ref.)	-	-	-	-
Yes	**0.003	1.074	1.025	1.125

Note: AOR: adjusted odds ratio; CI: confidence interval; ref= reference; *p < 0.050; **p < 0.010; ***p < 0.001

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Mothers in the Papua Region who participated in prenatal classes or received training in knowledge, attitudes, and practices were more likely to breastfeed their babies exclusively. This association remained significant even after controlling for many potential factors. The positive correlation underscores the need to offer continuous guidance and support to expectant mothers to promote exclusive breastfeeding. Previous research found that prenatal education has a beneficial influence on the efficacy of exclusive breastfeeding in mothers with infants under six months old (Naja *et al.*, 2022; Oggero, Rozmus and LoBiondo-Wood, 2024). A study in Somalia found the impact of maternal prenatal education focusing on breastfeeding on the successful practice of exclusive breastfeeding (Jama *et al.*, 2020).

Prenatal classes could increase pregnant women's awareness of potential lactation issues and their underlying reasons. Maternal stress, postpartum depression, and low breastfeeding self-efficacy likely affect the mother's decision to breastfeed exclusively (Ahmadinezhad *et al.*, 2024). Research has shown that expert counseling throughout pregnancy can enhance maternal confidence in breastfeeding and effectively address several breastfeeding challenges after childbirth, such as improving the success rate of acquiring lactation-latching skills (Shafaei, Mirghafourvand and Havizari, 2020; Gao *et al.*, 2022). Attending prenatal classes aims to improve understanding, perspectives, and actions regarding various facets of pregnancy, childbirth, postpartum, family planning, newborn care, cultural customs, contagious illnesses, and birth records (Directorate General of Nutrition Development and Maternal Child Health, 2015; Fuada and Setyawati, 2016; Ashar *et al.*, 2019). Additionally, this research shows that incorporating prenatal classes featuring diverse materials alongside exclusive breastfeeding can benefit EBF. Consequently, it is more practical to include these classes in routine antenatal care.

Moreover, the study also found that EBF is influenced by several covariates, including maternal socio-demographic variables, child biological parameters (particularly age), and EIBF.

Papuan mothers in rural areas had 1.501 times more chance to perform EBF than mothers living in urban areas (AOR = 1.501; 95% CI [1.419 – 1.587]). According to the research, the location of one's residence has a significant impact on the attainment of exclusive breastfeeding. This finding is consistent with previous research (Bankole, Solanke and Bisiriyu, 2022). However, other studies reported a contrasting outcome (Ihudiebube-Splendor *et al.*, 2019). Rural mothers' extended breastfeeding duration is credited to their communal lifestyle (Bankole, Solanke and Bisiriyu, 2022). Another possible explanation for higher EBF among rural mothers is that rural residents show high respect for healthcare professionals (Paramashanti *et al.*, 2022).

Meanwhile, the demographic characteristics of four Papuan mothers are also associated with EBF: age, marital status, and education. The findings regarding age were inconsistent when comparing them to the youngest group of mothers, in contrast to studies conducted in Ghana, which discovered a significant correlation between age and EBF, indicating that the youngest age group was particularly vulnerable to not practicing EBF (Yeboah, Forkuor and Agyemang-Duah, 2019). A study conducted in Thailand and Bangladesh found that information obtained from media regarding breastfeeding, positive attitudes towards breastfeeding, and social support were identified as protective variables that increased the likelihood of EBF among young married women (Kanhadilok *et al.*, 2016; Agho *et al.*, 2021).

The impact of marital status on EBF in the study is consistent with previous research conducted in Bangladesh, indicating that married mothers had a higher likelihood of engaging in EBF. Based on the research results, EBF would be successful if parents worked together as a team (Hasan *et al.*, 2021). This is particularly important because in the context of Papua, exclusive breastfeeding practices are influenced by unique socio-cultural dynamics, including strong kinship

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systems and limited paternal involvement in infant care (Hidayat, Wiarsih and Nurkhayati, 2024).

