

# Investigation of factors associated with delayed initiation of breastfeeding in Papua New Guinea: a cross-sectional study

McKenzie Maviso <sup>1</sup>, Francis Pulsan,<sup>2</sup> Lisa M Valley<sup>3</sup>

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<sup>1</sup>Division of Public Health, School of Medicine and Health Sciences, University of Papua New Guinea, Port Moresby, Papua New Guinea

<sup>2</sup>Division of Clinical Sciences, School of Medicine and Health Sciences, University of Papua New Guinea, Port Moresby, Papua New Guinea

<sup>3</sup>Asia and Pacific Health Program, The Kirby Institute, Kensington, New South Wales, Australia

## Correspondence to

McKenzie Maviso; mckenzie.maviso@upng.ac.pg

## ABSTRACT

**Background** Breastfeeding within the first hour of birth is critical for newborn survival. However, in Papua New Guinea (PNG), about 40% of newborns are not breastfed within the first hour of birth. This study aimed to determine the prevalence and factors associated with delayed initiation of breastfeeding in PNG.

**Methods** This study used secondary data from the 2016–2018 PNG Demographic and Health Survey, a nationally representative cross-sectional study. A total weighted sample of 4748 women aged 15–49 were included. Complex samples analysis was performed to determine the direction of association between the independent variables and delayed initiation of breastfeeding.

**Results** About a quarter (24.6%) of women delayed initiation of breastfeeding. Women with an unplanned pregnancy (adjusted OR (AOR) 1.32; 95% CI 1.03 to 1.68), those who had a caesarean section (AOR 3.16; 95% CI 1.39 to 7.17), those who did not initiate newborn skin-to-skin contact immediately after birth (AOR 1.83; 95% CI 1.41 to 2.38) and those who watched television (AOR 1.39; 95% CI 1.11 to 1.75), and were from the Momase region (AOR 1.31; 95% CI 1.00 to 1.93) had higher odds of delayed breastfeeding initiation. Conversely, the odds of delayed initiation of breastfeeding was lower among women who read a newspaper or magazine (AOR 0.76; 95% CI 0.61 to 0.95), were from the Southern (AOR 0.81; 95% CI 0.56 to 1.15) and Highlands (AOR 0.86; 95% CI 0.58 to 1.29) regions, and gave birth at home or in the village (AOR 0.69; 95% CI 0.49 to 0.96).

**Conclusion** One in four women in this study delayed initiation of breastfeeding until after 1 hour after birth. Interventions to promote optimal breastfeeding require a multi-sectoral approach, as well as bolstering health workers' capacity to encourage and support early initiation of breastfeeding during the antenatal and early postnatal periods.

## INTRODUCTION

Scaling up breastfeeding is one of the most cost-effective interventions for improving infant and child survival and reducing under-five mortality.<sup>1</sup> Breastfeeding has the potential to save the lives of over 800 000 children under the age of 5 every year.<sup>2</sup> It is universally

## WHAT IS ALREADY KNOWN ON THIS TOPIC

- ⇒ Early breastfeeding initiation within the first hour of birth is an important intervention to reduce childhood morbidities and mortalities.
- ⇒ 40% of newborns in PNG are not breastfed immediately or within the first hour of birth.

## WHAT THIS STUDY ADDS

- ⇒ One in four women in PNG delayed early initiation of breastfeeding.
- ⇒ Unplanned pregnancy, caesarean section, no newborn skin-to-skin contact immediately after birth and exposure to media predicted delayed initiation of breastfeeding.
- ⇒ Birth at home or in the village reduces the likelihood of delayed initiation of breastfeeding.

## HOW THIS STUDY MIGHT AFFECT RESEARCH, PRACTICE OR POLICY

- ⇒ This study seeks to promote targeted breastfeeding support for mothers, particularly in rural areas.
- ⇒ Breastfeeding advocacy and promotion programmes, strengthening health workers' capacity to address factors influencing delayed initiation of breastfeeding, and promoting optimal breastfeeding practices are required.

accepted and recommended that all newborn babies, irrespective of the place of birth, be placed in skin-to-skin contact with their mothers immediately after birth to promote breastfeeding initiation within the first hour of birth.<sup>3</sup> Early initiation of breastfeeding is the provision of the mother's breast milk within the first hour of birth and ensures that the newborn receives colostrum, while delayed breastfeeding initiation occurs after 1 hour of birth.<sup>3 4</sup>

