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ORIGINAL ARTICLE

Association between Maternal Health Literacy and Exclusive Breastfeeding Practices in Urban and Rural Communities

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ABSTRACT

Background: Maternal health literacy could be a factor in understanding breastfeeding advice, feeding challenges and making infant-feeding decisions. The present study aimed to determine the relationship between the exclusive breastfeeding and the health literacy of mothers in urban and rural areas.

Methods: A multicentre cross-sectional study was conducted from January 2022 to January 2023 at the Department of Obstetrics and Gynaecology, Unit III, Liaquat University of Medical and Health Sciences, Jamshoro, and the Department of Paediatrics, Khyber Teaching Hospital, Peshawar, Pakistan. One hundred mothers with their infants aged 0-5 months were selected, comprising half from rural and half from urban areas. A culturally adapted, 16-item European Health Literacy Questionnaire was used to assess maternal health literacy. The exclusive breastfeeding (EB) was evaluated using 24 hours dietary recall. Chi square and multivariable binary logistic regression were used for data analysis.

Results: The mean maternal age was 28.4 ± 5.0 years. There was adequate health literacy among 58.0% of participants, which was higher among urban than rural mothers (70.0% versus 46.0%, respectively; p=0.015). Overall, 57.0% of mothers exclusively breastfed (urban mothers 66.0%, rural mothers 48.0%). Mothers with good health literacy were more likely to exclusively breastfeed compared to those with limited health literacy (74.1% versus 33.3%, p<0.001). Good health literacy was an independent predictor of exclusive breastfeeding (aOR 4.76; 95% CI 1.86–12.17; P=0.001). Other significant predictors were breastfeeding counselling and initiation within one hour.

Conclusion: counselling, education, and access to health information were associated with urban–rural difference and maternal health literacy was found to be associated with exclusive breastfeeding.

Keywords: maternal health literacy; exclusive breastfeeding; infant feeding; urban communities; rural communities; breastfeeding counselling

INTRODUCTION

Exclusive breastfeeding is defined as feeding an infant only breast milk, without any additional liquids or foods, except prescribed medicines, vitamins, minerals, or oral rehydration solution. The World Health Organization recommends exclusive breastfeeding during the first six months of life, followed by the introduction of nutritionally appropriate complementary foods while breastfeeding continues for up to two years or beyond[1]. Despite international efforts to promote optimal infant feeding, exclusive breastfeeding rates remain below recommended targets in many low- and middle-income countries[2].

Breast milk provides essential nutrients, antibodies, enzymes, hormones, and bioactive components required for healthy infant growth and development. Exclusive breastfeeding reduces the incidence of diarrhoeal diseases, respiratory tract infections, otitis media, childhood obesity, and infant mortality[3]. It is also associated with improved cognitive development and may reduce the long-term risk of diabetes and other metabolic disorders. For mothers, breastfeeding promotes postpartum recovery and is associated with reduced risks of breast cancer, ovarian cancer, and type 2 diabetes mellitus [4].

Although the benefits of breastfeeding are well established, its initiation and continuation are influenced by several maternal, familial, cultural, healthcare, and socioeconomic factors. Maternal education, employment, parity, mode of delivery, antenatal care, early initiation of breastfeeding, family support, and access to professional counselling may affect exclusive breastfeeding practices[5]. In Pakistan, exclusive breastfeeding remains suboptimal because many infants receive water, honey, animal milk, formula milk, or other prelacteal feeds during the first six months of life[6].

Maternal health literacy has emerged as an important determinant of maternal and child health behaviours. Health literacy refers to an individual's ability to access, understand, evaluate, and apply health-related information when making decisions regarding disease prevention, healthcare utilisation, and health promotion [6,7]. In the context of breastfeeding, maternal health literacy includes the ability to understand recommendations concerning exclusive breastfeeding, recognise normal infant feeding behaviour, manage common breastfeeding difficulties, and identify reliable sources of information [8].

Mothers with adequate health literacy may be better able to understand the nutritional and immunological importance of breast milk, recognise signs of effective feeding, and seek professional assistance when breastfeeding problems occur[9]. They may also be more capable of evaluating conflicting information received from family members, social media, commercial advertisements, and healthcare workers. In contrast, limited health literacy may contribute to misconceptions regarding breast-milk insufficiency, inappropriate supplementation, delayed breastfeeding initiation, and premature discontinuation of exclusive breastfeeding [10].

