

Application of a Modified Comprehensive Care Map for Elderly Postnatal Mothers after Caesarean Section to Enhance Maternal and Neonatal Outcomes: A Pilot Study

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ABSTRACT

Introduction: Caesarean Section (CS) is a surgical procedure with a challenging recovery period, especially for elderly postnatal mothers who may experience higher risks of complications. Effective postnatal care is essential in ensuring optimal maternal and neonatal outcomes.

Aim: The present study evaluates a Modified Comprehensive Care Map (MCCM) for elderly postnatal mothers to enhance recovery, improve wound healing, reduce postnatal depression, and support neonatal well-being.

Materials and Methods: The present pilot study was conducted at AVBRH, Wardha, Maharashtra, India, starting in December 2022. Thirty participants were randomly assigned to experimental group receiving the MCCM intervention and control group receiving standard postnatal care. Maternal and neonatal outcomes, including pain, depression, wound healing, and latching, were assessed. Data were collected at baseline,

during hospitalisation, and follow-up visits, with statistical analysis performed.

Results: Postintervention, the knowledge scores in staff nurses were significantly higher in the experimental group ($p=0.0001$). Similarly, postintervention, the experimental group showed significant improvements in oedema ($p=0.041$), ecchymosis ($p=0.004$), and total REEDA score ($p=0.006$) among mothers. A significant reduction in Postnatal Depression Scores (PDS) was observed in the mothers in experimental group ($p<0.01$). The experimental group had a higher percentage of pain-free mothers postintervention (46.67% vs. 23.33% in the control group). While improvement was observed in latching and sucking, statistical significance was not achieved ($p=0.3006$).

Conclusion: The MCCM significantly improved wound healing, reduced postnatal depression, and enhanced pain management among elderly postnatal mothers.

Keywords: Elderly primigravida mothers, Latching and sucking, Pain management, Wound healing and postnatal depression

INTRODUCTION

When a woman age 30 or older delivers childbirth for the first time, she may encounter three pregnancy-related issues like gestational hypertension and preeclampsia, delayed wound healing after CS and postnatal depression that could have major ramifications for both the mother and the foetus [1]. Due to improved levels of knowledge, effective contraceptives, and high aspirations for careers, the rate of senior primigravida has grown recently. Elderly primigravida are women who get pregnant over the age of thirty-five [2]. The Indian norm is more than thirty years by Dutta DC. These women are more likely to experience challenges and unfavourable outcomes that could have an impact on both the mother and the foetus [3]. The risk of pregnancy among older moms is still very high, although it happens quite frequently [4]. Older women are more vulnerable to the risks of pregnancy-related diabetes, high blood pressure, induced labour, prolonged labour, malpresentations and malposition, antenatal and postpartum haemorrhage, and prolonged labour [5].

There has been significant research in the outcomes of elderly primigravida mothers (typically aged 35 or older) undergoing CSs because of a greater risk of both maternal and neonatal morbidity. Additionally, caesarean delivery itself carries risks like infections, blood clots, and longer recovery times for the mother, while neonates born via CS are at higher risk for respiratory problems, birth injuries, and lower APGAR scores [6]. Thus, with adequate antenatal care, early recognition of complication and timely intervention, optimum outcome can be expected [7].

Clinical pathways refer to systematic, multidisciplinary treatment strategies that delineate the necessary procedures for addressing

particular clinical issues in patients. They facilitate the translation of regional protocols- which are based on medical standards and are then used in clinical practice- from local norms [8]. Clinical pathways, or standardised care protocols, have been studied extensively in various obstetric contexts, including CS delivery. Clinical pathways focuses on giving streamline care, reducing variability, and improving patient outcomes by providing standardised guidelines for healthcare providers [9]. However, the care needs of older primigravida mothers may differ significantly from those of younger women. The standard clinical pathways are not always fitted to the unique challenges and higher risks faced by this demographic, such as pre-existing conditions like hypertension, diabetes, and advanced maternal age, which complicate both the pregnancy and post-delivery recovery.