Early initiation of breastfeeding has health benefits for both the infant and the mother. It provides many nutritional, immunological and psychosocial benefits, including protection of the infant against infectious diseases and enhanced maternal-infant bonding.<sup>3</sup> For

the mothers, early initiation of breastfeeding promotes the release of oxytocin for uterine contractions to prevent postpartum haemorrhage.<sup>5 6</sup> In addition, early initiation of breastfeeding and exclusive breastfeeding for up to 6 months has been shown to lower the odds of cancer, diabetes (Type 2) and cardiovascular diseases, including maternal mortality.<sup>7–9</sup>

Despite the established health benefits of early initiation of breastfeeding, suboptimal breastfeeding remains prevalent in low- and middle-income countries (LMICs).<sup>4 10</sup> There is evidence that delayed initiation of breastfeeding (after the first hour of birth) has been associated with neonatal infections and illnesses,<sup>4 7 11</sup> and increased newborn and child mortality.<sup>7 11</sup> Findings from a systematic review revealed that initiating breastfeeding between 2 and 23 hours after birth increased the risk of neonatal death by 33% compared with breastfeeding within the first hour of birth.<sup>11</sup> The delay in initiating breastfeeding was also found to increase the risk of respiratory diseases, including breathing difficulty during the first 6 months.<sup>11</sup> This can influence breastfeeding and negatively affect its continuation into infancy.

In Papua New Guinea (PNG), the rate of early initiation of breastfeeding is around 60%,<sup>12</sup> suggesting that 40% of newborns are at higher risk of morbidity and mortality throughout their infancy and early childhood years. Earlier work from PNG has identified that low rates of early initiation of breastfeeding are associated with factors such as younger maternal age, lack of breastfeeding knowledge and support, lack of antenatal education, place and mode of birth, grandmothers' influence and sociocultural norms.<sup>12–14</sup> While there are few studies in PNG on infant feeding practices<sup>14–16</sup> including early breastfeeding initiation,<sup>12</sup> there is a paucity of information concerning factors predisposing to delayed initiation of breastfeeding. Understanding the factors that influence the delay in initiating breastfeeding is crucial for designing interventions to improve breastfeeding outcomes in line with the country's *Infant and Young Child Feeding Policy*.<sup>17</sup> Therefore, this study aimed to determine the prevalence and factors associated with delayed initiation of breastfeeding in PNG.

## METHODS

### Study design and data source

This study used secondary data from the 2016–2018 PNG Demographic and Health Survey (DHS), a nationally representative cross-sectional survey that collected demographic and health-related data across the country's four major administrative regions: Southern, Highlands, Momase and Islands.<sup>18</sup> The current DHS was the second round of surveys conducted in the country by the National Statistical Office with financial and technical assistance from Inner City Fund International through the DHS Programme, funded by the United States Agency for International Development. For sampling, the DHS used a two-stage stratified sampling procedure to sample

census units from each stratum. In the first stage, 800 census units were within each sampling stratum to achieve implicit stratification and proportional allocation via a probability proportional-to-size selection. The second stage involved systematically selecting 24 households from each cluster using probability sampling, producing 19 200 households.<sup>18</sup> In the interviewed households, 18 175 women aged 15–49 were identified for individual interviews, of which 15 198 women were interviewed successfully (a response rate of 84%). For this study, a weighted sample of 4748 women who had given birth 3 years before the survey and had complete information on the variables of interest was included. Information about the methodology, pretesting, sampling design and selection is available in the final report<sup>18</sup> and can be accessed online (<https://dhsprogram.com/publications/publication-fr364-dhs-final-reports.cfm>).