Previous studies have demonstrated an association between maternal health literacy and breastfeeding duration. Mothers with limited health literacy have been reported to discontinue exclusive breastfeeding earlier than mothers with adequate literacy[7]. Higher health literacy has also been associated with stronger breastfeeding self-efficacy, improved maternal confidence, and a greater likelihood of maintaining exclusive breastfeeding for four to six months after delivery[8,9].

The relationship between health literacy and breastfeeding may differ between urban and rural communities. Urban mothers generally have greater access to hospitals, antenatal services, digital information, educational institutions, and breastfeeding counselling. However, they may also experience employment-related barriers, short maternity leave, aggressive marketing of breast-milk substitutes, and inadequate workplace breastfeeding facilities [1]. Rural mothers may face lower educational attainment, limited access to trained healthcare professionals, transportation barriers, poverty, traditional infant-feeding practices, and greater dependence on advice from family elders [14].

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Early initiation and professional breastfeeding counselling may partially reduce these inequalities. Breastfeeding support provided during pregnancy, immediately after childbirth, and throughout the postnatal period can improve maternal knowledge, correct misconceptions, and assist mothers in managing attachment difficulties, nipple pain, perceived insufficient milk, and infant crying[15]. Initiation of breastfeeding within the first hour after birth also facilitates skin-to-skin contact, promotes milk production, and decreases the likelihood of prelacteal feeding [16].

Health literacy is related to, but distinct from, formal education. A mother with several years of schooling may still experience difficulty understanding medical instructions or applying breastfeeding recommendations, whereas a mother with limited formal education may develop adequate functional health literacy through effective counselling and community support[17]. Therefore, assessing maternal health literacy may provide a more practical understanding of breastfeeding behaviour than educational level alone. Recently developed breastfeeding-specific health literacy instruments further emphasise the need to evaluate whether mothers can translate breastfeeding information into appropriate feeding practices[18].

Although several international studies have examined maternal health literacy and breastfeeding outcomes, evidence comparing urban and rural populations in Pakistan remains limited. Existing national studies have largely focused on maternal education, employment, household income, cultural beliefs, and healthcare utilisation, while the independent contribution of maternal health literacy has received less attention[19,20]. Understanding this association may help healthcare professionals develop culturally appropriate and literacy-sensitive breastfeeding interventions.

Therefore, the present study aimed to determine the association between maternal health literacy and exclusive breastfeeding practices among mothers living in urban and rural communities. It also aimed to compare health literacy and exclusive breastfeeding prevalence between the two populations and identify the maternal, healthcare, and infant-related factors independently associated with exclusive breastfeeding.

MATERIALS AND METHODS

Study Design and Setting: The study was carried out on a multicentre comparative cross-sectional study model from January 2022 to January 2023 in the Department of Obstetrics and Gynaecology, Unit III, Liaquat University of Medical and Health Sciences, Jamshoro, Pakistan and the Department of Paediatrics, Khyber Teaching Hospital, Peshawar, Pakistan. Mums were sampled from four Postnatal, Paediatric, Immunisation and MCH clinics (urban and rural). Participants were categorized into urban or rural based on the administrative categorization that was used by the respective local authorities and the permanent residence of the participants.

Study Population and Sample Size: One hundred mothers were included, all of whom had infants 0–5 months of age. The participants were split into two groups—50 mothers from urban communities and 50 mothers from rural communities. The sample size was deemed sufficient to compare exclusive breastfeeding practices in an exploratory manner between the two residential groups. Consecutive non-probability sampling was employed for the selection of eligible mothers till the required sample size was obtained.

Eligibility Criteria: Eligible mothers were 18–45 years of age, had a live singleton infant less than six months of age, and had been the primary feeder since birth. All participants had to have resided in the community in which they were selected for study for a period of at least six months prior to enrolment, either urban or rural.

Mums were excluded if their baby had congenital abnormalities, metabolic disorders, severe neonatal illness, cleft lip and/or palate, or other conditions that influenced oral feeding. In addition, mothers who had a serious medical illness, cognitive impairment, a contraindication to breastfeeding, or were unable to complete the interview were excluded. Moms of babies 6 months or older and those who did not want to participate were not included.

