Breastfeeding practices and attitudes among women in West Sumatra, Indonesia

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Abstract

Background:

Significant variations in breastfeeding initiation and continuation exist in different global communities. Understanding women's attitude and experiences about breastfeeding within different communities is important to inform optimum infant feeding practices.

Aim:

To explore breastfeeding practices and gain insights into women's practices, knowledge and beliefs concerning infant feeding in West Sumatra, Indonesia.

Methods:

A mixed methods study was undertaken. Breastfeeding data were collected from mothers at birth, 6 weeks, 6 and 9 months of infant's age within a feasibility study of antenatal nutritional supplementation in West Sumatra (n=158). Additionally, a convenience sample of mothers (n=19) undertook qualitative semi-structured interviews. Interviews were analysed thematically.

Results:

While only 84.2% of infants were exclusively breastfed within the 24 hours prior to hospital discharge, 93.7% of infants at 6 weeks and 64.7% at 6 months were exclusively breastfed. At 9 months 92.9% of infants continued to breastfeed.

Qualitative interviews generated three overarching themes: 1. "Mothers' attitude". Women viewed breastfeeding as normal and natural and strongly valued the health benefits of exclusive breastfeeding. 2."Cultural perspectives" showed breastfeeding was the default choice within the women's communities. 3."Family and social support" found women received good family support and encouragement to breastfeed.

Conclusion:

The exclusive breastfeeding rate of 64.7% and any breastfeeding rate of 96.0% at 6 months in West Sumatra is noteworthy. Cultural values, family and social support along with a positive attitude reinforced by information and knowledge regarding breastfeeding appeared to catalyse high rates of breastfeeding. Further international comparative studies to provide insights into the underpinning social and belief constructs that may contribute to these positive health behaviours (or lack of it in other communities) is worthy of further investigation.

Keywords: Breastfeeding; breastfeeding practices; cultural norms; Indonesia; mixed methods study

Introduction

Exclusive breastfeeding is recommended for the first six months of a child's life, with continued breastfeeding alongside consumption of supplementary foods up to 2 years of age or beyond (World

Health Organization, 2021). Globally, only 48% of infants aged zero to five months are exclusively breastfed, with breastfeeding rates decreasing with increasing age from 0-5 months (UNICEF, 2023). In the most recent Indonesia demographic health survey, 67% of infants were exclusively breastfed at one month, 38% exclusively breastfed at four to five months, and nationally 55% of infants received some breastmilk until age 2 years (National Population and Family Planning Board (BKKBN), Statistics Indonesia (BPS), Ministry of Health (Kemenkes), and ICF, 2018).

Adequate nutrition in early life is vital, with breastfeeding providing optimal nutrition and unique health benefits (Eidelman et al., 2012; Victora et al., 2016). Extensive research has shown that breastmilk has a protective effect against infant sickness, including reduced rate of hospitalisations for diarrhoea and respiratory infections (Lessen and Kavanagh, 2015; Victora et al., 2016) and a lower mortality rate (North et al., 2022). This is of importance in Indonesia as infant mortality is a major public health issue. The latest Indonesia Demographic and Health Survey indicated the mortality rate among children under 1 year to be 24 per 1,000 live births, and the neonatal mortality (death in the first 28 days of life) to be 15 per 1,000 live births, equating to 1 in 67 children dying within the first month of life (BKKBN, BPS, Kemenkes and ICF, 2018). Additionally, the advantages of breastfeeding continue into adulthood with a lower risk of obesity and diabetes in later life (Victora et al., 2016). The benefits of breastfeeding are not just limited to the infant, research has indicated a decline in breast and ovarian cancers, type two diabetes and endometriosis in women who breastfeed (Victora et al., 2016; Farland et al., 2017; Modugno et al., 2019).

In Indonesia, 36.7% of under 5-year-olds suffer from stunting, signalling the necessity for adequate nutrition early in life (Rachmi et al., 2016). That study suggested that Indonesian infants breastfed for 6 months or more were more likely to be stunted or underweight (Rachmi et al., 2016). However, other studies suggest infants are more likely to be undernourished if they are not exclusively breastfed (Ananta et al., 2016) and in areas with higher proportions of infants not receiving any breastmilk from 0-23 months (Perdani et al., 2021), in particular among low income women (Hadi et al., 2021).

Many factors have been indicated to improve rates of breastfeeding. Mothers with a higher level of education have been demonstrated to improve rates of breastfeeding in the UK (McAndrew et al., 2012). To date, there has been little agreement on whether this result is replicated in Indonesia, with some studies reporting a correlation between high education levels and shorter durations of any or predominant breastfeeding (BKKBN, BPS, Kemenkes and ICF, 2018). Conversely, other studies have shown increased exclusive breastfeeding among women receiving any level of formal education compared to no education (Laksono et al., 2021). Other factors that have also been shown to influence breastfeeding rates in Indonesia include employment (Laksono et al., 2021), mode of birth and smoking status (Nurokhmah et al., 2022).