Individuals lacking formal education in the Papua Region were less likely to engage in EBF than mothers from all other educational levels. This discovery aligns with the results of research conducted in China. Mothers with higher education levels show a strong understanding and skill in nursing and usually have more options for exclusive breastfeeding (Hamze, Mao and Reifsnider, 2019).

According to wealth status, the study indicated that, alongside the poor, mothers from the poorest wealth groups have had a greater chance of achieving EBF in the Papua region than those from the upper wealth categories. The newborns from low-income households were more likely to get exclusive breastfeeding. Infants from more affluent family status have a greater chance of receiving non-exclusive breastfeeding, similar to some previous studies in India and Bangladesh (Ariful Islam *et al.*, 2019; Sharma *et al.*, 2023). The result in India found that the dissatisfying EBF practices in wealthier households may be due to recurrent exposure to various formula feeding methods, the financial capacity to buy formula, and the need to understand the benefits of EBF for mothers and their infants due to insufficient counseling on breastfeeding habits throughout pregnancy and after delivery (Sharma *et al.*, 2023).

Regarding the infant's age, the results showed that all ages were more likely to perform EBF than those aged 4 to 5 months. A study in Nigeria reported a similar result. EBF was discovered to be more prevalent among infants under four months old because of the misconception that breast milk alone is insufficient to fulfill infants' dietary needs after the first three months (Olasinde *et al.*, 2021). A study in Northwest Ethiopia found that mothers who did not believe in tradition did not feed breast milk to their babies until six months (Yimer *et al.*, 2021).

According to the data on infants' gender, girls have a 1.417 times higher likelihood of achieving EBF (AOR = 1.417; 95% CI [1.354–1.482]). Previous research in Papua has shown that there are differences in the value placed on boys and girls. Differences in the values of boys and girls in Papua remain a significant issue, particularly in a social and cultural context that is still heavily influenced by traditions and customary values. Boys and girls have different roles in family and community life, with boys often appointed as leaders and caretakers, while girls are more focused on domestic and family roles (Kenelek, Poli and Frank, 2021). Expectations that sons will provide as a leader and primary breadwinner of the household made the value of boys higher in the family (Sen, Mallick and Bari, 2020).

Prior research has identified a correlation between gender and exclusive breastfeeding (EBF) practices. For instance, infant girls are more likely than boys to begin nursing at an early age (Belvedere *et al.*, 2018). A study on the barriers to optimal breastfeeding found that attitudes and beliefs positively and negatively affect nursing practices (Belvedere *et al.*, 2018). Hence, the results of this study are linked to the detrimental consequences of some customary traditions and societal behaviors, as well as a patriarchal system prevalent in Papua (Situmorang *et al.*, 2022), which likely contributed to disparities in the perceived worth of girls and boys. There are still misunderstandings that infant males tend to become hungry more frequently, have difficulty feeling satiated, and possess greater strength (Belvedere *et al.*, 2018). Thus, infant boys require a greater amount of nutrients than infant girls. In addition, boys must consume more food because breast milk alone is deemed inadequate (Silva *et al.*, 2019). Boys are more likely to be introduced to supplementary food earlier, leading to a shorter duration of EBF and earlier weaning (Silva *et al.*, 2019). Moreover, this suggests that there is a perception that nursing is deficient in nutrients (Belvedere *et al.*, 2018), necessitating the provision of supplementary food to infant boys before it is introduced.