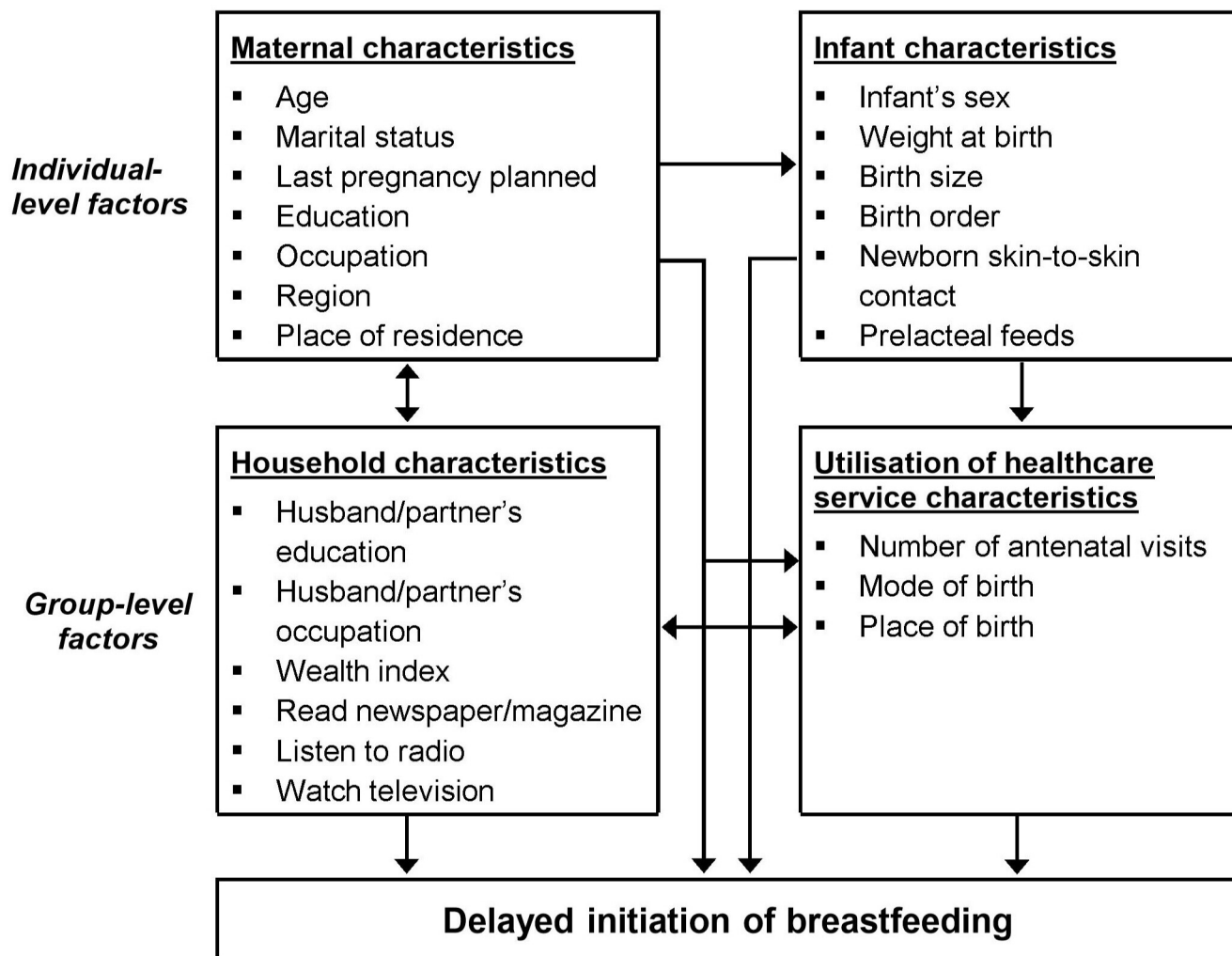
## Variable measurement

### Dependent variable

The dependent variable of interest was 'delayed' initiation of breastfeeding. Information regarding the timing of initiation of breastfeeding was obtained from women using the question, 'How long after birth did you first put (name of child) to the breast?'. The dataset included four responses for breastfeeding initiation: 'immediately', 'within the first hour', 'hours' and 'days'. A new variable for the time of initiation of breastfeeding was generated and dichotomised as '1' for 'early' (immediately or within the first hour of birth), and '2' for 'delayed' (any time after the first hour of birth).

### Independent variables

The selection of the variables from potential confounders of delayed initiation of breastfeeding was identified in previous studies.<sup>4 10 19</sup> Variable selection also depended on the availability of relevant data in the 2016–2018 PNGDHS. Potential individual and group-level factors associated with delayed initiation of breastfeeding are presented in the conceptual framework to guide the conceptualisation (figure 1). The conceptual framework summarises selected independent variables at two levels that influenced the delay in breastfeeding initiation. Individual-level factors relate directly to the mother and infant and include maternal age, marital status, last pregnancy planned, education, occupation, place of residence and region. Infant characteristics include the infant's sex, birth weight, birth size, birth order, newborn skin-to-skin contact immediately after birth and pre-lacteal feeds. In addition, group-level factors are directly related to household and healthcare settings. Household characteristics include the husband's education and occupation, wealth index, reading a newspaper or magazine, listening to the radio, and watching television, whereas health service characteristics include access to and utilisation of maternal and child health services, such as number of antenatal care visits, mode of birth and place of birth (see figure 1).