Understanding women's attitudes to and experiences of breastfeeding in different parts of the globe could help in guiding promotional strategies in optimum infant nutrition. This study was therefore aimed to explore breastfeeding practices and gain insights into women's practices, knowledge and beliefs concerning infant feeding in West Sumatra, Indonesia.

Methods

Design: This is part of a feasibility trial aimed to assess the practicality of protocol implementation and acceptability of a food supplementation intervention using a traditional Indonesian yogurt (Dadih) made from buffalo milk during pregnancy. The control group in the study were provided with a gelatine-based pudding with lower fat, protein, and calorie content. This intervention was developed in response to the high prevalence of malnutrition during pregnancy in Indonesia, where 20.1% of pregnant women have been found to be underweight (BMI<18.5kg/m²) and over 50% of women gain less weight in pregnancy than recommended by the Institute of Medicine (IOM) (Soltani et al., 2017).

Setting: Women were recruited from three areas of West Sumatra: Agam, Padang Panjang and the Lintau Buo district in Tanah Datar from January 2019 to December 2019, with a second wave of recruitment in Padang Panjang from May to September 2020.

Participants: Women were recruited to the feasibility study at their first antenatal clinic appointment. Any woman presenting to antenatal care within the target districts (Agam, Padang Panjang and Lintau Buo) were invited by their midwife to participate in the study through the provision of a participant information sheet. Women willing to participate in the feasibility study signed a consent form. Women were recruited regardless of parity. Exclusion criteria were pre-existing diabetes or a dislike or allergy to Dadih. After inclusion, women were randomly assigned to the intervention or control group using random sequences of block sizes of 2, 4 or 6, and random permutations of group allocation within each block. The intervention group received the high calorie Dadih product from approximately 18 weeks gestation until delivery. Women in the control group received a gelatine-based pudding which was lower in fat, protein, and calorie content than Dadih from approximately 18 weeks gestation until delivery. The feasibility study aimed to recruit approximately 208 women. This was to provide 80% power to detect a reduction in gestational weight gain below IOM recommendations (Rasmussen and Yaktine, 2009) from 57% to 37% with 95% confidence, allowing for a 10% attrition rate. A subsample of 19 women undertook semi-structured interviews, eight of these had been randomised to the control group and the remaining eleven randomised to the intervention group.

Data collection: Data was collected about breastfeeding status at discharge from hospital, 6 weeks, 6 months and 9 months. Women were asked about exclusive breastfeeding in the previous 24 hours up to 6 months and any breastfeeding in the previous 24 hours and more than 50% of feeds being at the breast in the previous 24 hours at all time points. Exclusive breastfeeding was defined as no nutrition other than breastmilk within the last 24 hours.

Additionally, qualitative semi-structured interviews were undertaken with a convenience subsample of women. The breastfeeding questions employed during the interview can be found in Supplemental File S1. These interviews were undertaken with women individually and occurred when the infant was aged between 9 months and one year. During these interviews, women's knowledge and beliefs concerning infant feeding practices were explored. Interviews were conducted in the women's native language, then translated into English by a professional translation service prior to analysis.

Data analysis: Descriptive statistics regarding rate of breastfeeding at each time point were determined. Maternal characteristics including maternal age, body mass index (BMI), parity, employment outside of the home, educational level and smoking status, alongside mode of birth and infant's birthweight were investigated for any differences in rate of exclusive breastfeeding at discharge, 6 weeks and 6 months and proportion of women who provided more than 50% of feeds at the breast at 9 months. It was not possible to analyse maternal characteristics according to any breastfeeding due to the limited number of women who did not provide any breastmilk within this cohort. Maternal age and infant's birthweight were assessed using independent t-tests. Maternal BMI was not normally distributed, so analysed using the Mann Whitney U test. Binary categorical variables were assessed using Chi Square tests and ordinal categorical variables using the Chi square for trend. Where Chi square test assumptions were violated due to more than 20% of cells having expected counts less than 5, the Fisher exact test was used. $p<0.05$ was taken as statistically significant.

For the qualitative data, interview transcripts were transcribed and then coded thematically by one researcher and independently reviewed by two additional researchers. Themes generated within the data were discussed by the research team until consensus was reached. No new themes were identified after interviewing 19 women, so data collection was discontinued.

Ethical implications: Ethical approval was obtained from the ethical committee of the Faculty of Medicine of Andalas University in January 2019. Informed consent was gained from participants separately for the feasibility study and the qualitative interview component.

Results

In total 229 women were recruited to the feasibility study, with 173 having birth data available and 158 having breastfeeding data available at one or more timepoints (See Figure 1). Of the 158 women with breastfeeding data, 85 (53.8%) had been allocated to the intervention group and 73 (46.2%) to the control group. The mean gestation at birth within the sample was 39.2 weeks (standard deviation 2.5 weeks). Eight included infants had had a special care baby unit admission prior to hospital discharge.

