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ORIGINAL RESEARCH

Enhancing General Practitioners' Compliance with Antenatal Care Standards and Pregnant Women's Satisfaction Through Point-of-Care Quality Improvement in Indonesian Community Health Centers

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Background: Point-of-Care Quality Improvement (POCQI) is a technique used to improve the quality of health services. Improving antenatal care (ANC) is essential for better health outcomes in pregnant women. This study aimed to evaluate the effectiveness of the POCQI in improving general practitioners (GPs) compliance with ANC service standards and its impact on pregnant women's satisfaction in Indonesian community health centers. Indonesia was selected because it still faces gaps in maternal healthcare quality and resources.

Methods: A quasi-experimental pre–post study was conducted over six months at six community health centers in Cianjur District, West Java, Indonesia. The intervention involved eight GPs and 172 pregnant women. GPs' compliance and pregnant women's satisfaction were measured using structured questionnaires administered before and after the intervention. Data were analyzed using Rasch modeling with stacking and racking techniques, and the Wilcoxon signed-rank test.

Results: Significant improvements were found in both GPs' compliance and pregnant women's satisfaction. Stacking analysis showed an increases in mean logit person values from 2.78 to 5.24 for GPs' compliance ($p = 0.018$) and from 2.94 to 7.76 for pregnant women's satisfaction ($p < 0.001$). Racking analysis showed a significant decrease in item difficulty, with logit values decreasing from 0.01 to – 2.42 for GPs' compliance ($p < 0.001$) and from 1.89 to –1.89 for pregnant women's satisfaction ($p = 0.043$).

Conclusion: The POCQI approach effectively improved GPs' compliance with ANC standards and increased pregnant women's satisfaction. As a practical quality improvement strategy, the POCQI should be scaled up and integrated into primary health care systems to enhance the quality of ANC services in Indonesia.

Keywords: antenatal care, general practitioner, pregnant women's satisfaction, POCQI, Rasch analysis

Introduction

Antenatal care (ANC) is essential for improving pregnancy outcomes and reducing maternal, neonatal, and infant mortality, particularly in low- and middle-income countries (LMICs).[1,2] High-quality ANC, encompassing health promotion, disease prevention, screening, diagnosis, and early treatment, can effectively prevent pregnancy related complications.[3] Ensuring high-quality ANC requires a systematic and continuous approach involving all health system levels, supported by stakeholder feedback.[4,5] Pregnant women's satisfaction is a key indicator of ANC quality and promotes care-seeking during and between pregnancies.[6,7]

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The Maternal and Child Health (MCH) Handbook plays a key role in antenatal and maternal health education in Indonesia. It serves both as a reference for focused assessments and as a shared documentation tool between healthcare providers and pregnant women.[8,9] However, a study conducted at Dr. Cipto Mangunkusumo Hospital (RSCM), one of Indonesia's national referral hospitals, revealed that 46% of referred pregnant women did not receive the recommended number of ANC visits as per the WHO standards. Moreover, all participants (100%) had incomplete entries in their MCH handbooks.[9] In one of the CHCs in Indonesia, 52.6% of ANC services were classified as poor despite high coverage, highlighting the need to improve service quality.[10]

The quality of ANC services in Indonesia is significantly affected by structural limitations within CHCs, which often operate with only a single GP or a midwife tasked with multiple responsibilities. This staffing constraint limits consultation time and undermines service effectiveness. Approximately 24.36% of CHCs lack adequate numbers of GPs, and only approximately one-third are sufficiently staffed to meet care demands.[11] These disparities contribute to excessive workloads, thereby impeding the delivery of comprehensive ANC services.[12,13] Several studies across various countries have identified that one of the key reasons for suboptimal ANC is excessive workload among healthcare providers. Heavy workloads among practitioners further hinder optimal ANC implementation, resulting in long waiting times, abbreviated consultations, and protocol lapses,[14–17] all of which may compromise maternal and neonatal outcomes.[18,19]

Disparities of ANC coverage and quality in Indonesia remain as major public health concerns. One study revealed significant regional inequalities, where women in Papua and Maluku being far less likely to complete the recommended ANC visits than those in Java–Bali.[20] Socioeconomic status, education level and health insurance ownership were related to the inequalities.[20] Other study reported considerable socioeconomic and regional gaps between western and eastern Indonesia, in which only 20.8% of pregnant women in the eastern Indonesia received more than 8 ANC visits.[21] An additional study reported that 18.2% of women in Papua, the largest province in eastern Indonesia, did not utilize ANC services.[22] The quality of ANC in those area remain substandard, which was associated with a two-fold risk increase for low birth weight.[23] Collectively, these findings highlight persistent inequities and systemic weaknesses in maternal health service delivery, underscoring the need for context-specific and evidence-based strategies to improve the quality of antenatal services.

High-quality comprehensive ANC has been shown to reduce maternal anemia and neonatal complications.[24] From the patient's perspective, effective communication, empathy, and family centered approaches improve satisfaction, although gaps persist in facility readiness and continuity of care.[25] The Point-of-Care Quality Improvement (POCQI) model, developed by WHO-SEARO, AIIMS New Delhi, and USAID ASSIST offers a simple, evidence-based framework that leverages local data and promotes team-driven problem-solving. This approach empowers frontline health workers to identify service gaps and implement iterative solutions through continuous quality improvement, ultimately strengthening maternal, newborn, and child health outcomes.[26,27] The POCQI model emphasizes team building and strengthens primary care providers' capacity for shared decision-making to define quality improvement and patient satisfaction targets based on service standards. A key strength and distinctive feature of the POCQI model are its simplicity and practicality. It offers an easy-to-understand, effective approach to quality improvement that relies on available resources and does not require substantial additional investment in healthcare infrastructure.[26]

