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Multilevel Analysis of Individual and Contextual Determinants of Compliance with Complete Postnatal Care (PNC) Visits in Sragen Regency, Indonesia

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ABSTRACT

Background: Compliance with complete postnatal care (PNC) visits is essential for the early detection of postpartum complications and the prevention of maternal morbidity and mortality. However, the coverage of complete postnatal care visits in several areas of Sragen Regency remains below the national target. This study aimed to examine the individual- and contextual-level determinants of compliance with complete postnatal care (PNC) visits in Sragen Regency, Indonesia.
Subjects and Method: This analytic observational study employed a cross-sectional design and was conducted in six primary healthcare centers (Puskesmas) in Sragen Regency, comprising three urban and three rural facilities. A total of 162 postpartum women were selected using purposive sampling. The dependent variable was compliance with complete postnatal care (PNC) visits. Individual-level independent variables included maternal age, educational level, employment status, parity, pregnancy risk status, mode of delivery, and knowledge of postnatal care, while the contextual-level variable was the category of the Puskesmas (urban or rural). Data were collected using a structured questionnaire and the Maternal and Child Health (MCH) handbook and were analyzed using multilevel logistic regression in STATA version 17.
Results: Compliance with complete PNC visits was significantly higher among women of optimal reproductive age (AOR=6.75; p=0.027), those with higher education (AOR=5.20; p=0.015), unemployed women (AOR=3.06; p=0.026), primiparous women (AOR=4.41; p=0.002), women with high-risk pregnancies (AOR=4.34; p=0.004), women who had operative deliveries (AOR=6.76; p=0.002), and women with good knowledge of postnatal care (AOR=16.98; p<0.001). The contextual effect of the Puskesmas was also significant, with an intraclass correlation coefficient (ICC) of 9.70%.
Conclusion: Compliance with complete postnatal care visits was influenced by both individual characteristics and the contextual characteristics of primary healthcare centers. Strengthening maternal knowledge and implementing context-specific postnatal care strategies are needed to improve the coverage of complete postnatal care visits.

Keywords: postnatal care, multilevel analysis, maternal health

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BACKGROUND

The postnatal period refers to the period from childbirth until the mother's reproductive organs return to their pre-pregnancy condition, approximately 6 hours to 42 days after delivery. This period is considered a critical phase because physiological recovery is accompanied by a high risk of complications that may threaten maternal health and even result in death. Approximately 60% of maternal deaths occur during the postnatal period, making postnatal care (PNC) an essential intervention for the early detection and appropriate management of postpartum complications and the prevention of maternal mortality (Winarsih & Dwihestie, 2025).

According to the 2025 Central Java Provincial Health Profile, the postnatal period has consistently accounted for the highest proportion of maternal deaths. Maternal deaths during the postnatal period totaled 513 cases in 2021, decreased to 302 cases in 2022 and 275 cases in 2023, but increased again to 306 cases in 2024. A similar trend was observed in Sragen Regency, where postnatal maternal deaths were recorded annually, with 11 cases in 2022, 9 cases in 2023, 8 cases in 2024, and 7 cases in 2025. The leading causes of death were eclampsia, followed by postpartum hemorrhage and cardiovascular disease. To reduce maternal morbidity and mortality, the Indonesian government has established a national standard for postnatal care through complete postnatal care (PNC) visits, locally referred to as Kunjungan Nifas Lengkap (KF4), consisting of four scheduled visits at 6–48 hours, 3–7 days, 8–28 days, and 29–42 days after childbirth. These visits aim to monitor maternal recovery, facilitate early detection of complications, provide health education, and ensure the well-being of both mother and newborn. Therefore, compliance with complete postnatal care visits has become an important indicator of maternal health service performance (Ifan et al., 2026). Conversely, poor compliance with recommended postnatal visits may delay the detection and management of complications, thereby increasing maternal morbidity and mortality (Putri & Nuraidah, 2026).