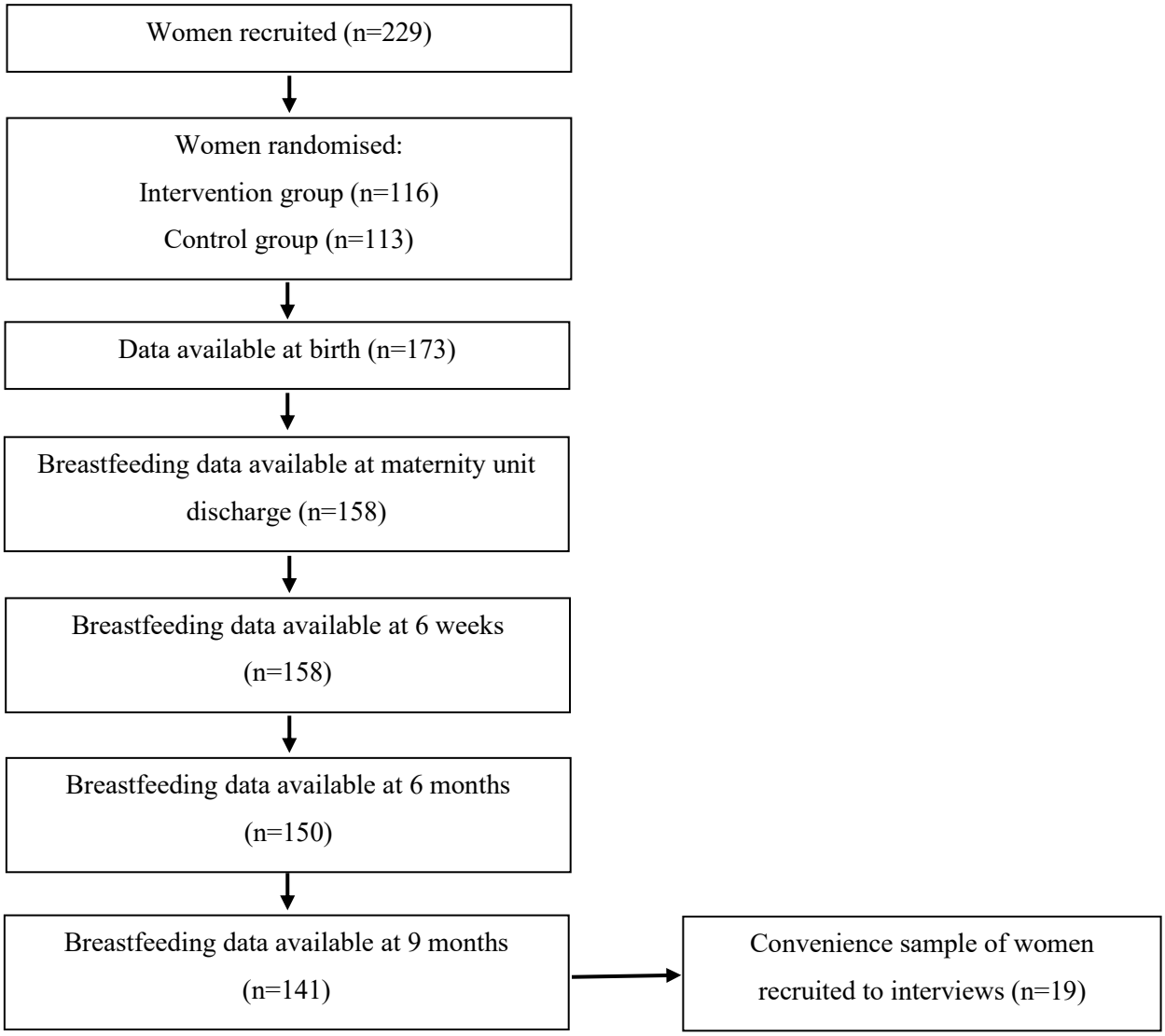

Figure 1. Flow chart of study participation

The rate of exclusive, any and more than 50% of feeds at the breast at each time point are given in Table 1. Only 2 women did not undertake any breastfeeding on discharge from hospital or at 6 weeks. 96% of women continued to provide at least some breastmilk at 6 months, with 64.7% of women exclusively breastfeeding at 6 months.

Table 1. Rates of Breastfeeding at Different Time Points

	N (%)
Exclusive breastfeeding at discharge from maternity unit	133/158 (84.2)
Any breastfeeding at discharge from maternity unit	156/158 (98.7)
Exclusive breastfeeding at 6 weeks	148/158 (93.7)
Any breastfeeding at 6 weeks	156/158 (98.7)
Greater than 50% of feeds breastfeeding at 6 weeks	152/158 (96.2)
Exclusive breastfeeding at 6 months	97/150 (64.7)
Any breastfeeding at 6 months	144/150 (96.0)
Greater than 50% of feeds breastfeeding at 6 months	132/150 (88.0)
Any breastfeeding at 9 months	131/141 (92.9)
Greater than 50% of feeds breastfeeding at 9 months	49/141 (34.8)

The proportion exclusively breastfeeding at discharge, 6 weeks, 6 months or providing more than 50% of feeds at the breast at 9 months according to maternal and infant's birth characteristics are given in Table 2 and Table 3. Those with high school or graduate education were significantly more likely to exclusively breastfeed at discharge (p-value=0.002), but not at other time points. Mothers who smoked were more likely to exclusively breastfeed at discharge (p-value =0.001), but less likely to continue providing more than 50% of feeds at the breast by 9 months (p-value<0.001). The proportion of women breastfeeding at each time point did not vary according to any other maternal or birth characteristics.