**Figure 1** A conceptual framework of individual and group-level factors associated with delayed initiation of breastfeeding in Papua New Guinea. Adapted from previous studies.<sup>43 44</sup>

### Statistical analysis

The extracted data were cleaned and all the missing observations were dropped while subcategories of variables with small observations were merged. The final sample data were weighted to restore representativeness and produce a reliable estimate and SE. Descriptive statistics were computed and reported as weighted frequencies and percentages. Bivariate associations between predictors and delayed breastfeeding initiation were performed to determine the strength of association using Pearson's  $\chi^2$  test. Only significant variables from the bivariate analyses were entered into the multivariable logistic regression model. To account for the cluster sampling design and sample weight and provide generalisable and accurate estimates of proportion, probability values and ORs,<sup>20</sup> the complex samples analysis technique was applied. The Hosmer-Lemeshow goodness-of-fit was used to test for model fitness. Adjusted ORs (AORs) with 95% CIs are reported. A  $p \leq 0.05$  was considered statistically significant. Data were analysed using IBM SPSS Statistics for Windows, V.22.0 (IBM, Armonk, NY, USA).

### Patient and public involvement

Patients and/or the public were not involved in the design, conduct, reporting or dissemination of this research.

## RESULTS

### Characteristics of the study population

Table 1 presents the characteristics of the participants. A total weighted sample of 4748 women was included in the analysis. The mean (SD) maternal age was 29.9 ( $\pm 7.0$ ) years. Overall, 1177 (24.6% (95% CI 23 to 26)) of women delayed initiation of breastfeeding, which remained high in rural areas (88.3%). Half (50%) had attained primary education and more than two-thirds (68.3%) were not working. Regarding maternal health factors, slightly over three-quarters (75.6%) had planned their last pregnancies; more than half (55.9%) had received four or more antenatal visits and 61% gave birth in a health facility. In addition, over half of the women read newspapers/magazines (50.9%) and listened to radio (54.1%). Regarding

**Table 1** Characteristics of the participants

Variables	All participants N (%)	Delayed initiation of breastfeeding n (%)	P value*
<b>Total</b>	<b>4748 (100)</b>	<b>1177 (24.6)</b>	
<b>Maternal characteristics</b>			
Age (years)			<b>0.025</b>
Mean (SD)=29.9 (±7.0)			
15–24	1200 (25.3)	269 (22.9)	
25–34	2278 (48.0)	557 (47.3)	
35–44	1129 (23.7)	313 (26.6)	
45–49	141 (3.0)	38 (3.2)	
Marital status			0.261
Never married	149 (3.1)	32 (2.7)	
Married	4312 (90.8)	1083 (92.0)	
Divorced/separated	287 (6.1)	62 (5.3)	
Last pregnancy planned			<b>&lt;0.001</b>
Yes	3803 (80.1)	890 (75.6)	
No	945 (19.9)	287 (24.4)	
Education (maternal)			0.641
No formal education	1238 (26.1)	310 (26.3)	
Primary	2404 (50.7)	589 (50.0)	
Secondary	952 (20.0)	246 (20.9)	
Higher	154 (3.2)	33 (2.8)	
Occupation (maternal)			0.266
Not working	3304 (69.6)	804 (68.3)	
Working	1443 (30.4)	373 (31.7)	
Region			<b>&lt;0.001</b>
Southern	989 (20.8)	223 (18.9)	
Highlands	1799 (37.9)	391 (33.2)	
Momase	1291 (27.2)	377 (32.1)	
Islands	669 (14.1)	186 (15.8)	
Place of residence			0.190
Urban	508 (10.7)	138 (11.7)	
Rural	4239 (89.3)	1039 (88.3)	
<b>Household characteristics</b>			
Education (husband) (n=4250)			<b>0.014</b>
No formal education	969 (22.8)	216 (20.3)	
Primary	1847 (43.5)	480 (45.1)	
Secondary	1144 (26.9)	310 (29.1)	
Higher	289 (6.8)	59 (5.5)	
Occupation (husband) (n=4189)			0.868
Not working	2157 (51.5)	539 (51.7)	
Working	2032 (48.5)	503 (48.3)	
Wealth index			<b>0.017</b>
Poorest	1027 (21.6)	221 (18.8)	
Poorer	992 (20.9)	245 (20.8)	
Middle	970 (20.1)	234 (19.9)	
Richer	956 (20.1)	253 (21.5)	
Richest	803 (16.9)	225 (19.1)	