Data Collection: The instrument used for data collection was a structured, interviewer-administered questionnaire, which was given face-to-face to the subjects. Questionnaire was designed in English, and then, translated into Urdu and Pashto as per the linguistic choice of the participants. It was checked by experts from the fields of obstetrics, paediatrics and community medicine, and pretested with 10 mothers not included in the actual study.

The questionnaire included maternal age, education, employment, parity, family income, place of residence, number of visits during pregnancy, place of delivery, method of delivery, breastfeeding counselling, time of the introduction of breastfeeding, breastfeeding support from family, infant age, infant sex, use of prelacteal feeds and infant-feeding practices.

Assessment of Maternal Health Literacy: A culturally adapted 16-item European Health Literacy Questionnaire was used to assess maternal health literacy. The instrument assessed the mother's perceived ability to access, understand, appraise, and use health related information. Each item was judged as being very difficult, fairly difficult, fairly easy, or very easy. Fairly easy and very easy were given a score of 1, while fairly difficult and very difficult were given a score of 0.

The scores on the total scale varied from 0 to 16. The scores 0-8 were considered to indicate low health literacy, 9-12 as moderate health literacy and 13-16 as high health literacy. Limited health literacy" was used to represent inadequate health literacy and problematic health literacy; adequate health literacy was used to represent sufficient health literacy in the regression analysis.

Exclusive Breastfeeding Assessment: The main outcome was the exclusive breastfeeding practice of children from 0-5 months. The infant was exclusively breastfed as breastfeeding without any supplementation of liquids or solid foods, except on prescription medicines, and vitamins and minerals, or oral rehydration solution.

Dietary recall was used for feeding status assessment, with a 24-hour recall. Mothers were inquired if the baby had breast milk, infant formula milk, animal milk, water, honey, herbal preparations, juice, semisolid food or other liquid or food in the previous 24 hours. There were some questions to improve the accuracy of feeding classification: "Has he/she ever been given any prelacteal feeds or any regular supplementation since birth?".

Study Variables: Maternal health literacy was the independent variable, and exclusive breastfeeding was the dependent variable. Maternal age, education, employment, parity, residential status, antenatal attendance, mode of delivery, breastfeeding counselling, initiation of breastfeeding within one hour of birth, family support, infant age and infant sex were other factors.

Early initiation of breastfeeding was considered as putting the baby to the breast within an hour after birth. Good antenatal care was considered to be a minimum of four antenatal visits. Strong family support was obtained when the mother reported that she received emotional support or practical support from other family members or the husband on breastfeeding.

Data Quality Assurance: All data collectors received training on participant recruitment, interviewing techniques, health-literacy scoring, and classification of infant-feeding practices. Completed questionnaires were reviewed daily to verify for omitted, inconsistent and incomplete responses. The data were entered twice and checked for accuracy before analysis. The responses of the participants were collected anonymously with identification codes.

Statistical Analysis: IBM SPSS Statistics version 26 was used to analyse data. Continuous variables were reported as mean and standard deviation and categorical variables as numbers and percentages. Continuous variables were compared between urban and rural using independent-samples t-test. The chi-square test or Fisher's exact test was applied to compare categorical variables.

Crude odds ratios (ORs) and 95% confidence intervals (CIs) were calculated by univariate binary logistic regression to estimate factors associated with exclusive breastfeeding. Variables with a p-value < 0.10 based on univariate analysis and clinically important

variables were incorporated in a multivariable binary logistic regression model. Adjusted odds ratios (ORs) and 95% confidence intervals (CIs) are presented. The Hosmer–Lemeshow test was used to evaluate the fitness of the models and the multicollinearity was checked prior to the interpretation of the final models. Statistically significant p-values were set at < 0.05 (two sided).

Ethical Considerations: Ethical approval was obtained from the appropriate institutional ethics review committees of Liaquat University of Medical and Health Sciences, Jamshoro, and Khyber Teaching Hospital, Peshawar, before commencement of the study. Written informed consent was obtained from each participant before enrolment. Participation was entirely voluntary, and participants were informed of their right to withdraw from the study at any stage without any consequences. Confidentiality and anonymity were maintained throughout data collection, analysis, and reporting.

RESULTS

The study included a total of 100 eligible mothers with infants under six months of age. There were 50 participants from urban communities and 50 participants from the rural communities. The mean maternal age was 28.4 ± 5.0 years and the mean infant age was 2.7 ± 1.6 months. Of the included infants, 54 (54.0%) were male and 46 (46.0%) were female.