The primigravida mothers aged 35 and older, undergoing CS has unique care requirements, which are not always adequately addressed by standard clinical pathways. There is limited research in modified compressive care map for primigravida mother whose age is 30 years and above, undergoing CS [10]. Thus, this study was conducted in two phases. Phase I focuses on developing the Modification Comprehensive Care Map (MCCM) for elderly primigravida mothers post-CS. Phase II assesses nurses' existing knowledge through a pre-test, followed by training for MCCM implementation. The efficacy of MCCM is then evaluated in improving maternal and neonatal outcomes, and its effectiveness is compared with conventional care.

MATERIALS AND METHODS

The present pilot study was conducted at Acharya Vinoba Bhave Gramin Rughalay, Wardha District, Maharashtra, India. The study

commenced in December 2022 and was completed in December 2023. Institutional ethical approval was granted by the Datta Meghe Institute of Higher Education and Research (Deemed to be University) under IEC/DEC/2022/472. Participants were randomly selected based on the inclusion and exclusion criteria.

Inclusion and Exclusion criteria:

Mothers:

- **Inclusion criteria:** Elderly primigravida mothers (aged 30 above, giving birth for the first time) undergoing elective or emergency CS, with singleton pregnancies, no severe co-morbidities (e.g., active infections, malignancies), and willing to provide informed consent.
- **Exclusion criteria:** Mothers with uncontrolled chronic conditions (e.g., hypertension, diabetes, autoimmune diseases) or neonates with congenital anomalies requiring specialised neonatal care.

Nurses:

- **Inclusion criteria:** Registered nurses working in obstetric wards or labour and delivery units, with $\geq$ six months of obstetric/maternal care experience, involved in CS care, willing to undergo MCCM training, and available for the study duration.
- **Exclusion criteria:** Nurses unwilling to participate in MCCM training or those enrolled in conflicting advanced education programs.

Sample size selection: A convenience sample of 30 participants per group was selected due to feasibility constraints, ensuring equal distribution between the experimental and control group. Demographic variables recorded for nurses were age, level of education, marital status, year of experience, and prior knowledge regarding the care map. Demographic variable recorded for mothers were age, gestational age and types of a caesarean

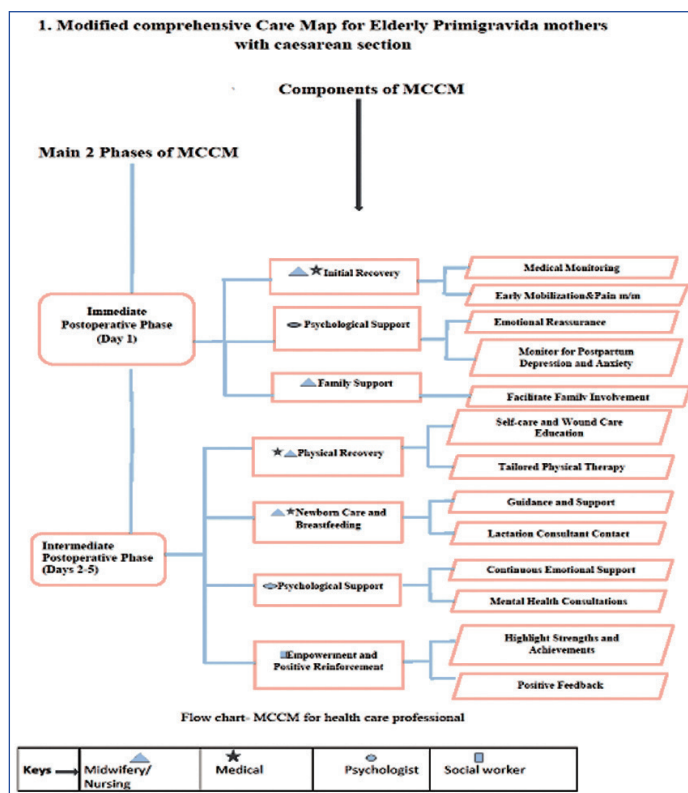
Modification Comprehensive Care Map (MCCM): Based on the concept of Virginia Henderson's 14 fundamental needs form the foundation of nursing care [11], a MCCM was developed to provide structured, evidence-based, and holistic postpartum care for elderly primigravida mothers undergoing C-section.