Table 2. A Comparison of Maternal and Infant Characteristics at Discharge, 6 Weeks, 6 Months and 9 Months According to Breastfeeding Status.

Exclusively breastfed at discharge

Characteristic	Total	Exclusively breastfed	Not exclusively breastfed	*p*-value
	N=158	*n*=133	*n*=25	
	M (SD)	M (SD)	M (SD)	
Maternal age (in years)	29.0 (5.5)	29.2 (5.6)	27.9 (4.9)	0.281
Maternal BMI (in kg/m²)	22.7 (4.2)	22.5 (3.9)	23.4 (5.4)	0.343
Infant's birthweight (in grams)	3239 (420)[a]	3253 (396)[a]	3151 (529)	0.256
Exclusively breastfed at 6 weeks				
Characteristic	Total	Exclusively breastfed	Not exclusively breastfed	*p*-value
	N=158	n=148	n=10	
	M (SD)	M (SD)	M (SD)	
Maternal age (in years)	29.0 (5.5)	29.0 (5.5)	29.1 (5.7)	0.959
Maternal BMI (in kg/m²)	22.7 (4.2)	22.7 (4.2)	22.4 (3.1)	0.812
Infant's birthweight (in grams)	3239 (420)[a]	3235 (409)[a]	3298 (587)	0.646
Exclusively breastfed at 6 months				
Characteristic	Total	Exclusively breastfed	Not exclusively breastfed	*p*-value
	N=150	n=97	n=53	
	M (SD)	M (SD)	M (SD)	
Maternal age (in years)	29.1 (5.5)	29.6 (5.4)	28.1 (5.7)	0.107
Maternal BMI (in kg/m²)	22.8 (4.2)	22.9 (4.2)	22.6 (4.3)	0.756
Infant's birthweight (in grams))	3256 (417)[a]	3255 (419)[a]	3259 (417)	0.952
Greater than 50% of feeds breastfeeding at 9 months				
Characteristic	Total	>50% feeds breastfeeding	≤50% feeds breastfeeding	*p*-value
	N=141	n=49	n=92	
	M (SD)	M (SD)	M (SD)	
Maternal age (in years)	29.3 (5.4)	29.0±4.9	29.3±5.7	0.723
Maternal BMI (in kg/m²)	22.9 (4.3)	22.9±5.5	22.8±3.5	0.909
Infant's birthweight (in grams)	3251 (413)[a]	3270 ± 381	3241 ± 430[a]	0.696

[a] missing value = 1

M – Mean

SD – standard deviation

Table 3. A Comparison of Maternal Background Characteristics at Discharge, 6 Weeks, 6 Months and 9 Months According to Breastfeeding Status.

Exclusively breastfed at discharge				
Characteristic	N	Exclusively breastfed *n* (%)	Not exclusively breastfed *n* (%)	*p*-value
Parity				0.839
Para 1	45	40 (88.9)	5 (11.1)	
Para 2	60	47 (78.3)	13 (21.7)	
Para 3	53	46 (86.8)	7 (13.2)	
Education				0.002
None / elementary	14	7 (50.0)	7 (50.0)	
High school	113	100 (88.5)	13 (11.5)	
College / university	31	26 (83.9)	5 (16.1)	
Employment status				0.869
Not employed	118	99 (83.9)	19 (16.1)	
Employed	40	34 (85.0)	6 (15.0)	
Smoking status				0.001
Smoker	41	41 (100)	0 (0)	
Non-smoker	117	92 (78.6)	25 (21.4)	
Mode of birth				0.899
Vaginal	114	95 (83.3)	19 (16.7)	
Caesarean	38	32 (84.2)	6 (15.8)	
Exclusively breastfed at 6 weeks				
Characteristic		Exclusively breastfed *n* (%)	Not exclusively breastfed *n* (%)	*p*-value
Parity				
Para 1	45	42 (93.3)	3 (6.7)	0.919
Para 2	60	57 (95.0)	3 (5.0)	
Para 3	53	49 (92.5)	4 (7.5)	
Education				0.755
None / elementary	14	13 (92.9)	1 (7.1)	
High school	113	105 (92.9)	8 (7.1)	
College / university	31	30 (96.8)	1 (3.2)	
Employment status				0.124 [a]
Not employed	118	113 (95.8)	5 (4.2)	
Employed	40	35 (87.5)	5 (12.5)	
Smoking status				0.286 [a]
Smoker	41	37 (90.2)	4 (9.8)	
Non-smoker	117	111 (94.9)	6 (5.1)	
Mode of birth				0.269 [a]
Vaginal	114	108 (94.7)	6 (5.3)	
Caesarean	38	34 (89.5)	4 (10.5)	
Exclusively breastfed at 6 months				
Characteristic		Exclusively breastfed n (%)	Not exclusively breastfed n (%)	p-value
Parity				0.573