The Donabedian model, developed by Avedis Donabedian, serves as a foundational framework for evaluating and improving health care quality. It categorizes quality into three interrelated components: structure, process, and outcomes, which together provide a comprehensive assessment of the effectiveness and efficiency of healthcare services including antenatal care (ANC).[28] Effective communication, adherence to clinical guidelines, and timely provision of care are critical components of process quality in antenatal care (ANC).[29] Improvements in these processes have been associated with increased pregnant women satisfaction and improved pregnancy outcomes.[30] The POCQI approach emphasizes the integration of quality improvement techniques directly into frontline healthcare delivery, thus enabling systematic changes in service processes that ultimately lead to improved health outcomes.[26]

The POCQI has successfully improved care quality in 131 healthcare facilities in India and is considered replicable in settings with similar challenges.[31] A pilot project implementing the POCQI model was conducted at a CHC and hospital in Indonesia to strengthen neonatal care. The intervention, involving structured POCQI training and coaching, improved

providers' understanding of and engagement in quality improvement, enhanced clinical processes, and contributed to better service outcomes across both primary and referral care settings.[32] Given the regional disparities and limited human resources that continue to affect ANC quality in Indonesia, particularly in Cianjur District—an area prone to natural disasters and resource shortages—there is a pressing need to test the effectiveness of POCQI at the primary care level.

Structured quality improvement initiatives are essential for maternal care to reduce morbidity by providing high-quality ANC. Building upon these principles, this study aimed to evaluate the effectiveness of the POCQI approach in enhancing general practitioners' compliance with ANC standards and improving pregnant women's satisfaction with CHCs. Given its promising applicability, the POCQI model has broader implementation potential across Indonesia.

Material and Methods

Study Context

Cianjur Regency is an administrative region in West Java Province, Indonesia, located in the central part of the province. It is approximately 65 km from the provincial capital (Bandung) and 120 km from the national capital (Jakarta). Geographically, Cianjur is prone to natural disasters, particularly landslides and earthquakes, with an increased risk during the rainy season (October–December). These environmental conditions pose serious challenges to the continuity and accessibility of essential healthcare services, including antenatal care (ANC), particularly for pregnant women residing in vulnerable areas.

Cianjur regency has 47 nationally accredited CHCs that serve as the first-level public health facilities. Each CHC provides comprehensive ANC services and acts as the main entry point for maternal and child health care delivery. This study is part of a follow-up to the implementation of the POCQI approach initiated by a team from the Universitas Padjadjaran (UNPAD) in collaboration with the Ministry of Health of the Republic of Indonesia. The initiative supported the implementation of the POCQI for newborn care services in both Cianjur and Indramayu districts. The facilitation of the POCQI at the Ciranjang CHC in Cianjur revealed that non-compliance with ANC service standards was a key contributing factor to preventable neonatal deaths. This finding highlighted the urgent need for early quality improvement in maternal health services, beginning in the antenatal period, to ensure better outcomes for both mothers and newborns.

Cianjur Regency was chosen as the study site due to a recent rise in maternal mortality, reflecting persistent gaps in the delivery and quality of ANC services. The coverage of iron and folic acid (IFA) supplementation (90-tablet provision) was also among the lowest in the province, indicating ongoing challenges in meeting maternal nutritional needs and ensuring effective implementation of national ANC standards.[33] These conditions underscore the need for targeted quality-improvement efforts at the primary care level. Accordingly, the district was designated as a priority area to evaluate the effectiveness of the POCQI intervention, particularly in CHCs, where frontline providers' compliance most directly influences maternal outcomes.

Study Design and Site

This study used a quantitative approach with a quasi-experimental pre-test-post-test design, and was conducted from April 2023 to June 2024, covering a 15-month period that included baseline assessment, program implementation, and post-intervention evaluation. Six out of forty seven CHCs in Cianjur were purposively selected based on readiness for program implementation, geographic representation resource availability, leadership commitment, and accessibility to facilitate continuous mentoring and periodic evaluation. The implementation was conducted in a staggered manner under coordination with Cianjur regency health office.

Every CHC implemented the POCQI approach over an average duration of six months, therefore the mentoring team allowed one CHC at a time to carry on the program following four sequential steps. This approach ensured sufficient technical support and accommodating differences in the baseline capacity among the facilities. Within the six-month implementation period, the 3 steps (the Plan–Do–Study–Act, or PDSA, cycle) was applied uniformly for three months, accompanied by monthly progress evaluations. Corrective actions were implemented when performance indicators failed to meet predefined targets, whereas successful improvements were standardized and sustained before the next cycle commenced.

During the implementation, intensive mentoring was provided to healthcare workers, which allowed the POCQI implementation to proceed effectively. This mentoring offered direct support and ensured that the procedures could be applied properly in the field. Additionally, this approach strengthened healthcare workers' involvement in decision-making and monitoring while providing opportunities to identify and address obstacles during implementation. Mentoring also enhanced healthcare workers' confidence and reinforced their commitment to improving service quality.

Training and Coaching as Intervention Tools

Prior to the implementation of the POCQI training, a coordination meeting was conducted with appointed officers from the Cianjur District Health Office (CDHO) to organize training session schedules and select appropriately targeted CHCs with challenging antenatal care service issues. The POCQI team members of each participating CHC were selected based on deliberations involving the CDHO and the heads of each selected CHC. The appointed quality assurance team members of the community health center were selected to ensure an effective, collaborative implementation process. A one-day session was conducted to provide participants with a comprehensive understanding of the POCQI and assess the feasibility of implementing the four-stage POCQI framework. Participants underwent pre- and post-test assessments to evaluate their understanding of the POCQI. To assess the four stages of implementation, participants were provided with case studies during training and were required to propose solutions.

Participants

This study included two groups of participants: GPs and pregnant women. Eligible GPs actively provided ANC services at selected CHCs and were willing to participate in the study. GPs on leave during the data-collection phase were excluded. All GPs provided written informed consent and agreed to participate in all stages of the study including completing a pre-implementation questionnaire, participating in the POCQI implementation process, attending in-depth interviews, and completing a post-implementation questionnaire. On average, each health center had only one GP responsible for ANC services. However, eight doctors were included in the study because two of the centers had more than one GP providing ANC.