Despite these efforts, the coverage of complete postnatal care visits in Indonesia remains below the national target of 100% and has fluctuated in recent years. According to the 2025 Indonesia Health Profile, national coverage of complete PNC visits reached 90.7% in 2021, declined to 80.9% in 2022, increased to 85.7% in 2023, and decreased again to 77.63% in 2024. In Central Java Province, coverage remained relatively high during 2021–2023 (98.1%, 99.3%, and 98.4%, respectively) but declined to 97.5% in 2024. In Sragen Regency, complete PNC coverage also showed a declining trend, from 96.7% in 2023 to 97.5% in 2024 and subsequently to 93.97% in 2025. Moreover, considerable variation in coverage was observed across Puskesmas, ranging from 77.7% to 103.5%

in 2023, 82.8% to 102.4% in 2024, and 80.88% to 105.0% in 2025. These variations occurred in both urban and rural Puskesmas, indicating that district-level aggregate coverage may not adequately reflect the performance of individual service areas.

Previous studies have identified several factors associated with the utilization of postnatal care services. Individual-level factors, including maternal age, knowledge, educational attainment, attitudes, parity, mode of delivery, access to healthcare services, and family and community support, have been reported to influence compliance with postnatal care visits (Porgasari et al., 2026). Sembiring et al. (2023) found that maternal knowledge, attitudes, accessibility, family support, and support from healthcare providers were significantly associated with compliance with postnatal care visits. Furthermore, a meta-analysis conducted by Baten et al. (2025) reported that women residing in urban areas were more likely to utilize postnatal care services than those living in rural areas.

However, existing evidence remains limited. Most previous studies were conducted in a single healthcare facility with relatively small sample sizes, limiting their ability to explain variations across healthcare settings. In addition, these studies primarily focused on individual-level determinants and did not specifically examine compliance with complete postnatal care (PNC) visits or evaluate contextual differences among Puskesmas as the primary providers of maternal healthcare services.

The substantial variation in complete PNC coverage across Puskesmas in Sragen Regency suggests that compliance with postnatal care visits may be influenced not only by maternal characteristics but also by contextual factors related to healthcare settings, such as Puskesmas characteristics, healthcare accessibility, and the surrounding service environment. Nevertheless, studies integrating both individual- and contextual-level determinants using a multilevel analytical approach at the district level remain scarce. Therefore, this study aimed to examine the individual- and contextual-level determinants of compliance with complete postnatal care (PNC) visits among postpartum women in urban and rural Puskesmas in Sragen Regency using multilevel logistic regression. The findings are expected to provide a more comprehensive understanding of the factors influencing compliance with complete postnatal care visits and to support the development of context-specific strategies to improve maternal health service utilization.

SUBJECTS AND METHOD

1. Study Design

This analytic observational study employed a cross-sectional design and was conducted from March 2 to April 30, 2026, in six primary healthcare centers (Puskesmas) in Sragen Regency, Central Java, Indonesia. The study sites comprised three urban Puskesmas (Sragen, Karangmalang, and Gemolong) and three rural Puskesmas (Sukodono, Sambungmacan I, and Sambirejo).

2. Population and Sample

The study population consisted of all women who had completed the postpartum period in Sragen Regency. A total of 162 postpartum women were selected using purposive sampling. Eligible participants were women who had delivered between October and December 2025, had completed the postpartum period, and provided written informed consent to

participate. Women who had relocated during the postpartum period or had incomplete medical records were excluded from the study.

3. Study Variables

The dependent variable was compliance with complete postnatal care (PNC) visits. Individual-level independent variables included maternal age, educational attainment, employment status, parity, pregnancy risk status, mode of delivery, and maternal knowledge of postnatal care. The contextual-level variable was the Puskesmas category, classified as urban or rural.

4. Operational Definition of Variables

Compliance with complete postnatal care (PNC) visits was defined as attendance at all four recommended postnatal visits according to the schedule established by the Indonesian Ministry of Health and was categorized as compliant or non-compliant.

Maternal age was classified into optimal reproductive age (20–35 years) and high-risk reproductive age (<20 or >35 years).