The MCCM ensures optimal maternal recovery and newborn well-being by addressing key aspects such as immediate assessment, oxygenation, pain management, mobility, nutrition, hygiene, emotional support, health education, and discharge planning. This structured approach enhances safe recovery, breastfeeding success, and overall maternal confidence in newborn care [Table/Fig-1].

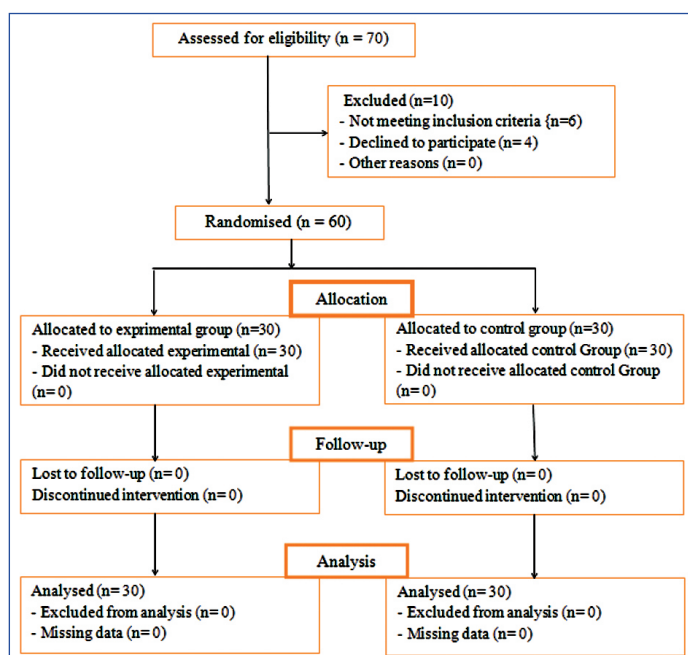
Study Procedure

Data collection: The study adopted a prospective interventional design to evaluate the effectiveness of a MCCM in improving maternal and neonatal outcomes among elderly postnatal mothers following a CS. Although randomisation was used for group allocation [Table/Fig-2].

The study commenced with a baseline knowledge assessment consisting of 25 questions. The scoring criteria allotted 1 mark for each correct response and 0 for an incorrect response. Thus, the minimum possible score was 0 and the maximum possible score was 25. A total of 60 staff nurses to determine their understanding of postnatal care for elderly mothers. After this assessment, staff nurses were randomly assigned to two groups: An experimental group and a control group, each consisting of 30 staff nurses by the method of block randomisation. The 30 nurses of experimental group underwent structured training on the implementation of MCCM to ensure consistent and effective application of the intervention. The knowledge of participants was assessed after the structured training also. The knowledge scores were evaluated using a structured questionnaire consisting of 25 multiple-choice questions related to the clinical pathway for mothers undergoing CS. The scores ranged from 0-25.



[Table/Fig-1]: MCCM flow chart in methodology.



[Table/Fig-2]: Study flowchart.

Participant mothers were also assigned by the method of block randomisation into two groups. The experimental group, which received care based on MCCM, and the control group, which continued to receive standard postnatal care. Before the implementation of MCCM.

On the 2nd postnatal day, MCCM-based care was introduced to the experimental group, while the control group continued receiving routine postnatal care. To measure the effectiveness of MCCM, maternal and neonatal outcomes were assessed using validated tools. Maternal outcomes included:

- **Wound healing**, evaluated using the REEDA Scale on 2nd postnatal day and 7th postnatal day (Redness, Oedema, Ecchymosis, Discharge, Approximation). REEDA Scale Assesses caesarean incision healing across five categories: Redness, Oedema, Ecchymosis, Discharge, and Approximation. Each category is scored from 0 to 3 (0=No signs, 3=Severe).