Pregnant women were eligible to participate if they lived within the catchment area of the selected CHCs, were aged $\geq$ 20 years, and were either in the first trimester of pregnancy or attending their first ANC visit. Pregnant women diagnosed with mental disorders were excluded from this study. All participating pregnant women were required to bring their Maternal and Child Health (MCH) handbook to every ANC visit. Participants were asked to provide written informed consent prior to participation. A total of 172 pregnant women agreed to participate in this study.

Sampling and Data Collection Method

The sample size calculation for pregnant women was performed using a one-sided hypothesis-test formula for the population proportion, assuming an increase in the proportion of women satisfied with ANC services following the POCQI intervention. The required sample size was calculated using the formula $n = [(Z_{1-\alpha}\sqrt{(p_0(1-p_0))} + Z_{1-\beta}\sqrt{(p_1(1-p_1))})]^2 / (p_1 - p_0)^2$. The following parameters were applied: $\alpha = 0.05$, power = 0.80, $p_0 = 0.50$, and $p_1 = 0.65$, yielding a minimum sample of 67 women. To accommodate potential non-response and to ensure equal allocation across six participating health centers, the target sample size was increased to 72 women. Participants were selected using a consecutive sampling method, based on the inclusion and exclusion criteria described in the participant section. For GPs, total sampling was applied because all doctors who provided ANC services at the six participating CHCs were included in the study. Eight GPs met the inclusion criteria and participated in this study.

Data were collected from two groups of participants: GPs and pregnant women selected from primary health centers (PHCs). Eight GPs and 172 pregnant women met the inclusion criteria and agreed to participate in this study. Data collection was conducted at six CHCs in Cianjur District, and involved two groups of participants: GPs and pregnant women. All participating GPs completed a series of study components including a pre-implementation questionnaire, participation in the POCQI implementation process, and a post-implementation questionnaire. The questionnaires for the GPs were distributed digitally using Google Forms.

Pregnant women completed pre- and post-intervention satisfaction questionnaires through face-to-face interviews. Throughout the study period, all ANC services received were documented using the Maternal and Child Health (MCH) handbook. All data were collected by two trained enumerators who had received standardized instructions on the study protocols and instruments. Data collection was conducted during the implementation period and at the end-line phase, using the same methods and tools to ensure consistency.

Research Instruments

The research instrument for GPs' compliance was issued by the Ministry of Health of Indonesia, which adapted and modified aspects available from the MCH Handbook as a standard guideline for ANC.[34] The questionnaire employed a modified Likert scale to measure both healthcare provider and patient perspectives.

1. GPs' compliance with antenatal care service standards was measured using 67 items on a 3-point modified Likert scale: Never; Sometimes; Always.
2. Pregnant women's responses were categorized into five dimensions with 32 items, assessed using a 5-point Likert scale ranging from 1 (Strongly Disagree) to 5 (Strongly Agree) and 1 (Very Dissatisfied) to 5 (Very Satisfied).

A summary of the instrument content is provided in Supplementary Tables 1 and 2.

Internal consistency was evaluated using Cronbach's alpha, with a value of 0.70 or higher considered acceptable.[35] The questionnaires for GPs and pregnant women were first tested for validity and reliability, as presented in Table 1. Instrument testing was conducted in West Bandung District, which shares a geographical border with Cianjur District, the main study site. This location was selected based on its demographic similarities and comparable health service systems to the study area, allowing for relevant instrument testing without overlapping primary intervention sites. Winsteps software was used to analyze the validity, reliability, and unidimensionality of the instrument based on the Rasch model assumptions.[36] The Rasch analysis demonstrated acceptable fit statistics and strong psychometric properties for both instruments.

Data Analysis

Data analysis began with the transformation of ordinal data from all items in each instrument using Rasch modeling via the Winsteps application (version 3.73). This process generates logit-based numerical data that objectively represents GPs' compliance and pregnant women's satisfaction. The Rasch model constructs a measurement scale with equal intervals, allowing for more precise and meaningful interpretation. It simultaneously analyzes the person and item scores to estimate the true scores, which reflect both individual ability levels and item difficulty. This transformation allows

Table 1 Validity and Reliability of the Instrument

Psychometric Attributes	Instrument	
	GP (N=30)	Pregnant Woman (N=36)
Number of items	67	32
Outfit mean square		
Mean	2.02	6.73
Standard deviation	1.01	4.11
Cronbach's alpha	0.94	0.98
Person separation	3.19	3.90
Person reliability	0.91	0.94
Item separation	2.73	6.43
Item reliability	0.88	0.98
Unidimensional		
Raw variance explained by measure	48.8% (>40%)	81.4% (>40%)
Unexplained variance 1st contrast	7% (<15%)	10.5% (<15%)

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ordinal data (eg, Likert-scale responses) to be converted into valid interval-level measures that are suitable for advanced statistical analysis.[37]

Changes in GPs' compliance and pregnant women's satisfaction were analyzed using stacking and racking techniques within the Rasch model framework. As standard Rasch-based approaches, stacking and racking were introduced by Benjamin Wright to assess the extent to which individuals' conceptual understanding and item properties change before and after an intervention.[38] The stacking technique enables the detection of differences in person measures by placing each respondent's pre- and post-intervention responses on a common logit scale, allowing for direct comparison of changes over time.The racking technique is used to examine shifts in item characteristics by aligning the same items across two time points to assess whether item difficulty or endorsement patterns have changed following the intervention. To test the hypothesis regarding the differences in GPs' compliance and pregnant women's satisfaction before and after the implementation of the POCQI, statistical comparisons were conducted using SPSS version 26.0. After each dimension was converted into numerical data through Rasch modeling, the normality of the data was tested. Normally distributed data were analyzed using the paired *t*-test, whereas non-normally distributed data were analyzed using the Wilcoxon signed-rank test to assess baseline and end-line differences.