Maternal age, infant age, infant sex, early initiation of breastfeeding and family support were similar for both mothers living in urban and rural areas. But urban mothers had much higher rates of secondary or higher education, formal employment, 4 or more antenatal visits, breastfeeding counselling and good maternal health literacy. Urban mothers had significantly higher maternal health-literacy scores than did rural mothers (13.1 ± 2.2 versus 11.0 ± 2.9; p<0.001). Table 1 shows that 35 (70.0%) mothers in urban areas and 23 (46.0%) mothers in rural areas had adequate health literacy.

Values are presented as n (%) unless otherwise stated. SD: standard deviation. Independent-samples t-test was performed for continuous variables and chi-square test for categorical variables. A p-value of <0.05 was considered statistically significant.

In total, 57 (57.0%) mothers were exclusively breastfeeding their infants when assessed. Urban mothers were more likely than their rural counterparts to exclusively breastfeed, however this was not statistically significant (66.0% versus 48.0%, p=0.069). Thirty-five mothers (35.0%) reported pre-lacteal feeding and this was significantly more common in rural communities than in urban communities (48.0% versus 22.0%, p=0.006).

Table 1: Sociodemographic, obstetric, and health-literacy characteristics of urban and rural participants

Characteristic	Urban, n=50	Rural, n=50	p-value
Maternal age, years, mean ± SD	28.9 ± 4.7	27.8 ± 5.2	0.270
Secondary or higher education	38 (76.0)	22 (44.0)	0.001
Currently employed	22 (44.0)	7 (14.0)	0.001
Primiparous mother	24 (48.0)	13 (26.0)	0.023
Caesarean delivery	23 (46.0)	12 (24.0)	0.021
Four or more antenatal visits	41 (82.0)	29 (58.0)	0.009
Received breastfeeding counselling	38 (76.0)	26 (52.0)	0.012
Breastfeeding initiated within one hour	34 (68.0)	27 (54.0)	0.151
Strong family support	35 (70.0)	33 (66.0)	0.668
Infant age, months, mean ± SD	2.6 ± 1.6	2.8 ± 1.7	0.547
Infant aged 0–2 months	26 (52.0)	23 (46.0)	0.548
Male infant	28 (56.0)	26 (52.0)	0.688
Health-literacy score, mean ± SD	13.1 ± 2.2	11.0 ± 2.9	<0.001
Adequate maternal health literacy	35 (70.0)	23 (46.0)	0.015

Table 2: Factors associated with exclusive breastfeeding among the study participants

Variable	Exclusive breastfeeding, n/N (%)	Crude OR	95% CI	p-value
Maternal health literacy				
Adequate	43/58 (74.1)	5.73	2.40–13.69	<0.001
Limited	14/42 (33.3)	Reference	—	—
Residential area				
Urban	33/50 (66.0)	2.10	0.94–4.71	0.069
Rural	24/50 (48.0)	Reference	—	—
Maternal education				
Secondary or higher	40/60 (66.7)	2.71	1.19–6.18	0.017
Below secondary	17/40 (42.5)	Reference	—	—
Maternal employment				
Employed	12/29 (41.4)	0.41	0.17–0.99	0.044
Not employed	45/71 (63.4)	Reference	—	—
Breastfeeding counselling				
Received	43/64 (67.2)	3.22	1.38–7.52	0.006
Not received	14/36 (38.9)	Reference	—	—
Initiation within one hour				
Yes	42/61 (68.9)	3.54	1.52–8.21	0.003
No	15/39 (38.5)	Reference	—	—
Family support				
Strong support	45/68 (66.2)	3.26	1.36–7.82	0.007
Limited support	12/32 (37.5)	Reference	—	—
Mode of delivery				
Vaginal delivery	42/65 (64.6)	2.43	1.05–5.64	0.036
Caesarean delivery	15/35 (42.9)	Reference	—	—
Infant age				
0–2 months	34/49 (69.4)	2.76	1.21–6.27	0.014
3–5 months	23/51 (45.1)	Reference	—	—
Infant sex				
Male	32/54 (59.3)	1.23	0.55–2.74	0.616
Female	25/46 (54.3)	Reference	—	—

Table 3. Multivariable binary logistic regression analysis of predictors of exclusive breastfeeding

Predictor	Adjusted OR	95% CI	p-value
Adequate maternal health literacy	4.76	1.86–12.17	0.001
Received breastfeeding counselling	2.54	1.01–6.38	0.047
Breastfeeding initiated within one hour	2.68	1.06–6.77	0.037
Infant age 0–2 months	2.44	0.98–6.07	0.056
Secondary or higher maternal education	1.62	0.59–4.45	0.351
Strong family support	1.89	0.71–5.04	0.204
Urban residence	1.31	0.49–3.52	0.588

OR: odds ratio; CI: confidence interval.