Total Score: 0-15 (higher scores indicate poor wound healing) [12].

- **Pain levels**, assessed with the Visual Analog Scale (VAS). On 2nd and 7th postnatal day. VAS measures pain intensity on a 0-10 scale. For the purpose of this study, VAS was classified as no pain (0), mild pain (1-3), moderate pain (4-6), and severe pain (7-10)
- **Postnatal depression**, measured using the Edinburgh Postnatal Depression Scale (EPDS) at two time points: the 1st postnatal week and again at the 4th postnatal week, following MCCM implementation. EPDS. Measures postpartum depression using 10 questions each scored 0 to 3. Total Score: 0-30 [13].

The neonatal outcome of breastfeeding effectiveness, focusing on latching and sucking, was assessed on postnatal Day 2 and Day 7. These time points were selected to capture feeding behaviours during the early postpartum period and the established phase of lactation. Day 2 represents the initiation of breastfeeding, while Day 7 corresponds to the period when mature milk production is typically established. This approach aligned with clinical guidelines and existing literature recommending both early and follow-up assessments to identify and monitor breastfeeding challenges [14].

STATISTICAL ANALYSIS

Data were analysed using Statistical Package for Social Sciences (SPSS) version 26.0. Descriptive statistics like mean, standard deviation, frequency, and percentage were used to describe the data. To compare results before and after the intervention within groups, the paired t-test was used for data that followed a normal distribution.

RESULTS

The nurses and the mothers in the experimental and control groups were comparable with no significant difference for age, education, experience, gestational age and types of CS between them ($p>0.05$) [Table/Fig-3,4].

Parameters		Experimental group Number (%)	Control group Number (%)	p-value
Age (years)	21-25	6 (20.0%)	8 (26.7%)	0.399279
	>25-30	13 (43.3%)	8 (43.3%)	
	>30	11 (36.7%)	14 (46.7%)	
Education	GNM	13 (43.3%)	18 (60.0%)	0.420551
	B.Sc	16 (53.3%)	11 (36.7%)	
	PB BSc	1 (3.3%)	1 (3.3%)	
Experience	<1 year	11 (36.7%)	10 (33.3%)	0.354402
	1-5 years	19 (63.3%)	18 (60.0%)	
	>5 years	0 (0.0%)	2 (6.7%)	
Previous information about care map	Journal	13 (43.3%)	13 (43.3%)	0.789693
	Magazines	10 (33.3%)	8 (26.7%)	
	Newspaper	7 (23.3%)	9 (30.0%)	

[Table/Fig-3]: Demographic variables of staff nurses.

For knowledge scores of staff nurses, the two groups had comparable knowledge at baseline ($p=0.437$). However, post intervention, the knowledge scores were significantly higher in the experimental group ($p=0.0001$). Similarly, on intragroup comparison, the knowledge scores improved significantly in the experimental group at post-test ($p=0.0001$) [Table/Fig-5].

Wound healing assessment using REEDA Scale on the 3rd postnatal day showed no significant difference between the control and experimental groups across all parameters, as indicated by p-values greater than 0.05 in redness (0.876), oedema (0.907), ecchymosis (0.567), discharge (0.504), approximation (0.067), and total score (0.450) as shown in [Table/Fig-6].

Variables		Experimental group Number (%)	Control group Number (%)	p-value
Age (years)	30-31	11 (36.7%)	11 (36.7%)	0.9213
	32-33	8 (26.7%)	7 (23.3%)	
	34-35	8 (26.7%)	10 (33.3%)	
	36 and above	3 (10.0%)	2 (6.7%)	
Gestational age	37 week of gestation	10 (33.3%)	13 (43.3%)	0.6989
	38 week of gestation	17 (56.7%)	15 (50.0%)	
	39 week of gestation	3 (10.0%)	2 (6.7%)	
Types of Caesarean Section (CS)	Elective	26 (86.736.7%)	28 (93.3%)	0.3894
	Emergency	4 (13.3%)	2 (6.7%)	

[Table/Fig-4]: Demographic variable of mothers.