Ethical Clearance

This study was performed under the ethical clearance obtained from the Health Research Ethics Committee of the Faculty of Medicine, Universitas Padjadjaran, Bandung, approval number: 940/UN6.KEP/EC/2022. All procedures performed in this study conformed to the principles outlined in the Declaration of Helsinki. An information sheet was provided to all pregnant women who met the inclusion criteria, outlining the purpose, procedures, and voluntary nature of the study. Written informed consent was obtained from all participants prior to the commencement of data collection.

Results

Characteristics of Study Participants

A total of 205 pregnant women from six community health centers (CHCs) were invited to participate in this study, all of whom agreed to do so. However, 33 participants were excluded because they did not complete the data and questionnaires. Consequently, the final sample comprised 172 pregnant women who completed both pre- and post-test assessments. The demographic and professional characteristics of the GPs and pregnant women who participated in this study are summarized in Table 2. The study population primarily consisted of pregnant women aged 20–35 years

Table 2 Characteristics of Participants

Characteristics		N (%) or Mean ± SD
Pregnant women	Age of women (years)	
	20–35	168 (97.7)
	>35	4 (2.3)
	Educational status	
	Elementary school	26 (15.1)
	Junior high school	62 (36.0)
	Senior high school	68 (39.5)
	University	16 (9.3)
	Gravida	
	Primigravida	56 (32.6)
	Multigravida	116 (67.4)
GPs	Age (years)	34.5±6.4
	Work Experience (Years)	6.9±4.9
	Educational status	
	GP	7 (87.5)
	Master's Degree	1 (12.5)

(97.7%), mostly with a senior high school or junior high school education (39.5% and 36.0%, respectively). Multigravida women (67.4%) were more common than primigravida women (32.6%). The GPs had an average age of 34.5 ± 6.4 years and a 6.9 ± 4.9 years of work experience, with only one person (12,5%) had a master degree.

Stacking Analysis

A stacking analysis was conducted to evaluate changes in GPs' compliance and pregnant women's satisfaction before and after implementation of the POCQI. Data were analyzed using the Rasch model on a unified logit scale to detect individual-level changes in ability and perception. These changes were quantified as Logit Value Person (LVP), where an increase in LVP indicated an improvement in compliance or satisfaction following the intervention.

Rasch analysis demonstrated an overall increase in LVP, reflecting the improved compliance of GPs with ANC service standards following POCQI implementation. As shown in Figure 1, the Wright Map illustrates a clear upward shift from pre-test (P) to post-test (O), with many post-intervention responses (eg, 010, 030, and 040) positioned at higher logits (6–9). Notably, subject 02 increased from logit 2 (02P) to logit 5 (020), whereas subject 07 shifted from logit −1 to +2, indicating meaningful gains. These findings support the effectiveness of POCQI in enhancing GPs' compliance.

Rasch analysis revealed a substantial increase in LVP for pregnant women's satisfaction after the implementation of the POCQI. Figure 2 shows a clear upward shift from pre-test (P) to post-test (O), with most post-intervention responses (eg, 003O, 025O, 042O, 063O, 084O, and 095O) clustered at higher logits (5–12). In contrast, pre-test responses, such as 069P, 136P, and 168P, were concentrated at lower logits (–7 to 0). Subject 136, for instance, increased from Logit −5 to Logit +10, indicating a notable improvement in perceived service quality. These findings provide evidence that POCQI contributes to improved satisfaction among pregnant women regarding antenatal care services.

Table 3 presents the LVP of GPs and pregnant women at pre-test and post-test. The analysis revealed significant improvements following the implementation of POCQI. The mean LVP for GPs compliance increased from 2.78 (range: –0.88, 5.63) to 5.24 (range: 2.24 to 9.33), with a mean difference of 2.46 ($p = 0.001$). Similarly, pregnant women's satisfaction showed a notable increase, from a mean LVP of 2.94 (range: –8.33 to 12.45) before the intervention to 7.76 (range: –3.83 12.45), yielding a mean difference of 4.82 ($p < 0.001$). These findings confirmed that POCQI implementation significantly enhanced GPs' compliance and pregnant women's satisfaction regarding antenatal care services.

Racking Analysis

This study also applied racking analysis to evaluate changes in item difficulty, expressed as logit value items (LVI), between the pre-test and post-test. A decrease in the LVI indicated that an item became easier to perform or endorse following the intervention. This analysis was used to determine whether items related to GPs' compliance and pregnant women's satisfaction shifted after implementation of the POCQI. Lower LVI scores on the post-test reflect improved compliance with ANC service standards among GPs and a more positive service experience from the perspective of pregnant women. The Wright Map (Figure 3) demonstrated a significant decrease in Logit Value Item (LVI) scores for most post-test items, indicating that the tasks became easier to perform following the implementation of the POCQI. Several items previously located at higher logits in the pre-test, such as P13, P17, P23, and P31, shifted to lower positions in the post-test (O13, O17, O23, and O31), reflecting improved understanding and compliance with ANC service standards among the GPs.

Although a few post-test items, such as O13 and O21, remained above the 0-logit line, their difficulty levels were still lower than their corresponding pre-test versions, indicating progress despite the continued challenges in performing those tasks. Additionally, the majority of the post-test items were distributed in the negative logit range, such as O4 to O12 and O30 to O59, suggesting that these tasks were perceived as significantly easier after the intervention. These findings reinforce that the implementation of the POCQI effectively reduced item difficulty and improved GPs' ability to perform ANC procedures in accordance with the established service standards.