Para 1	40	25 (62.5)	15 (37.5)	
Para 2	57	36 (63.2)	21 (36.8)	
Para 3	53	36 (67.9)	17 (32.1)	
Education				0.241
None / elementary	14	7 (50.0)	7 (50.0)	
High school	106	69 (65.1)	37 (34.9)	
College / university	30	21 (70.0)	9 (30.0)	
Employment status				0.312
Not employed	112	75 (67.0)	37 (33.0)	
Employed	38	22 (57.9)	16 (42.1)	
Smoking status				0.312
Smoker	38	22 (57.9)	16 (42.1)	
Non-smoker	112	75 (67.0)	37 (33.0)	
Mode of birth				0.492
Vaginal	109	71 (65.1)	38 (34.9)	
Caesarean	35	25 (71.4)	10 (28.6)	
Greater than 50% of feeds breastfeeding at 9 months				
Characteristic		>50% feeds at breast *n* (%)	≤50% feeds at breast *n* (%)	*p*-value
Parity				0.976
Para 1	37	13 (35.1)	24 (64.9)	
Para 2	53	18 (34.0)	35 (66.0)	
Para 3	51	18 (35.3)	33 (64.7)	
Education				0.296
None / elementary	14	7 (50.0)	7 (50.0)	
High school	98	33 (33.7)	65 (66.3)	
College / university	29	9 (31.0)	20 (69.0)	
Employment status				0.115
Not employed	107	41 (38.3)	66 (61.7)	
Employed	34	8 (23.5)	26 (76.5)	
Smoking status				<0.001
Smoker	34	0 (0)	34 (100)	
Non-smoker	107	49 (45.8)	58 (54.2)	
Mode of birth				0.107
Vaginal	100	41 (41.0)	59 (59.0)	
Caesarean	35	9 (25.7)	26 (74.3)	

[a] Fisher exact used when assumptions for Chi square violated

Qualitative results

Three overarching themes were generated from the mothers' interviews, "Mothers' attitude"; "Cultural perspectives"; and "Family and social support".

Mothers' attitude

There was a very positive attitude and general acceptance of breastfeeding as the best infant feeding method among these mothers. This theme encompassed two subthemes, "Belief in the value of breastmilk" and "Baby led complementary feeding".

Belief in the value of breastmilk

Mothers in this study seemed to have a good level of knowledge and a genuine belief in the benefits of breastmilk from both immunity and nutritional perspectives. The value and importance of exclusive breastfeeding in the first six months of life appeared very strongly from the data.

> *"I only gave breastmilk until the age of 6 months because this breastfeeding has benefits such as for immunity, children don't get sick easily."* **Participant 1**
>
> *"Just breastfeed, because XXXX [baby's name] growth has increased, it means that breastmilk is enough."* **Participant 18**

The majority of women also reported continuing to breastfeed beyond 6 months alongside the introduction of complementary feeding:

> *"I can breastfeed more than 8 times a day, my target is to breastfeed until the age of 2 years because there is a lot of nutrition from breastmilk."* **Participant 8**
>
> *"In my opinion, my baby still needs breastmilk and additional food (rice porridge) at the age of 15 months."* **Participant 13**
>
> *"I still breastfeed even until now. It's the baby's staple food."* **Participant 12**

Baby-led complementary feeding

There was a consensus that complementary feeding should begin around 6 months of age, with women showing good awareness that the digestive system may not be adequately developed before this:

> *"Because breastfeeding alone is not sufficient for children's nutritional needs. If I have been given food before 6 months, I am afraid that the child's intestines will not digest properly. That's why I fed him after he was 6 months old."* **Participant 5**

Most commonly mothers reported offering rice porridge as a first food and gradually progressing to eating family foods by 1 year of age, however among our participants this appeared to be very much led by the child and their reaction to different types of food:

> *"For me, if the baby doesn't want to eat rice, then replace it with rice porridge. The important thing is the baby eats. For my friends and relatives, if their baby won't eat, they just let it go so that the baby loses weight. But if he doesn't want to eat, I change the menu so he wants to eat, so that his stomach is full."* **Participant 6**
>
> *"At 7 months I gave him solid food, my son was tired of rice porridge and I introduced him to family food."* **Participant 8**

Where food other than breastmilk was introduced prior to 6 months of age, women also reported being led by their babies in terms of waiting a while longer:

"I tried to feed him at the age of 4 months, but my son didn't want to, he always vomited." **Participant 16**

Cultural perspectives

The majority of participating women expressed no perceived disadvantages with breastfeeding and considered it the normal and natural way to feed their child. The wide cultural acceptance of the superiority of breastfeeding was reinforced by substantial knowledge and information. Women demonstrated very good knowledge of the numerous advantages of breastfeeding, not only for nutrition but also to enhance immune response. They also raised the importance of breastfeeding being of low cost, as well as emotionally advantageous for promoting bonding between mothers and babies:

"The advantage is that the immune system is stronger, fever is rare, cheap and simple, no need to pay." **Participant 19**

"The benefits of breastfeeding are clear, the reward is also in practicing my religion [due to Islamic law affirming breastfeeding]. If the children are happy we are also happy. If it is for the child, the child will be stronger, healthier. If we look at children who are given formula [supplementary milk], some are allergic." **Participant 4**

"There are many advantages, the child is full, the child's nutritional intake is fulfilled. There is a bond between the child and the mother." **Participant 3**

Women's responses suggested that breastfeeding was a cultural norm within their communities and considered the default choice for infant feeding.

"I think my family members, neighbours or friends feed their babies the same way I do. Exclusive breastfeeding remains the same for up to 6 months, after 6 months other foods are introduced." **Participant 11**

Family and social support

The final overarching theme emerging from the data was the importance of family and social support, creating a culture which nurtures mothers and babies. Women saw this support as a catalyst and mediator for a successful breastfeeding experience. Many of the women reported that their husbands and wider family supported and encouraged them to breastfeed:

"So, to facilitate breastfeeding, drink honey and date palm extracts, of course there is support from your husband. My husband even suggested that I should breastfeed until my child is 3 years old." **Participant 6**

"Everyone supports me to breastfeed, especially my husband, parents and the social environment." **Participant 19**

Discussion

The exclusive breastfeeding rate of 64.7% and any breastfeeding rate of 96.0% at 6 months in West Sumatra is noteworthy, given it is higher than in many countries (World Population Review, 2025), and in particular high-income countries (Theurich et al., 2019). Within the qualitative interviews women demonstrated a good level of knowledge about the benefits of breastfeeding and were supported by their families and within their communities to breastfeed.

A high prevalence of any breastfeeding has similarly been reported in various previous Indonesian cohorts, with a very high proportion of infants ever being breastfed consistently noted over time in Indonesia. Within the 2007 Indonesian Family Life Survey, 96.6% of infants were ever breastfed (Rachmi et al., 2016) and 95.0% of infants born within the last two years were ever breastfed in the Indonesia Demographic Health Survey in 2017 (BKKBN, BPS, Kemenkes and ICF, 2018). When specifically considering the area of West Sumatra within Indonesia, 97.6% of infants have previously been reported to have ever breastfed (BKKBN, BPS, Kemenkes and ICF, 2018).

Similar rates of exclusive breastfeeding to those found in this research have also been noted previously. The Indonesian National Household Health Survey in 2007 found the rate of exclusive breastfeeding across Indonesia to be 46.3% at 6 months or at the time of survey completion if the infant was less than 6 months (Ananta et al., 2016). The later Indonesia Demographic Health Survey in 2017, found a slightly higher rate of 52.3% of infants aged 0-6 months were exclusively breastfed (Gayatri, 2021) and that 77% of infants were still receiving some breastmilk at 1 year of age (BKKBN, BPS, Kemenkes and ICF, 2018). This suggests that Indonesia is well on course regarding the global nutrition target of increasing exclusive breastfeeding for the first 6 months to at least 50% of infants by 2025 (Development Initiatives, 2020). Rates of exclusive breastfeeding at 6 months however varies by region in Indonesia, with only 10.5% of infants in East Java exclusively breastfed at 6 months compared to 66.9% of infants in Jambi (Ananta et al., 2016). Previous estimates in West Sumatra suggested that 56.1% of infants were breastfed exclusively at 6 months of age (Ananta et al., 2016), which was slightly lower than the 64.7% of infants exclusively breastfed at 6 months within this current cohort. It is of particular interest that many infants were exclusively breastfed at 6 months despite the prevalence of early initiation of breastfeeding, defined as within one hour of birth, being only 60.9% across Indonesia (Kurniawan et al., 2021), that 43.9% of Indonesian infants are given a feed other than breastmilk in the first 3 days of life (BKKBN, BPS, Kemenkes and ICF, 2018) and that the proportion of women exclusively breastfeeding on discharge from the birthing unit was only 84.2% within this cohort.