Continued

**Table 1** Continued

Variables	All participants N (%)	Delayed initiation of breastfeeding n (%)	P value*
Read a newspaper or magazine			<b>0.051</b>
Yes	2531 (53.3)	599 (50.9)	
No	2217 (46.7)	578 (49.1)	
Listen to radio			0.232
Yes	2498 (52.6)	637 (54.1)	
No	2250 (47.4)	540 (45.9)	
Watch television			<b>0.008</b>
Yes	2085 (43.9)	556 (47.2)	
No	2662 (56.1)	621 (52.8)	
<b>Health service characteristics</b>			
Number of antenatal care visits			<b>&lt;0.001</b>
No visits	1102 (23.2)	222 (18.9)	
1–3	1127 (23.7)	297 (25.2)	
4 or more	2519 (53.1)	658 (55.9)	
Mode of birth			<b>&lt;0.001</b>
Caesarean	131 (2.8)	68 (5.8)	
Vaginal	4617 (97.2)	1109 (94.2)	
Place of birth			<b>0.012</b>
Home/village	2000 (42.1)	459 (39.0)	
Health facility	2748 (57.9)	718 (61.0)	
<b>Infant characteristics</b>			
Sex of the child (n=3178)			0.858
Male	1653 (52.0)	393 (52.3)	
Female	1525 (48.0)	358 (47.7)	
Birth weight (g) (n=2400)			0.579
<2500	430 (17.9)	118 (18.6)	
>2500	1970 (82.1)	515 (81.4)	
Birth size (n=4562)			<b>0.009</b>
Small	875 (19.2)	217 (19.2)	
Average	1942 (42.6)	442 (39.0)	
Large	1744 (38.2)	473 (41.8)	
Birth order			<b>0.012</b>
First	1008 (21.2)	246 (20.9)	
Second	960 (20.2)	236 (20.1)	
Third	853 (18.0)	179 (15.2)	
Fourth or more	1926 (40.6)	516 (43.8)	
Newborn skin-to-skin contact			<b>&lt;0.001</b>
Yes	2179 (45.9)	456 (38.7)	
No	2569 (54.1)	721 (61.3)	
Prelacteal feeds given (n=4532)			<b>&lt;0.001</b>
Yes	402 (8.9)	138 (12.0)	
No	4130 (91.1)	1013 (88.0)	

The bold values represents variables that were found to be significant at p-value of <0.05.  
\* $\chi^2$  test, p<0.05.



infant-related factors, a significant proportion of the newborns weighed over 2500 g (81.4%) and 61.3% had no skin-to-skin contact immediately after birth. In  $\chi^2$  analysis, maternal age, last pregnancy planned, region, husband's education, wealth index, reading a newspaper or magazine, watching television, number of antenatal care visits, mode of birth, place of birth, birth size, birth order, newborn skin-to-skin contact and prelacteal feeding were factors significantly associated with delayed initiation of breastfeeding ( $p < 0.05$ ).

### Factors associated with delayed initiation of breastfeeding

Table 2 presents the multivariable analysis of determinants of delayed initiation of breastfeeding. Last pregnancy planned, reading a newspaper or magazine, watching television, region, mode of birth, place of birth and newborn skin-to-skin contact immediately after birth were associated with delayed initiation of breastfeeding. In the multivariable analysis, the odds of delayed initiation of breastfeeding remained higher among women with an unplanned pregnancy (AOR 1.32; 95% CI 1.03 to 1.68,  $p = 0.030$ ), those who had a caesarean section (AOR 3.16; 95% CI 1.39 to 7.17,  $p = 0.006$ ), those who did not have initiate newborn skin-to-skin contact immediately after birth (AOR 1.83; 95% CI 1.41 to 2.38,  $p < 0.001$ ) and those who watched television (AOR 1.39; 95% CI 1.11 to 1.75,  $p = 0.004$ ), and were from the Momase region (AOR 1.31; 95% CI 1.00 to 1.93,  $p = 0.041$ ). Conversely, the odds of delayed initiation of breastfeeding was lower women who read a newspaper or magazine (AOR 0.76; 95% CI 0.61 to 0.95,  $p = 0.018$ ), were from the Southern (AOR 0.81; 95% CI 0.56 to 1.15,  $p = 0.041$ ) and the Highlands (AOR 0.86; 95% CI 0.58 to 1.29,  $p = 0.041$ ) regions, and gave birth at home or in the village (AOR 0.69; 95% CI 0.49 to 0.96,  $p = 0.028$ ). The study found no significant correlation between the number of antenatal care visits, birth size, birth order, prelacteal feeding and delayed initiation of breastfeeding.