Figure 4 shows the Wright Map depicting changes in item difficulty levels (LVI) derived from the racking analysis of pregnant women's satisfaction before and after post-POCQI implementation. The post-test items (eg, O1 to O5) are positioned at significantly lower logit levels than the pre-test items (P1 to P5), which are mostly concentrated in the

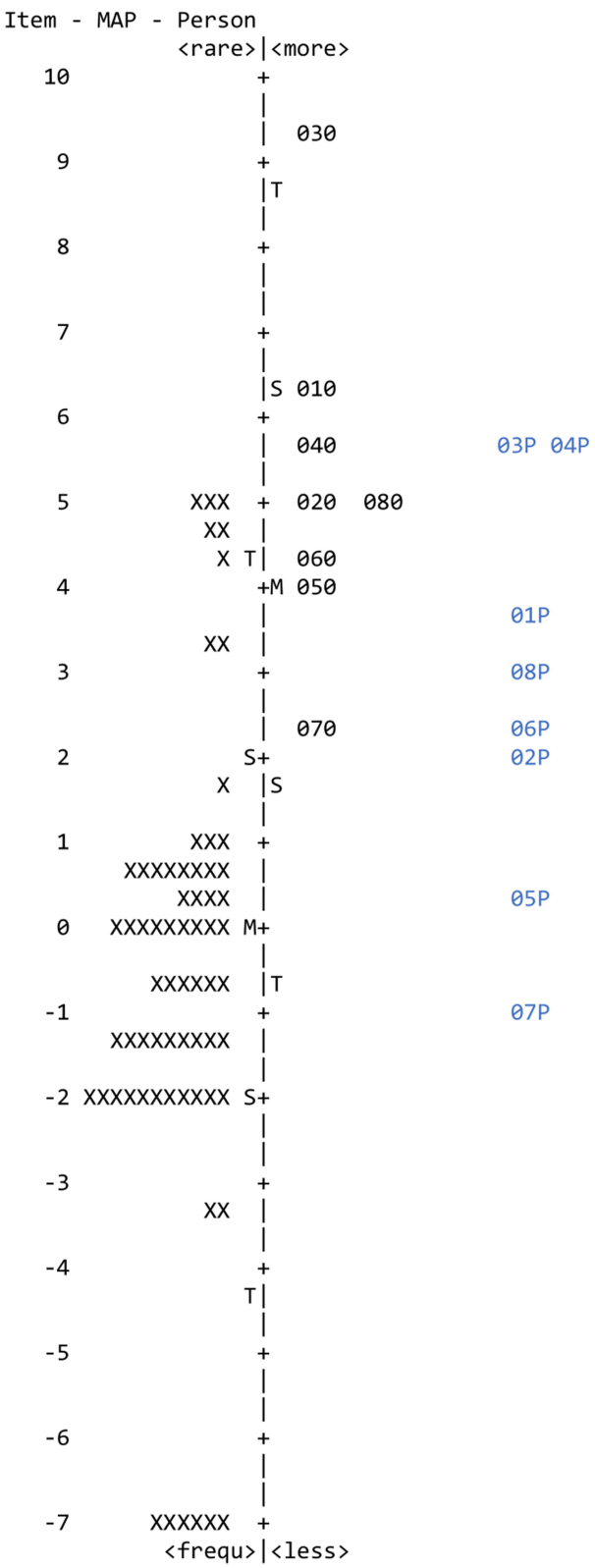

Figure 1 Wright map of GPs' compliance with antenatal care service standards before and after the POCQI implementation: Stacking of ANC service compliance.

Figure 2 Wright map of pregnant women's satisfaction before and after the POCQI implementation: Stacking of satisfaction with antenatal care services.

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Table 3 GPs and Pregnant Women's Logit Value Person (LVP) at Pre- and Post-Test

Variables	Before Implementation	After Implementation	Difference	P Value*
GPs' compliance				
Mean ± SD	2.78 ± 2.28	5.24 ± 2.05	2.46	0.001[a]
Median (Min-Max)	2.80 (−0.88 to 5.63)	5.13 (2.24 to 9.33)		
Pregnant women's Satisfaction				
Mean ± SD	2.94 ± 4.99	7.76 ± 4.17	4.82	<0.001[b]
Median (Min-Max)	1.82 (−8.33 to 12.45)	8.23 (−3.83 to 12.45)		

Notes: *Significant at p<0.05. [a] GPs' compliance data were analyzed using the paired *t*-test (normality test p > 0.05). [b] Pregnant women's satisfaction data were analyzed using the Wilcoxon signed-rank test (normality test p ≤ 0.05).

positive logit range (logits 1 to 2). This downward shift in logit positions indicates that satisfaction-related statements became easier to endorse or were rated more positively by respondents following the intervention. These findings suggest improved perception of antenatal care service quality among pregnant women. Overall, the results indicate that POCQI not only enhanced healthcare provider compliance but also had a direct impact on improving patient experience and satisfaction with ANC services.

Table 4 presents the changes in the Logit Value Item (LVI) across two main variables: GPs' compliance with service standards and pregnant women's satisfaction with ANC services.

The mean LVI (Table 4) for GPs' compliance before the intervention was 0.01 (range: –4.49 to 6.18). After the implementation of POCQI, this value significantly decreased to –2.42 (range: –4.49 to 3.21), with a mean difference of 2.41 ($p < 0.001$). This reduction indicates that compliance-related items became easier to perform according to the standards, reflecting improved skills and consistency among GPs in providing ANC. For pregnant women satisfaction, the mean LVI before the intervention was 1.89 (range: 1.62 to 2.15), which decreased to –1.89 (range: –2.29 to –1.40) after the intervention. The mean difference of 3.78 ($p < 0.001$) suggests that pregnant women more readily agreed with or experienced the positive aspects of the services provided, indicating improved satisfaction following the implementation of the POCQI.

Discussion

This study demonstrated that implementing the POCQI approach in CHCs resulted in notable improvements in general practitioners' (GPs') compliance with ANC standards and pregnant women's satisfaction with the services received. The intervention strengthened adherence to evidence-based clinical practices among GPs and enhanced the delivery of patient-centered care, leading to better-perceived service quality. These findings suggest that integrating quality improvement principles into routine ANC services can effectively bridge the quality gaps patient experience, particularly within resource-constrained primary healthcare settings.