Knowledge	Samples Nos.	Control	Experimental	p-value
Pre	30	5.57 (0.928)	5.39 (0.850)	0.437
Post	30	5.79 (0.97)	7.839 (0.964)	0.0001
p-value		0.21	0.0001	

[Table/Fig-5]: Knowledge scores for nurses.

Parameters	Groups	N	Mean	Std. Deviation	Median	Z-test	p-value
Redness	Control	30	1.433	1.006	1.00	-0.156	0.876
	Experimental	30	1.467	0.819	1.00		
Oedema	Control	30	1.733	1.081	2.00	-0.117	0.907
	Experimental	30	1.700	1.022	2.00		
Ecchymosis	Control	30	1.433	1.135	1.00	-0.572	0.567
	Experimental	30	1.400	0.814	1.00		
Discharge	Control	30	0.867	0.730	1.00	-0.669	0.504
	Experimental	30	0.967	0.718	1.00		
Approximation	Control	30	0.767	1.223	0.00	-1.829	0.067
	Experimental	30	0.967	0.718	1.00		
Total score	Control	30	6.233	2.763	6.00	-0.755	0.450
	Experimental	30	6.500	1.943	6.00		

[Table/Fig-6]: Wound healing assessment using REEDA scale on the 2nd postnatal day.

Wound Healing Assessment using REEDA Scale on the 7th postnatal day indicated a significant reduction in oedema ($p=0.041$), ecchymosis ($p=0.004$), and total score ($p=0.006$) in the experimental group compared to the control group. However, no significant differences were observed for redness ($p=0.634$), discharge ($p=0.652$), and approximation ($p=0.973$) as shown in [Table/Fig-7].

Parameters	Groups	N	Mean	Std. Deviation	Median	Z-test	p-value
Redness	Control	30	1.0667	0.78492	1.0000	-0.4764	0.634
	Experimental	30	0.9333	0.36515	1.0000		
Edema	Control	30	1.2	0.71438	1.0000	-2.045	0.041
	Experimental	30	0.8333	0.74664	1.0000		
Ecchymosis	Control	30	1.2	0.80516	1.0000	-2.845	0.004
	Experimental	30	0.6333	0.61495	1.0000		
Discharge	Control	30	0.7333	0.52083	1.0000	-0.451	0.652
	Experimental	30	0.6667	0.47946	1.0000		
Approximation	Control	30	0.5667	0.8172	1.0000	-0.034	0.973
	Experimental	30	0.4667	0.50742	1.0000		
Total score	Control	30	4.7667	1.85106	5.0000	-0.034	0.006
	Experimental	30	3.5333	1.13664	4.0000		

[Table/Fig-7]: Wound Healing Assessment using REEDA Scale on the 7th postnatal day.

The PDS was assessed at the 1st and 4th postnatal weeks to evaluate the effectiveness of the MCCM. At the 1st week, the mean PDS in the control group was 10.33±2.65, while in the experimental group, it was 9.77±2.70, with no statistically significant difference (p=0.381). However, by the 4th week, the mean PDS had significantly decreased in the experimental group (4.53±2.24) compared to the control group (6.47±2.19), showing a statistically significant difference (p<0.01). This suggests that MCCM had a positive impact in reducing postnatal depression over time as shown in [Table/Fig-8].

postnatal week	Groups	Mean	Std. Deviation	Median	Z-test	p-value
1 st week	Control	10.3333	2.65659	10.00000	-0.8754	0.381
	Experimental	9.7667	2.69972	10.00000		
4 th week	Control	6.4667	2.19299	7.00000	0.381357	<0.01
	Experimental	4.5333	2.23966	5.00000		

[Table/Fig-8]: Postnatal Depression Score (PDS) assessment.