Moreover, according to EIBF, infants who received EIBF are 1.074 times more likely to breastfeed exclusively compared to those who do not receive EIBF in the Papua

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Region (AOR = 1.074; 95% CI [1.025 – 1.125]). This finding demonstrates that EIBF has a positive impact on EBF practice. EIBF is crucial in promoting and establishing breastfeeding patterns (Nguyen *et al.*, 2020). This discovery is consistent with the investigation conducted in Haiti (Walsh *et al.*, 2019). Maternal attitude toward initiating breastfeeding is related to the intention to breastfeed (Kanhadilok *et al.*, 2016; Naja *et al.*, 2022). One of the topics covered in prenatal classes is the importance of providing colostrum, which has led mothers to choose exclusive breastfeeding for their newborns. Colostrum, the initial fluid secreted by a woman during breastfeeding, is a rich source of vital elements for maintaining immunological health and development (Gayatri, 2021). A study found a positive correlation between breastfeeding attitudes, social support, and cultural ideas about parenting and EIBF (Kanhadilok *et al.*, 2016). Given the importance of EBF for children's nutrition and development, it is necessary to promote EIBF to enhance the practice of EBF in Papua.

Limitations of the Study

The study required a thorough data analysis to produce results at the regional level in Papua. Related to the nature of cross-sectional research designs, this study cannot establish a causal relationship but is limited to identifying the relationship between various potential predictors and exclusive breastfeeding. The methods used to answer the question were self-reported, which may be subject to underreporting or social desirability bias. However, the SSGI survey instrument was a validated tool designed to minimize bias. The enumerators are also undergoing training to gather more objective data.

For this analysis, we focused solely on the factors provided in the 2021 Indonesian National Nutrition Status Survey, a secondary data source. The study's conclusions exclude several other variables associated with EBF in previous investigations, including birth order, the total number of children, the worth of children, psychological barriers, and cultural issues (Laksono and Wulandari, 2019; Witten et al., 2020). However, the community representative sampling and the findings in this study which indicate the higher success of EBF in mothers who attend prenatal classes, could serve as evident base for improving and expanding prenatal classes implementation in Papua region with similar characteristics as Papua.

Conclusion

Participation in prenatal classes is associated with the achievement of EBF in the Papua Region. Additional characteristics related to an increased likelihood of EBF among Papuan mothers were having a higher level of education and employment, living in rural regions, experiencing poverty, being married, and achieving successful EIBF. The findings suggest that mothers who receive comprehensive education through prenatal classes are more likely to breastfeed their infants exclusively. This condition highlights the importance of promoting the significance of EBF to pregnant women and their partners in Papua, primarily through prenatal classes. Additionally, it is crucial to extend this knowledge to the broader community in the Papua region, as they play a vital role in supporting mothers in implementing EBF effectively. Further research needs to be done on several other variables associated with EBF including psychological barriers, and cultural issues.

Abbreviations

EBF: Exclusive Breastfeeding; EIBF: Early Initiation of Breastfeeding; ASI: Air Susu Ibu; KIH: Kelas Ibu Hamil; IMD: Inisiasi Menyusu Dini; HDI: Human Development Index; PHDI: Public Health Development Index; MNH: Maternal and Newborn Health; INS: Indonesian Nutritional Survey; NIHRD: National Institute of Health Research and Development; ICBS: The Indonesia Central Bureau of Statistics; PSU: Primary Sampling Units; PPS: Probability Proportional to Size; CB: Census Block; PHC: Public Health Center; PCA: Principal

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Component Analysis; CI: Confidence Interval; AOR: Adjusted Odds Ratio; VIF: Variance Inflation Factor.

Declarations

Ethics Approval and Consent to Participate

The Indonesian National Nutritional Status Survey of 2021 received ethical approval from the National Ethics Commission with license number LB.02.01/2/KE.248/2021. Respondents provided written informed consent, and the survey was designed to ensure the voluntary and confidential nature of the data collection process using written informed consent.

Conflict of Interest

The authors have declared that no conflict of interest exists.

Availability of Data and Materials

Data is available upon request to the management of the data laboratory at the Ministry of Health, Republic of Indonesia. The authors, as a third party, have no authorization to reveal data publicly.

Authors' Contribution

LL conceptualized the study, prepared and wrote the manuscript; ADL conceptualized the study, prepared and wrote the first manuscript, analyzed the data; RS, DKM, MK, HDK, TH, S, MAM wrote the manuscript. All authors contributed equally and approved the final version of the manuscript.

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