The mothers who had sufficient health literacy reported exclusive breastfeeding in 43 out of 58 mothers (74.1%) while the mothers with limited health literacy reported exclusive breastfeeding in 14 out of 42 mothers (33.3%) ($p<0.001$). A mother's exclusive breastfeeding rate was almost six times higher when she had high health literacy. Also, exclusively breastfeeding was significantly associated with breastfeeding counselling, infant initiation of breastfeeding within one hour of birth, strong family support, vaginal delivery, secondary or higher education and younger infant age. In contrast, the formal work status of mothers was found to be a negative predictor of exclusive breastfeeding. These associations are listed in Table 2.

OR: odds ratio; CI: confidence interval. Associations were assessed using the chi-square test and univariate binary logistic regression. A p-value of <0.05 was considered statistically significant.

All variables that had $p<0.10$ in the univariate analyses and clinically relevant factors were added to the multivariable binary logistic regression model. Even after adjustment, adequate maternal health literacy was the best independent predictor of exclusive breastfeeding. Moms with high health literacy were about 5 times more likely to exclusively breastfeed compared to moms with low health literacy.

Breastfeeding counselling and initiating breastfeeding within 1 hour of delivery were also independently associated with exclusive breastfeeding. Mothers who were given breastfeeding counselling had 2.54 times higher odds and mothers who initiated breastfeeding within 1 hour had 2.68 times higher odds of exclusive breastfeeding. The association between urban residence and exclusive breastfeeding was not significant after adjustment, suggesting that the urban–rural difference was partially attributable to the differences in maternal health literacy and breastfeeding support. The adjusted regression results are shown in Table 3.

Limited health literacy, no breastfeeding counselling, breastfeeding initiation > 1 hour, infant age 3–5 months, low level of education, low level of family support, and rural residence were the reference categories. The Hosmer–Lemeshow goodness-of-fit test resulted a good calibration of the model ($p=0.720$). The Nagelkerke R^2 for the model was 36.0% for exclusive breastfeeding. A p-value of <0.05 was considered statistically significant.

Mothers who had high health literacy level, had breastfeeding counselling, and started breast-feeding within the first hour after birth had the highest predicted probability of exclusive breastfeeding. Limited health literacy mothers who did not receive counselling and started breastfeeding after the first hour, on the other hand, had the lowest probability of exclusive breastfeeding. There was no significant relationship between sex of infant and exclusive breastfeeding.

DISCUSSION

The present study demonstrated a strong association between maternal health literacy and exclusive breastfeeding among mothers from urban and rural communities[1]. In total, 57.0% were exclusively breastfeeding and good maternal health literacy was found in 58.0% of mothers. There was a significant difference in exclusive breastfeeding between mothers with very good health literacy and mothers with limited health literacy. Even after controlling for the other factors, including residential area, maternal education, breastfeeding counselling, family support, early initiation and infant age, adequate health literacy remains the strongest independent factor to predict exclusive breastfeeding[2].

For this study, the exclusive breastfeeding prevalence was higher than that in some national surveys[3]. This discrepancy could be due to the younger age of infants included, recruitment in health care facilities, regional variations, and increased exposure to breastfeeding advice during the prenatal and postnatal periods. However, the results show that significant number of infants are given water, formula milk, animal milk, herbal preparations, honey or complementary foods prior to 6 months[4].

The key conclusion: Mothers with sufficient health literacy were almost five times more likely to exclusively breastfeed compared to mothers with limited health literacy[5]. This finding indicates that access, comprehension, appraisal and use of health information is an integral component to maternal infant-feeding decisions. Mums with high health literacy may be more able to adhere to the breastfeeding recommendations, identify normal infant-feeding behaviour, and manage common breastfeeding problems without early introduction of other foods and fluids[6].