Consistent with previous research, POCQI has been shown to improve compliance with evidence-based guidelines, enhance medical record systems, and increase service effectiveness in healthcare facilities.[31] There were persistent barriers to ANC delivery, including fragmented service integration, poor documentation, and limited managerial supervision at the primary care level in Indonesia.[9] Afrizal et al highlighted that incomplete documentation and weak monitoring systems undermined continuity and accountability in maternal programs.[33] Similarly, Al Yunus et al found variations in ANC implementation across health centers due to unequal staff training and inadequate supervision.[39] These challenges mirrored the baseline gaps in the present study—particularly in documentation and adherence to clinical standards. Through structured mentorship, continuous feedback, and real-time data use, the POCQI approach effectively addressed these weaknesses.

One study in Tanzania have implemented quality improvement interventions for maternal health services, which were conducted in primary health care facilities in rural areas. Unfortunately this cluster-randomized trial in rural Tanzania found no significant improvements in provider competence or patient satisfaction.[40] Although this study followed multifaceted quality intervention, failure occurred primarily due to challenges in maintaining implementation fidelity

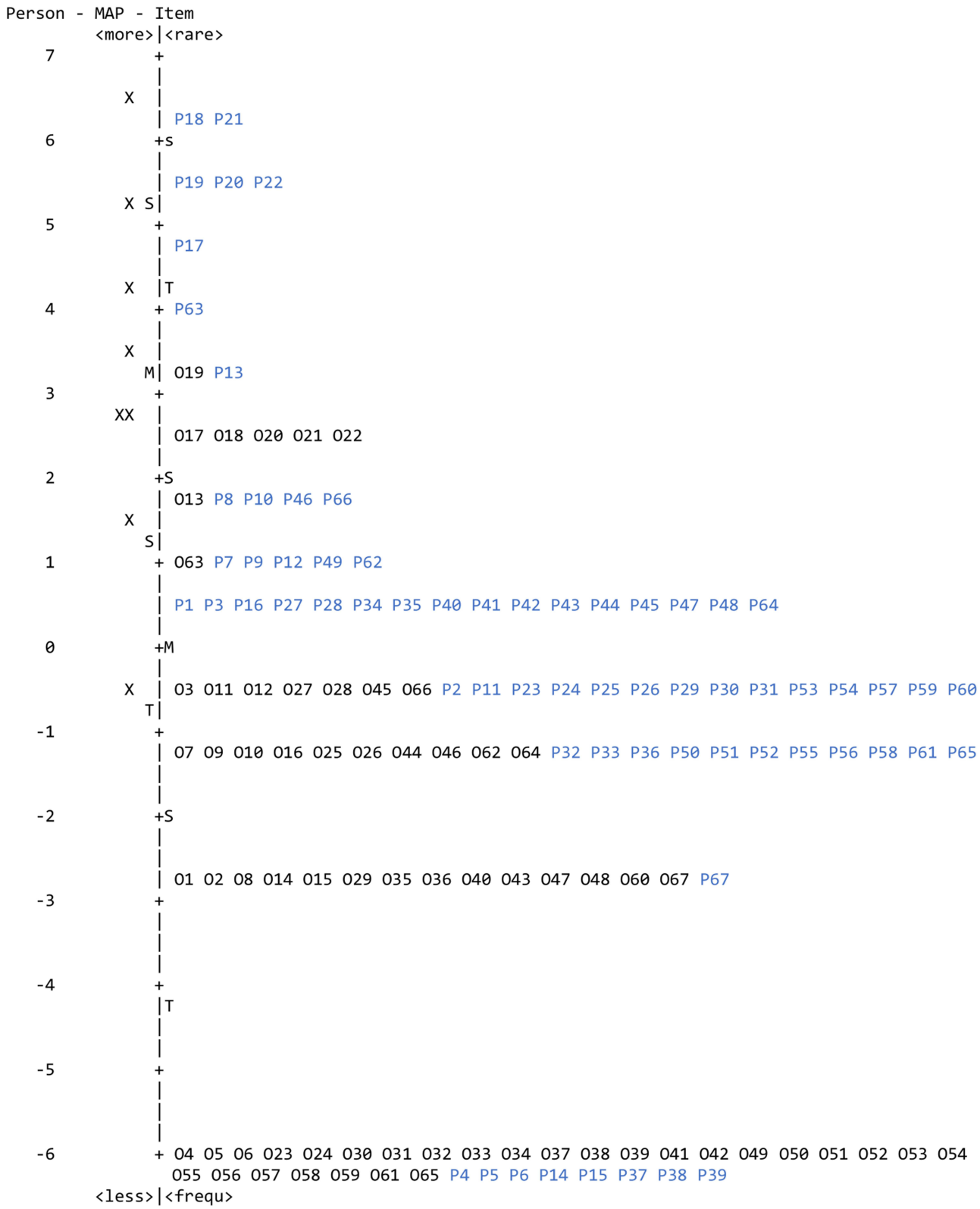

Figure 3 Wright map of LVI for GPs' compliance with ANC standards: Racking analysis before and after the POCQI implementation.