### DISCUSSION

This study sought to determine the prevalence of delayed initiation of breastfeeding in PNG and to examine the association between household, maternal, child and health services determinants. Women who had not planned their last pregnancies, had a caesarean section, had no newborn skin-to-skin contact immediately after birth, watched television and were from the Momase region were more likely to experience a delay in initiating breastfeeding. The findings in this study underscore the demand for tailored programme interventions to improve breastfeeding initiation practices, particularly among rural women.

While timely breastfeeding initiation is crucial for the growth and survival of infants, the practice remains suboptimal in PNG. In this study, about one-quarter (24.7%) of women have delayed breastfeeding initiation. This result was lower than the findings from an earlier

study in PNG,<sup>12</sup> including those in Bangladesh,<sup>4</sup> South Sudan<sup>10</sup> and Uganda.<sup>21</sup> The variation in prevalence may be due to sample size, maternal sociodemographic factors (ie, socioeconomic status, educational status, social norms and beliefs concerning breastfeeding practice), and health service utilisation.

Findings from this study revealed that women with unplanned pregnancies were more likely to delay initiation of breastfeeding. This is in agreement with studies done in sub-Saharan Africa.<sup>22</sup> Women who have unplanned pregnancies are not likely to utilise maternal health services, such as family planning and antenatal care, which often include appropriate information and education on breastfeeding for pregnant women.<sup>23 24</sup> Despite this finding, the increased odds of delayed initiation of breastfeeding from women with unplanned pregnancies are an observation that would necessitates further qualitative investigation.

Caesarean section was positively associated with delayed initiation of breastfeeding in this study, consistent with several studies conducted elsewhere.<sup>25–27</sup> Women who underwent caesarean section were three times more likely to delay early initiation of breastfeeding. This could be explained by the hospital practice of separating newborns from their mothers after the procedure.<sup>27</sup> In addition, maternal exhaustion and the effects of anaesthesia following a caesarean section may impede early breastfeeding initiation.<sup>21 28</sup> While maternal recovery from this procedure generally takes some time, immediate breastfeeding is required once the woman regains consciousness and alertness.<sup>29 30</sup>

Interestingly, women who gave birth at home or in the village had lower odds of delayed initiation of breastfeeding compared with those who gave birth in a health facility. This was similar to findings from several LMICs,<sup>31</sup> indicating that home-birthed infants were more likely to be breastfed in the first hour of birth. The type and level of support from skilled birth attendants, family members, particularly partners/husbands and a familiar home birthing environment may reduce stress, leading to intervention-free birth and consequently influence breastfeeding outcomes.<sup>31 32</sup> Evidence from studies conducted in PNG has demonstrated an inverse association between social and family support that adversely affects breastfeeding initiation for mothers who had given birth at home or in the village.<sup>13–15</sup> However, it is unclear what underlies the observed association between delayed initiation of breastfeeding and home/village birth in the current study. Furthermore, the association between home/village birth and breastfeeding initiation is improbable to be directly causal, which will require further research to confirm the factors driving the observed differences.

From the results, poor newborn skin-to-skin contact immediately after birth was significantly associated with delayed initiation of breastfeeding. Women who did not initiate skin-to-skin contact immediately after birth with their newborns were more likely to delay initiation of