Enhancing maternal confidence and decision making through health literacy may help to continue breastfeeding. If mothers are aware of normal feeding patterns, infant crying and cluster feeding, and changes in sleeping patterns, they are less likely to assume these are a sign of insufficient milk. They can also be more likely to recognize when the milk is insufficient vs. the actual lactation issues and seek help when needed[7,8].

Good health literacy can also enable mothers to assess information they receive from family, social media, and commercial ads and informal sources[9]. Mothers with low health literacy may struggle to identify trustworthy information, especially when they are in conflict with the advice given by healthcare providers. This can lead to a higher risk of prelacteal feeding, formula supplementing and/or early complementary feeding[10].

A relationship between health literacy and exclusive breastfeeding cannot be assumed to be analogous to that of formal education and breastfeeding[11]. Secondary or higher education was related to exclusive breastfeeding in the unadjusted analysis, but was not independently significant when health literacy and other factors were taken into account. While formal education can enhance overall reading and comprehension skills, health literacy is a more functional, hands-on skill that involves applying health information to make decisions about maternal and infant care[12].

Even a mother who has had a few years of education might have trouble understanding the medical advice or implementing a breastfeeding recommendation[13]. In contrast, a mother who is not well educated can be provided with sufficient functional health literacy via clear counselling, practical demonstrations, explanations repeated over time, and assistance of trained healthcare providers. Breastfeeding programmes should therefore check the mothers' understanding, and not presume that the mothers' level of education is adequate in order to make informed choices about breastfeeding[14].

Compared to rural mothers, urban mothers had higher health-literacy scores and were more likely to exclusively breastfeed[15]. But urban residence was not independently associated with exclusive breastfeeding after adjustment. This discovery points to a need to consider a greater understanding of the role that education, antenatal attendance, access to professional counseling and availability of understandable health information can play in reducing the urban–rural divide[16].

Access to hospitals, specialist services, digital information, antenatal classes and trained breastfeeding counsellors may be greater for urban mothers. They could also have barriers in the workplace, short maternity leave, long commuting hours, poor workplace facilities and be exposed to commercial promotion of breast-milk substitutes. Thus, living in an urban environment does not necessarily guarantee optimal practices of breastfeeding[17,18].

Rural mothers might face other forms of obstacles, such as fewer access to skilled health care providers, transportation problems, poverty, lower education level, heavy household or agriculture work load, and more reliance on traditional infant-feeding practices. Family elders can also be a significant influence on choices of colostrum, prelacteal feeds, provision of water and the timing of complementary feeding[19,20].

A higher proportion of the rural participants fed their newborns pre-lacteal. Water, herbal mixtures, formula or animal milk may be offered for reasons that colostrum is not enough, is unhealthy, or is not suitable for the newborn. These practices can impede effective breastfeeding, decrease stimulation for suckling, disrupt milk production, and expose babies to contaminated liquids and/or feeding utensils[3-7].

Breastfeeding counselling was an independent predictor of exclusive breastfeeding. The adjusted odds of exclusive breastfeeding were more than doubled for mothers who received counselling versus mothers who did not receive counselling. Providing effective counselling can help to dispel any misconceptions about colostrum, how often to breastfeed, why babies cry, an infant's milk supply, and the need to give water in hot weather[8-10].

Counselling can also offer practical assistance with issues like poor positioning, ineffective attachment, breast pain, breast fullness and breast milk production concerns. It is not enough to have one teaching session right after giving birth to educate women about breastfeeding. Sustained support may be provided through repeated counselling during the pregnancy, at birth, during postnatal visits, at immunisation appointments and during paediatric follow-up[11-13].

Another independent predictor of exclusive breastfeeding was initiation of breastfeeding within one hour of birth. Early initiation facilitates skin to skin contact, good suckling, good milk production and less time for prelacteal or formula feeding. It also can boost confidence and facilitate early mother–infant bonding[14].

Delayed initiation can be observed following caesarean delivery, maternal complications, neonatal observation or when mother and infant are routinely separated[15]. Vaginal delivery was associated with exclusive breastfeeding in the unadjusted analysis, but was no longer independently significant after adjustment. This implies that the impact of delivery mode may act partially by making it more difficult to get to breast, and by delaying breast initiation[16].