Educational attainment was categorized as low (elementary or junior high school) and high (senior high school or higher education).

Employment status was classified as employed or unemployed.

Parity was categorized as primiparous and multiparous/grand multiparous.

Pregnancy risk status was classified as normal pregnancy or high-risk pregnancy.

Mode of delivery was categorized as vaginal delivery or operative delivery.

Maternal knowledge referred to mothers' understanding of the postpartum period and complete postnatal care visits and was categorized as good (score ≥75%) or poor (score <75%).

The Puskesmas category was classified as urban or rural based on the administrative classification of the District Health Office.

5. Study Instruments

Data were collected using a structured questionnaire to obtain information on respondents' socio-demographic characteristics and knowledge of postnatal care. The knowledge questionnaire covered the schedule and purpose of postnatal visits, postpartum danger signs, maternal self-care, breastfeeding, nutrition, family planning, and newborn care. Data on pregnancy history, mode of delivery, and compliance with complete postnatal care visits were verified using the Maternal and Child Health (MCH) Handbook and Puskesmas registers. Information regarding the Puskesmas category (urban or rural) was obtained from the administrative records of the Sragen District Health Office.

6. Data Analysis

Data were analyzed using Stata version 17. Descriptive statistics were used to summarize respondents' characteristics. Bivariate associations between independent variables and compliance with complete postnatal care visits were examined using the chi-square test. Variables with $p < 0.05$ in the bivariate analysis were subsequently entered into a multilevel logistic regression model to identify individual-level determinants and contextual effects at the Puskesmas level. Adjusted odds ratios (aORs) with 95% confidence intervals (95% CIs) were calculated, and statistical significance was determined at $p < 0.05$.

7. Research Ethic

This study received ethical approval from the Health Research Ethics Committee of dr. Soehadi Prijonegoro Regional General Hospital, Sragen, Indonesia (No. 297/Etik-Crssp/II/2026). All participants received an explanation of the study objectives, procedures, potential benefits, and confidentiality of the collected data before

providing written informed consent. The study was conducted in accordance with the ethical principles for research involving human participants.

RESULTS

1. Sample Characteristics

A total of 162 postpartum women participated in this study, comprising 81 respondents from rural primary healthcare centers (Puskesmas) and 81 respondents from urban Puskesmas. Most participants were aged 20–35 years (86.4%), had completed at least senior high school (79.6%), were unemployed (57.4%), and were multiparous or grand multiparous (55.6%). More than half of the participants had a normal pregnancy (54.3%), underwent vaginal delivery (53.7%), and demonstrated good knowledge of postnatal care (54.9%). Overall, 79 women (48.8%) complied with the recommended complete postnatal care (PNC) visits, whereas 83 women (51.2%) were non-compliant. The proportion of compliant women was higher in urban Puskesmas (56.8%), whereas non-compliance was more common among women attending rural Puskesmas (59.3%) (Table 1).

Table 1. Characteristics of the Study Participants by Puskesmas Category

Variables	Rural n (%)	Urban n (%)	Total n (%)
Maternal Age			
< 20 years and > 35 years	12 (14.8)	10 (12.3)	22 (13.6)
20–35 years	69 (85.2)	71 (87.7)	140 (86.4)
Education			
Lower education	18 (22.2)	15 (18.5)	33 (20.4)
Higher education	63 (77.8)	66 (81.5)	129 (79.6)
Employment Status			
Employed	44 (54.3)	25 (30.9)	69 (42.6)
Unemployed	37 (45.7)	56 (69.1)	93 (57.4)
Parity			
Multiparous/Grand multiparous	49 (60.5)	41 (50.6)	90 (55.6)
Primiparous	32 (39.5)	40 (49.4)	72 (44.4)
Pregnancy Risk Status			
Normal pregnancy	42 (51.9)	46 (56.8)	88 (54.3)
High-risk pregnancy	39 (48.1)	35 (43.2)	74 (45.7)
Mode of Delivery			
Vaginal delivery	43 (53.1)	44 (54.3)	87 (53.7)
Operative delivery	38 (46.9)	37 (45.7)	75 (46.3)
Knowledge of PNC			
Poor	33 (40.7)	42 (51.9)	73 (45.1)
Good	48 (59.3)	39 (48.1)	89 (54.9)
Compliance with Complete PNC			
Non-compliant	48 (59.3)	35 (43.2)	83 (51.2)
Compliant	33 (40.7)	46 (56.8)	79 (48.8)