**Table 2** Multivariable analysis of factors associated with delayed initiation of breastfeeding in Papua New Guinea

Variables	COR (95% CI)	AOR (95% CI)	P value*
Age (years)			0.710
19–24	0.76 (0.42 to 1.36)	0.71 (0.37 to 1.34)	
25–34	0.84 (0.49 to 1.42)	0.83 (0.48 to 1.45)	
35–44	0.98 (0.55 to 1.75)	0.87 (0.49 to 1.56)	
45–49	Ref.	Ref.	
Last pregnancy planned			<b>0.030</b>
Yes	Ref.	Ref.	
No	1.44 (1.10 to 1.89)	1.32 (1.03 to 1.68)	
Educational level (husband)			0.473
No formal education	1.14 (0.66 to 1.96)	1.51 (0.77 to 2.93)	
Primary	1.35 (0.83 to 2.19)	1.61 (0.88 to 2.96)	
Secondary	1.40 (0.79 to 2.49)	1.52 (0.83 to 2.78)	
Higher	Ref.	Ref.	
Wealth index			0.761
Poorest	0.70 (0.46 to 1.07)	0.73 (0.45 to 1.21)	
Poorer	0.84 (0.56 to 1.25)	0.86 (0.55 to 1.36)	
Middle	0.82 (0.56 to 1.20)	0.81 (0.54 to 1.23)	
Richer	0.92 (0.64 to 1.34)	0.87 (0.59 to 1.29)	
Richest	Ref.	Ref.	
Read a newspaper or magazine			<b>0.018</b>
Yes	0.86 (0.69 to 1.07)	0.76 (0.61 to 0.95)	
No	Ref.	Ref.	
Watch the television			<b>0.004</b>
Yes	0.89 (0.65 to 1.21)	1.39 (1.11 to 1.75)	
No	Ref.	Ref.	
Region			<b>0.041</b>
Southern	0.74 (0.54 to 1.02)	0.81 (0.56 to 1.15)	
Highlands	0.74 (0.52 to 1.04)	0.86 (0.58 to 1.29)	
Momase	1.08 (0.74 to 1.56)	1.31 (1.00 to 1.93)	
Islands	Ref.	Ref.	
Number of antenatal care visits			0.113
No visits	0.70 (0.53 to 0.94)	0.76 (0.54 to 1.06)	
1–3	1.05 (0.79 to 1.38)	1.14 (0.90 to 1.44)	
4 or more	Ref.	Ref.	
Mode of birth			<b>0.006</b>
Caesarean	3.68 (1.64 to 8.29)	3.16 (1.39 to 7.17)	
Vaginal	Ref.	Ref.	
Place of birth			<b>0.028</b>
Home/village	0.83 (0.64 to 1.07)	0.69 (0.49 to 0.96)	
Health facility	Ref.	Ref.	
Birth size			0.343
Small	0.89 (0.66 to 1.19)	0.93 (0.69 to 1.24)	
Average	0.79 (0.62 to 1.02)	0.84 (0.67 to 1.06)	
Large	Ref.	Ref.	
Birth order			0.338
First	0.88 (0.68 to 1.12)	0.93 (0.61 to 1.42)	
Second	0.94 (0.69 to 1.28)	1.02 (0.73 to 1.43)	

Continued



Table 2 Continued

Variables	COR (95% CI)	AOR (95% CI)	P value*
Third	0.72 (0.53 to 0.98)	0.77 (0.56 to 1.08)	
Fourth or more	Ref.	Ref.	
Newborn skin-to-skin contact			<b>&lt;0.001</b>
Yes	Ref.	Ref.	
No	1.50 (1.19 to 1.88)	1.83 (1.41 to 2.38)	
Prelacteal feeds given to infants			0.076
Yes	1.71 (1.08 to 2.72)	1.44 (0.96 to 2.15)	
No	Ref.	Ref.	

The bold values represents variables that were found to be significant at p-value of <0.05.  
\*p<0.05.  
AOR, adjusted OR; COR, crude OR; Ref., Reference category.

breastfeeding. They may be unaware of the importance of skin-to-skin contact as a means of promoting warmth and thermoregulation for their newborns, thus their lower odds of embracing and practising it.<sup>12 33</sup> The lack of information may therefore account for the delayed initiation of breastfeeding. Certain sociocultural norms and beliefs may disapprove of these women for practising newborn skin-to-skin contact.<sup>13 15 33</sup> Furthermore, poor knowledge on the part of health workers, shortages of health workers, poor newborn care and limited time can impede the practice of newborn skin-to-skin contact.<sup>33 34</sup> Qualitative inquiry is necessary to investigate the knowledge, attitudes and practices regarding breastfeeding initiation among health workers and mothers, particularly those in rural settings.