Although not significant within this research, women who were employed consistently had lower rates of exclusively breastfeeding at 6 weeks and 6 months, or offering more than 50% of feeds at the breast at 9 months. Employment status has similarly been seen to influence breastfeeding rates in

previous Indonesian research, with lower rates of exclusive breastfeeding in mothers who returned to work in Jakarta (Afiyanti and Juliastuti, 2012), urban Central Java (Paramashanti et al., 2022) and across Indonesia (Ananta et al., 2016; Laksono et al., 2021). The 2017 Indonesian Demographic Health survey also found reduced exclusive breastfeeding from 0-5 months among woman who worked compared to those who did not work (Gayatri, 2021), particularly in those employed in a non-agricultural setting (Nurokhmah et al., 2022). Other research in West Java has also demonstrated maternal employment outside of the home to be associated with increased supplementation with breastmilk substitutes (Green et al., 2021). Additionally, within this current study, despite that all women who smoked initiated breastfeeding and 57.9% still exclusively breastfed at 6 months, this proportion was lower than for women who did not smoke (67.0%). By 9 months there was a significant difference in breastfeeding according to smoking status with none of the women who smoked still providing more than 50% of feeds at the breast compared to 45.8% of women who did not smoke. The Indonesian Demographic Health Survey has also previously noted that exclusive breastfeeding from 0-5 months is reduced among women who smoked (Nurokhmah et al., 2022), with a systematic review of international studies also noting that smokers have reduced production of breastmilk and are likely to discontinue breastfeeding earlier (Napierala et al., 2016). It is suggested that some of these differences may be due to nicotine reducing maternal prolactin levels (Napierala et al., 2016). Smoking is also reported to adversely affect breastmilk composition with reduced fat content of breastmilk (Napierala et al., 2016; Macchi et al., 2021), increased toxic metal levels (Napierala et al., 2016; Favara et al., 2025), reduced antioxidant properties (Macchi et al., 2021) and altered immune molecule content (Macchi et al., 2021; Favara et al., 2025). As a result, infant growth, nervous system development and immunity are impacted in women who smoke, with infants of mothers who smoke more likely to suffer from infections such as respiratory tract and otitis media (Napierala et al., 2016; Favara et al., 2025). To support infant wellbeing and to improve duration of breastfeeding among women who smoke in West Sumatra, it is therefore essential to develop and deliver effective smoking cessation programmes during pregnancy and after birth.

Women with a high school or graduate education were significantly more likely to exclusively breastfeed at discharge within this study. A higher proportion of those with college or university education also exclusively breastfed at 6 weeks and 6 months, although this was no longer significant. Previous research in Indonesia regarding breastfeeding and education level has given conflicting results. Several surveys distributed to women across Indonesia suggested that women with no formal education were less likely to exclusively breastfeed (Laksono et al., 2021) and that women with postgraduate education were significantly more likely to exclusively breastfeed (Ananta et al., 2016). However, another survey in West Java suggested that women with higher education levels were more likely to provide their infant with breastmilk substitutes (Green et al., 2021). The reasons for this discrepancy within different cohorts is unclear.

Within our qualitative interviews, women appeared to be fairly knowledgeable about the benefits of breastfeeding. Other Indonesian studies have however found mixed results. One study found that women had been told by health professionals or community workers to breastfeed for 6 months, but that they had not been given reasons as to why (Hadi et al., 2021). A separate study found that not all rural mothers understood what exclusive breastfeeding was when asked to define it (Paramashanti et al., 2022). Additionally, they found that while women were aware of the health benefits of breastmilk for their infant, none mentioned the health benefits for themselves or the benefits for maternal infant bonding (Paramashanti et al., 2022). Women within our study were however aware of the benefits of breastfeeding for mother-infant bonding. They were also aware that breastfeeding is cheap, which is in line with other studies that also noted that women reported breastfeeding as an inexpensive way to feed their infant (Paramashanti et al., 2022). Women have also previously described being aware of the cost implication of weaning their infant off breastmilk due to the resultant need to buy food or breastmilk substitutes for their infants (Afiyanti and Juliastuti, 2012). Previous research in other areas within Indonesia have looked into women's reasons behind using breastmilk substitutes, not achieving exclusive breastfeeding despite planning to do so or early weaning. A common perception among women was of insufficient breastmilk supply to feed their infant (Afiyanti and Juliastuti, 2012; Paramashanti et al., 2022) especially among urban women (Paramashanti et al., 2022), and a perception that bigger babies required more than just breastmilk (Afiyanti and Juliastuti, 2012). Additional factors cited as reasons for providing nutrition other than breastmilk included infant illness and breast problems (Paramashanti et al., 2022).

Despite it being banned by the Indonesia government, advertising of breastmilk substitutes is still common in Indonesia, with 93.3% of women in one survey in West Java reporting seeing such advertisements on television, social media or in newspapers (Green et al., 2021). It has been suggested that advertisement of breastmilk substitutes influences women's timing of weaning (Afiyanti and Juliastuti, 2012). Of particular concern was that women from West Java commonly reported the use of breastmilk substitutes as they perceived they were beneficial for growth, intelligence and immunity (Green et al., 2021). Additionally, some women reported being hesitant to exclusively breastfeed their infants because a healthcare provider had given their baby breastmilk substitutes when they were in hospital (Afiyanti and Juliastuti, 2012). Healthcare providers recommending the use of breastmilk substitutes at some point since the birth of their child has also been reported by 22.7% of women (Green et al., 2021), with 23.3% of women recounting healthcare providers to have given breastmilk substitutes to their infant without the mother's permission (Ananta et al., 2016). This is of particular concern given that women have previously described being reliant on their midwives and healthcare professionals for receiving the majority of their breastfeeding information (Paramashanti et al., 2022).