2. Descriptive Statistics

The mean age of the participants was 28.66 ± 4.98 years, ranging from 18 to 43 years. The mean parity was 1.78 ± 0.83, with the number of previous births ranging from 1 to 4. The mean postnatal care knowledge score was 74.07 ± 13.24, with scores ranging from 38.85 to 100.00 (Table 2).

Table 2. Descriptive Statistics of the Study Variables

Variable	n	Mean	SD	Min	Max
Maternal Age	162	28,66	4,98	18	43
Parity	162	1,78	0,83	1	4
Knowledge	162	74,07	13,24	38,85	100

3. Bivariate Analysis

Bivariate analysis showed that all independent variables were significantly associated with compliance with complete PNC (p <0.05) (Table 3). Women of optimal reproductive age (20–35 years) were more likely to comply with complete PNC than those aged <20 or >35 years (OR=5.19; 95% CI=1.67–16.12; p=0.002). Higher educational attainment (OR=4.05; 95% CI=1.70–9.62; p=0.001), unemployment (OR=5.40; 95% CI=2.72–10.73; p<0.001), primiparity (OR=4.26; 95% CI=2.20–8.26; p<0.001), high-risk pregnancy (OR=2.22; 95% CI=1.82–4.17; p=0.013), vaginal delivery (OR=2.89; 95% CI=1.52–5.47; p=0.001), good knowledge of postnatal care (OR=5.21; 95% CI=2.65–10.25; p<0.001), and receiving care at an urban Puskesmas (OR=1.91; 95% CI=1.02–3.57; p=0.041) were significantly associated with higher compliance with complete PNC.

Table 3. Bivariate Analysis of Factors Associated with Compliance with Complete PNC

Variabel	OR	95% CI		*p*-value
		Lower	Upper	
Maternal Age (20-35 years)	5.19	1.67	16.12	0.002
Higher Education	4.05	1.70	9.62	0.001
Unemployed	5.40	2.72	10.73	<0.001
Primiparous	4.26	2.20	8.26	<0.001
High-risk Pregnancy	2.22	1.82	4.17	0.013
Vaginal delivery	2.89	1.52	5.47	0.001
Good knowledge	5.21	2.65	10.25	<0.001
Urban area	1.91	1.02	3.57	0.041

4. Multilevel Logistic Regression Analysis

Multilevel logistic regression analysis demonstrated that maternal age, educational attainment, employment status, parity, pregnancy risk status, mode of delivery, and maternal knowledge remained significantly associated with compliance with complete postnatal care (PNC) visits (p <0.05) (Table 4). Women aged 20–35 years were more likely to comply with complete PNC visits than women aged <20 or >35 years (aOR=6.75; 95% CI=1.24–36.83; p=0.027). Likewise,

women with higher educational attainment (aOR=5.20; 95% CI=1.38–19.57; p=0.015), those who were unemployed (aOR=3.06; 95% CI=1.14–8.18; p=0.026), primiparous women (aOR=4.41; 95% CI=1.76–11.02; p=0.002), women with high-risk pregnancies (aOR=4.34; 95% CI=1.58–11.87; p=0.004), those who underwent operative delivery (aOR=6.76; 95% CI=2.10–22.09; p=0.002), and women with good knowledge of postnatal care (aOR=16.98; 95% CI=5.30–54.72; p<0.001) had significantly higher odds of completing the recommended PNC.