Women who were exposed to mass media in this study, particularly television, were more likely to delay initiation of breastfeeding, consistent with studies done in sub-Saharan Africa.<sup>22 35</sup> Social marketing and advertising of infant formula feedings, milk substitutes, teats and bottles on various media platforms have been shown to affect breastfeeding initiation.<sup>36 37</sup> In contrast, this study further revealed that those who read newspapers or magazines had lower odds of delaying breastfeeding initiation. Print media (ie, newspapers or magazines) are available and accessible to the public compared with television, which could explain the reason for this finding. Access to print media improves information and health literacy on breastfeeding and its benefits and fosters positive behavioural beliefs about breastfeeding which have been reported as important determinants of optimal breastfeeding practice.<sup>38–40</sup> Print media can be also an influential tool for breastfeeding communication and promotion, for persuading breastfeeding behaviours, creating positive social norms and garnering support from stakeholders and policymakers.<sup>39</sup> However, limited information exists on how mass media coverage influences breastfeeding practice in PNG's context. Further qualitative inquiry could provide a deeper understanding of mass media coverage on breastfeeding practices.

Regarding the region, delayed initiation of breastfeeding was not common among women from the Highlands and Southern regions. This finding is in agreement with a similar study conducted in PNG.<sup>12</sup> Expansion of access to healthcare services and ongoing economic developments in these two regions are possible explanations for this observation. On the contrary, the odds of delayed breastfeeding initiation remained higher among women from the Momase region compared with women in the Island region. This is likely attributed to the lack of qualified health workers with adequate resources in this region of the country, impeding access to maternal, newborn and child health services as reported in similar studies.<sup>12 41</sup> This can also be elucidated in terms of the socioeconomic condition, frequently characterised by poor household wealth and low education levels, including accessibility, attitudes to antenatal care and interpersonal issues affecting women from accessing the services provided by health workers in this region.<sup>41 42</sup> Most of the provinces in the Momase region are relatively economically unstable and geographically remote, which makes healthcare, services problematic.<sup>42</sup> The regional variations relating to breastfeeding initiation could be attributed to poor healthcare service and resource distribution. This is also consistent with previous studies, which found that variations exist in various regions and the utilisation of antenatal care services.<sup>41 42</sup> Thus, mobile and outreach programmes should be strengthened to reach women, especially in rural areas and the disadvantaged.

This study has several strengths. It investigated household, maternal, and child factors and healthcare utilisation with delayed initiation of breastfeeding using a nationally representative survey. In addition, appropriate analysis techniques such as weighting and complex samples analysis were used to ensure that the results were representative of women in PNG. The two-stage sampling approach ensured that no selection bias could influence the results of this study. However, the study has limitations and should be interpreted with caution. As it was a cross-sectional study, the analysis could not determine



a cause-and-effect relationship between breastfeeding initiation and independent variables. The role of health workers and skilled birth attendants (eg, midwives or nurses) regarding breastfeeding was not captured in the dataset; therefore, it was not possible to establish the extent of breastfeeding counselling and support provided during antenatal and early postpartum periods. Since the outcome of the study was assessed based on the women's responses regarding the timing of breastfeeding initiation, results may have been influenced by self-report and social desirability biases. Furthermore, the DHS did not collect some information, such as maternal beliefs and knowledge about breastfeeding, so there may be residual confounding.

## CONCLUSION

Early initiation of breastfeeding within 1 hour after birth is beneficial in reducing neonatal mortality and preventing other neonatal illnesses. This study found that one in four women delayed early breastfeeding initiation. Factors significantly associated with delayed initiation of breastfeeding include unplanned pregnancies, media exposure, region, caesarean section and poor newborn skin-to-skin contact immediately after birth. Interventions to promote optimal breastfeeding require a multi-sectoral approach, as well as bolstering health workers' capacity to encourage and support early initiation of breastfeeding during the antenatal and early postnatal periods. This could increase breastfeeding initiation rates at birth and prevent adverse neonatal outcomes in PNG.

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**Patient consent for publication** Not applicable.

**Ethics approval** The 2016–2018 PNGDHS protocol was reviewed and approved by the Institutional Review Board of Inner-City Fund (ICF) International (530 Gaither Road, Suite 500 Rockville, MD 20850, USA). The dataset was accessed through the DHS programme website (<https://www.dhsprogram.com/data>) after the user's agreement and approval for use were completed. The data used in this study were de-identified to ensure anonymity. Informed consent was obtained from all participants before the survey was conducted. Therefore, no additional ethical approval was sought for this study.

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**Data availability statement** Data are available in a public, open access repository. The data underlying the results presented in the study are available from the DHS programme: <https://dhsprogram.com/methodology/survey/survey-display-499.cfm>.

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## ORCID id

McKenzie Maviso <http://orcid.org/0000-0001-5435-7054>

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