The qualitative interviews also highlighted the wide cultural acceptance of the superiority of breastfeeding within West Sumatra and the family and other social support women received to

achieve successful breastfeeding. Both of these aspects have previously been shown to be key factors. Normalisation of breastfeeding within a culture has previously been identified as a supportive factor for breastfeeding practice, with high rates noted in societies that value breastfeeding (Prentice, 2022). Additionally, seeing other women breastfeeding in public or seeing positive images of breastfeeding in mainstream or social media have also previously been identified as supporting successful breastfeeding (Snyder et al., 2021). In contrast women's discomfort at breastfeeding in social situations, for example in front of relatives or friends has been associated with lower rates of breastfeeding (Alyousefi, 2021; Gutierrez-de-Terán-Moreno et al., 2022). There are also known links between breastfeeding self-efficacy and social support within other countries, such as Iran and Turkey (Maleki-Saghooni et al., 2020; Mercan and Tari Selcuk, 2021). For example, having a female relative with a positive experience of breastfeeding has been associated with enhanced successful breastfeeding (Prentice, 2022). Conversely, a lack of familial support has been identified previously as a barrier to breastfeeding (Snyder et al., 2021), with the opinions of family and friends known to influence timing of weaning (Afiyanti and Juliastuti, 2012).

Although there are high rates of breastfeeding in Indonesia, the economic burden from treating gastrointestinal and respiratory infection in children under 2 years of age due to infants not being exclusively breastfed up to six months is still estimated to be US$118.6 million annually, which equated to 10.6% of the total annual health budget in Indonesia in 2012 (Siregar et al., 2018). Additionally, higher rates of stunting have been shown in children who have not been breastfed (Ananta et al., 2016), although the economic impact of this has not been calculated.

While breastfeeding knowledge has been shown to be high in some Indonesian studies, this is not universal which suggests that further improvements could be achieved. Our study highlights that interventions focussed on those with lower levels of education may potentially enhance breastfeeding rates in Indonesia. Several previous educational interventions have shown to be promising within Indonesia. One intervention that included six 2 hour long nutritional education sessions for pregnant women was beneficial towards knowledge, attitude and practices of child nutrition (Permatasari et al., 2021). A separate educational intervention undertaken in Java Indonesia that provided 30 postnatal women with a booklet within 10 days of giving birth showed increase breastfeeding self-efficacy (Prastyoningsih et al., 2021). However, no control group was included in this study and as breastfeeding self-efficacy would be expected to improve with increasing time postnatally, the impact of the intervention therefore remained unclear. While education can clearly highlight the positive health benefits of breastfeeding, building on existing positive social support and cultural norms about breastfeeding within Indonesia is also recommended to enhance breastfeeding rates. Additionally, interventions targeting smoking cessation during pregnancy and after birth could support enhanced breastfeeding duration within West Sumatra.

Limitations

A strength of this study was the prospective data collection. However, several limitations have to be noted. Firstly, all women within this cohort had received a nutritional supplement during pregnancy, with different forms of supplementation given in the intervention and control groups. It is unknown whether these women were therefore in a better nutritional state by the end of pregnancy, which may have influenced the slightly higher rates of exclusive breastfeeding in this sample compared to previous rates noted in West Sumatra. It should be emphasised that no additional information about the benefits of breastfeeding was provided for the study participants and breastfeeding data was analysed opportunistically. Breastfeeding data was self-reported by the woman, which may have led to social desirability bias. Finally, the limited number of women who did not provide any breastfeeds at each time point prevented analysis of these women according to maternal or birth characteristics.

Conclusions

Within West Sumatra there were exceptionally high rates of any breastfeeding with positive acceptance of breastfeeding by the mothers and their families. The exclusive breastfeeding rate of 64.7% and any breastfeeding of 96.0% at 6 months, is higher than in many other countries but still fell below World Health Organization recommendations. Interventions that support those with the lowest levels of education, as well as promoting smoking cessation during pregnancy and after the birth should be explored to build upon the existing positive social support and cultural norms about breastfeeding seen within West Sumatra. Lessons could also be learnt around socio-cultural and family support influences which may have impacted such high rates of breastfeeding in this community.

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Ethical approval

Ethical approval was obtained from Andalas University (707/KEP/FK/2019) in January 2019. Informed consent was gained from participants separately for the feasibility study and the qualitative interview component.

Conflicts of interest

The authors have no competing interests to declare that are relevant to the content of this article.

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Availability of data and material

The data that support the findings of this study are available from the corresponding author on reasonable request.

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