The intraclass correlation coefficient (ICC) was 9.70%, indicating that approximately 9.7% of the variation in compliance with complete PNC visits was attributable to differences between Puskesmas. Furthermore, the likelihood ratio (LR) test was statistically significant (p=0.038), indicating that the multilevel logistic regression model provided a better fit than the conventional single-level logistic regression model.

Table 4. Multilevel Logistic Regression Analysis of Factors Associated with Compliance with Complete Postnatal Care (PNC)

Variables	aOR	95% CI		*p*-value
		Lower	Upper	
Maternal age (20-35 years)	6.75	1.24	36.83	0.027
Higher education	5.20	1.38	19.57	0.015
Unemployed	3.06	1.14	8.18	0.026
Primiparous	4.41	1.76	11.02	0.002
High-risk pregnancy	4.34	1.58	11.87	0.004
Operative delivery	6.76	2.10	22.09	0.002
Good knowledge	16.98	5.30	54.72	<0.001
Random Effect: • ICC = 9.70 % • p = 0.038				

DISCUSSION

1. Maternal age and compliance with complete postnatal care

This study found that mothers aged 20–35 years were 6.75 times more likely to comply with complete postnatal care (PNC) visits than those aged <20 years or >35 years. This finding indicates that optimal reproductive age plays an important role in improving compliance with recommended postnatal care services. Women within this age range generally have greater physical and psychological maturity, as well as better decision-making capacity, enabling them to better understand health information and recognize the importance of postnatal care services (Titisari et al., 2025). In contrast, younger mothers often have limited experience and autonomy, whereas mothers aged over 35 years may experience health conditions that limit their utilization of postnatal care services (Khodijah et al., 2025).

The present findings are consistent with those reported by Situmorang and Pujiyanto (2021), who found that women aged 20–35 years were more likely to complete postnatal care visits than those aged <20 years or >35 years. Similarly, Nurani et al. (2025) reported that women

of optimal reproductive age were more receptive to health information and more responsive to recommendations from healthcare providers regarding postnatal care utilization. These consistent findings suggest that optimal reproductive age is an important determinant of postnatal care utilization. In addition to reflecting biological readiness for childbirth, optimal reproductive age may also indicate greater readiness to make informed healthcare decisions. Therefore, mothers at higher-risk reproductive ages may benefit from more intensive counseling and follow-up during pregnancy and the postpartum period to improve compliance with complete postnatal care.

2. Educational attainment and compliance with complete postnatal care

This study demonstrated that mothers with higher educational attainment were 5.20 times more likely to comply with complete postnatal care (PNC) visits than those with lower educational attainment. Education influences women's ability to obtain, understand, and interpret health information, thereby increasing awareness of the importance of receiving postnatal care according to recommended standards (Sangdang et al., 2025). Furthermore, women with higher levels of education tend to communicate more effectively with healthcare providers, better understand the recommended schedule of postnatal care visits, and make more informed decisions regarding the utilization of maternal healthcare services (Maryani et al., 2025).

These findings are consistent with those of Situmorang and Pujiyanto (2021), who reported that utilization of postnatal care services increased with maternal educational level. Similar results were also reported by Widayati et al. (2022), who found that mothers with higher educational attainment were more likely to comply with postnatal care visits because they had a better understanding of health information and the benefits of postnatal care services. Collectively, these findings indicate that education is an important determinant of maternal healthcare utilization. Higher educational attainment not only improves maternal health literacy but also strengthens women's capacity to make appropriate healthcare decisions. Therefore, postnatal health education should be tailored to mothers' educational backgrounds to ensure that health information is effectively understood and to promote compliance with complete postnatal care.

3. Employment status and compliance with complete postnatal care

This study found that unemployed mothers were 3.06 times more likely to comply with complete postnatal care (PNC) visits than employed mothers. This finding suggests that employment status may influence women's ability to access postnatal healthcare services. Unemployed mothers generally have greater flexibility in scheduling postnatal care visits, whereas employed mothers often face time constraints, work-related responsibilities, and difficulties obtaining leave to attend healthcare appointments according to the recommended schedule (Siregar et al., 2026).