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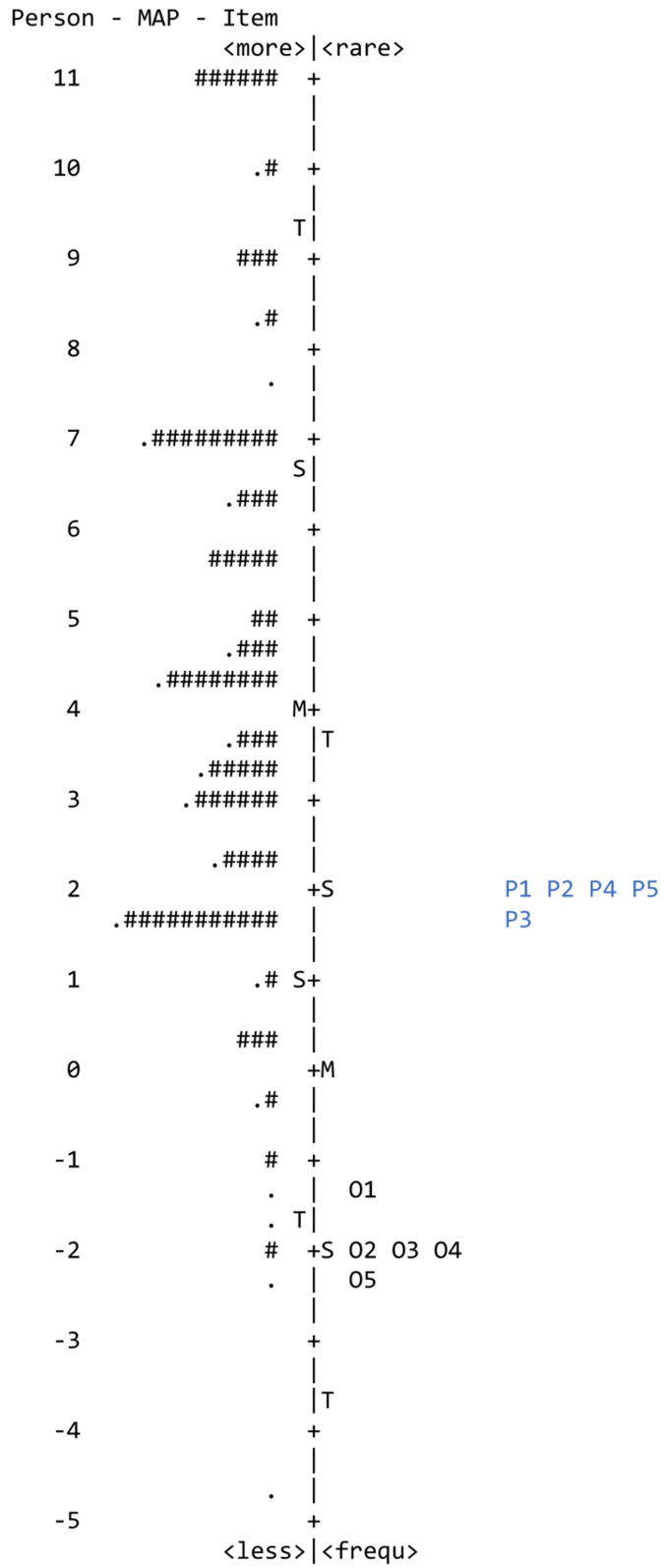

Figure 4 Wright map of LVI for pregnant women's satisfaction with ANC services: Racking analysis before and after the POCQI implementation.

Table 4 GPs and Pregnant Women's Logit Value Item (LVI) at Pre- and Post-Test

Variables	Before Implementation	After Implementation	Difference	P Value*
LVI measuring GPs Mean ± SD Median (Min-Max)	 0.01 ± 2.54 −0.39 (−4.49 to 6.18)	 −2.42 ± 2.28 −2,76 (−4.49 to 3.21)	2.41	<0.001[a]
LVI measuring pregnant women Mean ± SD Median (Min-Max)	 1.89 ± 0.19 1.9 (1.62 to 2.15)	 −1.89 ± 0.32 −1.91 (−2.29 to −1.40)	3.78	<0.001[b]

Notes: *Significant at p<0.05. [a] GPs' compliance data were analyzed using using the Wilcoxon signed-rank test (normality test p ≤ 0.05). [b] Pregnant women's satisfaction data were analyzed using the paired *t*-test (normality test p > 0.05).

and the limited baseline capacity of health facilities.[40] The POCQI framework introduced an innovative, team-based quality-improvement strategy that emphasized continuous problem-solving, structured feedback, and shared responsibility within healthcare teams. These collaborative and iterative processes were seamlessly integrated into existing community health center workflows, strengthening teamwork and communication, fostering a patient-centered environment, and sustaining quality-improvement efforts even within limited resource settings. Consistent with Gupta et al, empowering front-line staff is a key driver of accelerating and sustaining improvements. Regular feedback through weekly huddles facilitates ongoing communication between staff and leadership, ensuring continuous engagement and accountability in quality improvement efforts.[41]

One study in Yogyakarta, Indonesia, reported that POCQI improved the quality of neonatal health service and early breastfeeding, but ANC quality improvement was not included.[42] Supporting evidence of POCQI successes came from studies conducted in India and Qatar. In India, the Quality Improvement (QI) approach increased electronic partograph use from 30% to 93%, reduced obstructed/prolonged labor from 6.2% to 2.4%, and lowered neonatal ICU admissions for birth asphyxia from 8% to 3.4%, with sustained results after the PDSA cycle.[43] In Qatar, implementation of POCQI was named "value improvement model", led to early discharge among non obstetric case to rise from 9% to 70%, a 68% reduction in skin injuries, increased direct nursing care time (57% to 75%), and improved staff satisfaction (60% to 100%), all without added cost.[41] These results collectively highlight POCQI's adaptability and effectiveness across diverse healthcare systems.

Our study demonstrated that POCQI improved provider compliance with national ANC standards outlined in the MCH Handbook, reaffirming its relevance and impact at the primary care level. A correlation analysis using aggregated CHC-level data showed that a strong positive association between GPs' compliance with ANC standards and women's satisfaction ($r = 0.762$, $p = 0.078$; $R^2 = 0.581$), as illustrated in Supplementary Figure 1. Health care provider performance relates with client's satisfaction, as reported by the studies of two researcher highlighting the role of provider competence, responsiveness, and empathy in shaping maternal satisfaction.[44,45] Comparable results in Ethiopia and Zambia further demonstrate that both technical and interpersonal care dimensions influence women's perceptions of ANC quality.[46,47] The improvements achieved through POCQI—in communication, empathy, and accountability—reflect these dimensions and illustrate its potential to enhance ANC services in resource-limited settings.

The primary challenge encountered during the implementation of the POCQI is the third stage, namely, the design and execution of quality improvement interventions using the PDSA cycle. Barriers to the implementation of PDSA include a lack of understanding among healthcare workers, who perceive it as too technical and difficult to apply due to limited training.[48] In CHCs in Cianjur District, the transition from the Plan-Do-Check-Act (PDCA) to the PDSA model encountered both challenges and facilitators. A major barrier is the long-standing preference for PDCA, which is considered simpler and more practical for routine quality improvement.[49] As healthcare systems grow more complex, a shift to PDSA becomes increasingly necessary. However, many healthcare workers find PDCA easier and less time-consuming, leading to resistance in adopting PDSA. This resistance was reflected in the early interview.