For women having a cesarean birth, extra support should be provided with comfortable feeding positions, early skin to skin contact, rooming in, and offering help with expressing breastmilk when direct breastfeeding is initially challenging. Any health care professional must make sure that c-sections do not lead to delayed breastfeeding or unnecessary supplementation from formula[17].

In the unadjusted analysis exclusive breastfeeding was associated with strong family support, but this was not significant after adjustment. Family members can play a positive role in breastfeeding through emotional support, housework and helping mothers when they have breastfeeding problems. They can, however, at the same time encourage traditional feeding methods which do not go along with exclusive breastfeeding[18].

Breastfeeding education should, therefore, include husband, mothers-in-law and other caregivers who are involved in infant-feeding decisions. In rural and extended family settings where mothers have limited power over feeding practices, family-centred counselling might be particularly important[19].

In the unadjusted analysis, maternal employment was associated with not being exclusively breastfeeding. Working mothers can face short maternity leave, long working hours, no privacy, no breastfeeding breaks and poor breast milk expressing and storage facilities. The barriers may result in early introduction of formula or other milk substitutes[20].

Adequate maternity and breastfeeding leave, flexible working hours, breastfeeding areas, private breastfeeding spaces and secure milk storage should be included within workplace policies. The conditions of supportive employment are especially relevant for the exclusive breastfeeding rate of mothers who work in the health, education, office, factory, agriculture and informal sectors[1,11].

Exclusive breastfeeding was more common among infants aged 0–2 months than among infants aged 3–5 months. In the adjusted model, infant age just failed to reach statistical significance but the observed trends suggest that there is a gradual trend of incorporating more liquids and foods as infants age. Pressure from family and infant crying, change in sleeping habits, and worries about growth could lead to early supplementation[2-8].

This means that breastfeeding counseling might be needed more often later in infancy. It is important for health workers to remind mothers that, in general, breast milk is enough in the first 6 months and to explain normal infant growth and feeding patterns and how to recognize feeding cues. Growth monitoring and immunisation visits offer good opportunities to reinforce the exclusive breastfeeding advice[10-14].

The findings have important implications for maternal and child health services. Ensure that maternal health literacy is measured during prenatal and postnatal care to identify those mothers who need more assistance. Using simple language and diverse culturally appropriate examples, pictorial materials, demonstration, and teach back to confirm understanding[8,20].

Urban rural disparities in needs should be addressed when implementing health-literacy sensitive interventions. Rural programmes need to enhance the community outreach, involvement of lady health workers, educating families, and referral networks to address breastfeeding challenges. Comprehensive urban programmes should incorporate counselling along with support and protection in the workplace against inappropriate promotion of breast-milk substitutes[5,9].

The study's strengths included equal urban and rural representation, direct group comparison, assessment of maternal health literacy beyond formal education, and multivariable analysis of maternal, obstetric, healthcare, family, and infant-related factors[8-11].

Its limitations included the cross-sectional design, small sample size, wide confidence intervals, and possible selection bias from consecutive facility-based recruitment. Self-reported feeding practices were also susceptible to recall and social-desirability bias, while 24-hour recall may have overestimated exclusive breastfeeding. The adapted health-literacy tool also requires formal local validation[13-17].

Future prospective studies should include larger, representative samples and follow mothers until infants reach six months of age. They should evaluate health literacy, breastfeeding self-efficacy, household decision-making, employment conditions, formula promotion, and counselling quality, as well as test literacy-sensitive breastfeeding interventions[18-20].

CONCLUSION

Good maternal health literacy was independently and strongly associated with exclusive breastfeeding in both urban and rural communities. Mothers with sufficient health literacy were significantly more likely to do exclusive breastfeeding as compared to mothers with limited health literacy. Other important independent predictors were breastfeeding counselling and initiation within an hour of birth.

The health-literacy score was higher and rate of exclusive breastfeeding was higher among urban mothers, but this was not independently associated with residential area after adjustment. This indicates that the urban–rural disparities may be mainly linked to disparities in education, counselling, antenatal care, and availability of health information in an understandable language.

The breastfeeding counselling should be made literacy sensitive, and should be included into all maternal and child health programmes, including antenatal, delivery and postnatal care. Information should be provided in a simple, language appropriate manner with practical demonstrations, pictorial materials and teach-back techniques. To promote and increase exclusive breastfeeding and narrow down the urban-rural gap, community outreach, family involvement, early breastfeeding help and workplace support are needed.

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