These findings are consistent with those reported by Tanjung et al. (2024), who found that unemployed mothers were more likely to complete postnatal care visits than employed mothers because they had more available time to access healthcare services. This evidence suggests that, in addition to maternal knowledge and awareness, time availability is an important determinant of compliance with postnatal

care recommendations. Employment status may therefore influence compliance through its impact on mothers' opportunities to utilize healthcare services. Consequently, more flexible service delivery strategies, such as extended clinic hours or home-based postnatal care visits, should be considered to enable employed mothers to complete the recommended schedule of postnatal care.

4. Parity and compliance with complete postnatal care

This study demonstrated that primiparous mothers were 4.41 times more likely to comply with complete postnatal care (PNC) visits than multiparous or grand multiparous mothers. First-time mothers generally have limited experience with postpartum care, making them more likely to seek health information, follow recommendations from healthcare providers, and closely monitor their health during the postpartum period. In contrast, multiparous mothers often rely on previous childbirth experiences, which may reduce their perceived need for postnatal care when no postpartum complications or symptoms are present.

The present findings are consistent with those of Situmorang and Pujiyanto (2021) and Widyaningsih et al. (2025), both of whom reported that parity significantly influences the utilization of postnatal care services. These studies found that women with lower parity were more likely to utilize maternal healthcare services than those with higher parity because they had greater informational needs and concerns regarding postpartum health. These findings suggest that previous childbirth experience does not necessarily translate into greater adherence to recommended postnatal care. Therefore, healthcare providers should deliver equally comprehensive postnatal education to both primiparous and multiparous mothers to ensure that all women recognize the importance of completing the recommended postnatal care.

5. Pregnancy risk status and compliance with complete postnatal care

This study found that mothers with a history of high-risk pregnancy were 4.34 times more likely to comply with complete postnatal care (PNC) visits than those with a history of normal pregnancy. This finding may be explained by the more frequent contact that women with high-risk pregnancies have with healthcare providers during pregnancy, resulting in closer clinical monitoring, more intensive counseling, and greater exposure to health education regarding pregnancy complications and the importance of postpartum follow-up care. Experiencing a high-risk pregnancy may also increase maternal awareness of the need to monitor their health after childbirth (Abbasi et al., 2025).

The present findings are consistent with those reported by Situmorang and Pujiyanto (2021) and Widyaningsih et al. (2025), who found that women with pregnancy complications or high-risk conditions were more likely to utilize maternal healthcare services continuously, including postnatal care. These findings suggest that early identification of pregnancy-related risks not only improves the quality of antenatal care but also promotes continuity of care during the postpartum period. Women with high-risk pregnancies may therefore have greater motivation to complete recommended postnatal care visits because of their increased awareness of potential health complications. Nevertheless, postnatal health education should also be strengthened among women with

uncomplicated pregnancies to ensure that they recognize the importance of postnatal care regardless of their pregnancy risk status.

6. Mode of delivery and compliance with complete postnatal care

This study demonstrated that mothers who underwent operative or assisted delivery were 6.76 times more likely to comply with complete postnatal care (PNC) visits than those who had spontaneous vaginal delivery. This finding indicates that the mode of delivery influences maternal healthcare utilization during the postpartum period. Women who undergo cesarean section, vacuum-assisted delivery, or other obstetric interventions generally require more intensive clinical follow-up during recovery and may perceive themselves to be at greater risk of postpartum complications (Hilmiffah et al., 2025). Consequently, they are more likely to adhere to the recommended schedule of postnatal care visits provided by healthcare professionals.

These findings are consistent with those of Situmorang and Pujiyanto (2021), who reported that women who delivered through obstetric interventions were more likely to utilize postnatal care services than those who experienced spontaneous vaginal delivery. The need for postoperative wound assessment, monitoring of physical recovery, and prevention of postpartum complications may explain the higher level of compliance observed among these mothers. These findings suggest that the mode of delivery influences mothers' perceived need for postpartum healthcare services. Therefore, healthcare providers should ensure that comprehensive education regarding the importance of postnatal care is provided to all mothers, including those who experience uncomplicated vaginal deliveries, so that every woman receives appropriate postpartum monitoring in accordance with national postnatal care guidelines.