> We have been accustomed to using PDCA, which is simply a checklist to ensure whether a task has been completed or not. However, PDSA is something we are applying for the first time, and although we understand its basic principles, we are still unsure about how to implement it.

The PDSA cycle is an adaptation of the PDCA model and has become a key tool for healthcare quality improvement.[50] In contrast to PDCA, the PDSA cycle places greater emphasis on data analysis and outcome assessment during the 'Study' phase, thereby fostering continuous learning and quality improvement.[51] This approach is consistent with accreditation standards that emphasize patient safety and the quality of care.[52] Accreditation requirements have emerged as key drivers for the adoption of the PDSA cycle. The POCQI framework has been instrumental in helping healthcare workers understand and apply PDSA through a structured learning approach, effectively addressing initial challenges and fostering evidence-based quality improvement. As one POCQI team member noted:

> POCQI has helped me greatly in the accreditation process and its implementation, so I understand it better. Moreover, the POCQI accelerated the quality improvement process and helped identify problems faster. The PDSA is now part of the accreditation assessment. POCQI has truly assisted me in the accreditation process, and we are grateful and feel supported.

This study showed that most ANC quality parameters improved; however, some areas should be enhanced. This is consistent with the findings of Sharma et al in India, who reported that the POCQI significantly improved ANC practices, including weight (0–84%), height (0–74%), blood pressure (0–84%), and hemoglobin (58–84%) measurements [46]. Additionally, 76% of pregnant women received structured nutritional counseling, which increased their awareness of IFA, calcium intake, and pregnancy weight gain. The intervention also enhanced staff confidence and motivation, demonstrating that quality improvement can be achieved with minimal additional resources.[53]

The implementation of the POCQI in CHCs has significantly enhanced healthcare quality, demonstrating its effectiveness in strengthening health systems. Training and coaching improves providers' understanding, engagement, and QI skills, resulting in better service delivery. Patients also reported greater satisfaction owing to clearer communication, improved provider attentiveness, and reduced waiting times. These findings affirm that POCQI is an effective strategy for improving service performance and patient satisfaction.[32]

Chen et al demonstrated a strong association between patient-reported health outcomes and satisfaction, suggesting that higher satisfaction is indicative of better healthcare quality.[54] Odhayani and Khawaja emphasized the importance of effective communication, particularly in shared decision-making and explaining treatment outcomes, to enhance patient satisfaction.[55] Moreover, allocating more time to clarify information and discuss treatment options has been linked to greater satisfaction and improved adherence.[56] In line with these findings, the present study observed increased engagement of GPs in providing antenatal consultations to pregnant women following implementation of the POCQI approach.

As mandated by the Regulation of the Minister of Health No. 30 of 2022, compliance with ANC standards is central to Indonesia's National Quality Indicators, aiming to strengthen healthcare quality through structured reporting.[57] The successful implementation of the POCQI in ANC is also supported by the mandatory accreditation for CHC (Regulation of the Minister of Health No. HK.01.07/MENKES/90/2023), which requires quality improvement systems.[58] POCQI, through the PDSA cycle, aligns with accreditation by identifying problems, testing solutions, and promoting continuous improvement, ultimately enhancing service quality, patient safety, and staff collaboration.[59]

This study demonstrated an improvement in pregnant women's satisfaction following the implementation of the POCQI approach. This finding is consistent with previous research demonstrating a strong link between patient-reported health outcomes and satisfaction, suggesting that higher satisfaction reflects better healthcare quality.[54] Key contributing factors include effective communication by GPs, adequate time for patient education, positive provider attitudes, and efficient healthcare system organization.[60,61]

The limited number of health care workers at health centers, especially GPs, is one of the main barriers to improving the quality of ANC services. With only one GP serving many patients, a high workload affects the depth of the services

that can be provided. Many healthcare workers also have to take on two jobs, which adds pressure and worsens the quality of their services. This often leads to limited time for providing adequate attention to pregnant women, which in turn impacts the quality of the ANC services provided. As mentioned in the quote,

> At the health center, we only have one general practitioner, and they're overwhelmed with patients every day. Many of us have to juggle multiple roles, which makes it hard to focus on giving quality antenatal care. After the examination, we can only provide minimal services because of limited time and resources.

Overall, the POCQI intervention had significant positive outcomes on maternal health by improving key indicators such as preeclampsia prevention, treatment adherence, and nutritional status. These findings highlight the effectiveness of the POCQI in enhancing antenatal care quality and reducing pregnancy-related risks at the community health care level.

This study has several limitations. Firstly, the absence of a control group limited the ability to determine whether the observed improvements were solely due to POCQI intervention. Secondly, due to limitation of the observation time (six month for each CHC) this study did not assess pregnancy and child health outcomes. The fact that there was disruptions of implementation due to the 2022 Cianjur earthquake, causing a four-month delay between training and implementation, temporary reassignment of health personnel and reduced ANC attendance, health care resilience improved. In this context this study offered valuable insights into the adaptability and resilience of the POCQI approach, maintaining strong motivation and successfully resumed implementation once recovery began. This experience highlights that POCQI can be effectively applied even in disrupted, post-disaster environments—provided it is supported by a responsive, collaborative, and committed team.

Conclusion

The implementation of the POCQI approach, which primarily is supported by continuous mentorship, guardianship and constructive feedback, proved that it led to improved GP compliance to ANC standards and increased maternal satisfaction toward ANC services. GP compliance are reflected in improved service processes and maternal health outcomes. Sustainability of these improvements have been proven through accomplishment during disaster. It is suggested that such POCQI approach be implemented in larger scale in west java and eventually throughout Indonesia as a national policy to strengthen healthcare quality management system in the primary level.

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Disclosure

The authors declare no conflicts of interest associated with this study.

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