7. Maternal knowledge and compliance with complete postnatal care

This study demonstrated that mothers with good knowledge were 16.98 times more likely to comply with complete postnatal care (PNC) visits than those with poor knowledge. This was the largest effect observed among all variables included in the model, indicating that maternal knowledge was the strongest determinant of compliance with complete postnatal care visits. Adequate knowledge enables mothers to understand the objectives, benefits, and recommended schedule of postnatal care, as well as to recognize postpartum danger signs, thereby encouraging timely utilization of maternal healthcare services.

These findings are consistent with those reported by Nurani et al. (2025) and Hasri et al. (2025), who found that mothers with good knowledge were more likely to complete the recommended postnatal care visits. Hasri et al. (2025) also identified maternal knowledge as the strongest predictor of postnatal care utilization, with an odds ratio of 4.7. Collectively, these findings highlight the importance of improving maternal knowledge as one of the most effective strategies for increasing compliance with postnatal care recommendations. Maternal knowledge serves as the foundation for appropriate health-seeking behavior during the postpartum period. Therefore, strengthening health education throughout pregnancy through antenatal counseling, maternal education classes, and effective communication by healthcare providers is essential to improve compliance with complete postnatal care.

8. Contextual effects of primary healthcare center characteristics on compliance with complete postnatal care

The bivariate analysis showed that mothers residing in urban primary healthcare center catchment areas were 1.91 times more likely to comply with complete postnatal care (PNC) visits than those living in rural areas. This finding is consistent with the meta-analysis conducted by Baten et al. (2025), which reported that women living in urban settings were 1.48 times more likely to utilize postnatal care services than those living in rural settings. This disparity may be attributed to better geographical access to healthcare facilities, greater availability of healthcare professionals, higher quality of health services, and improved access to health information in urban areas.

The findings of this study are also consistent with the PRECEDE–PROCEED model proposed by Lawrence Green, which suggests that health behaviors are influenced by predisposing, enabling, and reinforcing factors. In the present study, maternal age, educational attainment, employment status, parity, pregnancy risk status, mode of delivery, and maternal knowledge represent predisposing factors, whereas the characteristics of primary healthcare centers function as enabling factors that influence compliance with complete postnatal care visits. These findings suggest that improving compliance with postnatal care requires not only interventions targeting individual behavior but also strengthening healthcare delivery systems according to local contextual characteristics. Consequently, strategies to increase coverage of complete postnatal care visits should be tailored to the characteristics of each primary healthcare center, particularly by improving service accessibility, quality of care, and equitable distribution of maternal health education across both rural and urban settings.

This study has several limitations. First, it was conducted in only six primary healthcare centers in Sragen District, which may limit the generalizability of the findings to other settings with different population and healthcare characteristics. Second, the cross-sectional design precludes causal inference between the identified determinants and compliance with complete postnatal care visits. Nevertheless, this study has important strengths. The application of multilevel logistic regression enabled simultaneous assessment of individual- and contextual-level determinants, providing a more comprehensive understanding of factors influencing compliance with postnatal care recommendations. The findings may assist district health authorities and primary healthcare centers in developing targeted strategies to improve complete postnatal care coverage through enhanced maternal health education, improved access to maternal healthcare services, and context-specific interventions. Future studies should consider longitudinal or cohort designs, include a broader range of study sites, and explore additional contextual factors, such as healthcare facility characteristics, availability of healthcare providers, health policy support, and sociocultural influences, that may affect compliance with complete postnatal care.

AUTHOR CONTRIBUTION

All authors made substantial contributions to the conception and design of the study, data collection, data analysis and interpretation, manuscript preparation, critical revision of the manuscript for important intellectual content, and approval of the final version for publication.

CONFLICT OF INTEREST

The authors declare that they have no competing interests.

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