The preintervention Visual Analog Scale (VAS) pain level distribution shows no significant difference between the Control and Experimental groups ($\chi^2=4.737$, p=0.192), indicating comparable baseline pain levels across both as shown in [Table/Fig-9].

VAS post		Group		Total	Chi-square	p-value
		Control	Experimental			
No pain	Freq	1	2	3	4.737	0.192132
	%	3.33%	6.67%	5.00%		
Mild pain	Freq	6	8	14		
	%	20.00%	26.66	23.33		
Moderate pain	Freq	17	16	33		
	%	56.66%	53.33%	55.00%		
Severe pain	Freq	6	4	10		
	%	20.00%	13.33%	16.66%		

[Table/Fig-9]: Pain level assessment using Visual Analog Scale (VAS) on the 2nd postnatal day.

On 7th postnatal day, VAS pain distribution suggests an improvement in pain levels, with the experimental group having a higher proportion of pain-free participants (46.67 vs. 23.33%) and fewer cases of mild and acute pain compared to the control group. Although the Chi-square test results showed no significant difference between the groups, the observed shift indicates a positive impact of the intervention [Table/Fig-10].

VAS post		Group		Total	Chi-square	p-value
		Control	Experimental			
No pain	Freq	7	14	21	3.607	0.165
	%	23.33%	46.67%	35.00%		
Mild pain	Freq	12	8	20		
	%	40.00%	26.67%	33.33%		
Moderate pain	Freq	11	8	19		
	%	36.67%	26.67	31.67		
Severe pain	Freq	0	0	0		
	%	0.00%	0.00%	0.00%		

[Table/Fig-10]: Pain level assessment using Visual Analog Scale (VAS) on the 7th postnatal day.

On 2nd postnatal day, latching and sucking assessment shows that most babies in both the control (24, 80%) and experimental (21, 70%) groups struggled with latching or maintaining suction. However, fewer babies in both groups latched effectively control 3 (10%) and experimental 4 (13.33%) [Table/Fig-11].

On 7th postnatal day, latching and sucking assessment showed improvement in both groups, with more babies latching effectively

Parameters		Group		Total	Chi-square	p-value
		Control	Experimental			
Baby latches effectively, maintains good suction throughout feeding	Freq	3	4	7	0.8429	0.6561
	%	10.00%	13.33%	11.67%		
Baby struggles with latching or maintaining suction, may require frequent re-latching	Freq	24	21	45		
	%	80.00%	70.00%	75.00%		
Baby unable to latch effectively, frequent breaks during feeding	Freq	3	5	8		
	%	10.00%	16.67%	13.33%		
Total	Freq	30	30	60		
	%	100.00%	100.00%	100.00%		

[Table/Fig-11]: Latching and sucking assessment on 2nd postnatal day.

control 12 (40%) and experimental 16 (53.33%) and fewer struggling with suction control 18 (60%) and experimental 14 (46.67%). Additionally, no babies were unable to latch effectively [Table/Fig-12].

Parameters		Group		Total	Chi-square	p-value
		Control	Experimental			
Baby latches effectively, maintains good suction throughout feeding	Freq	12	16	28	1.07	0.3006
	%	40.00%	53.33%	46.67%		
Baby struggles with latching or maintaining suction, may require frequent re-latching	Freq	18	14	32		
	%	60.00%	46.67%	53.33%		
Baby unable to latch effectively, frequent breaks during feeding	Freq	0	0	0		
	%	0.00%	0.00%	0.00%		
Total	Freq	30	30	60		
	%	100.00%	100.00%	100.00%		

[Table/Fig-12]: Latching and sucking assessment on 7th postnatal day.

DISCUSSION

The findings of the present study indicate that the implementation of the MCCM significantly improved maternal among elderly postnatal mothers who had undergone a CS. The intervention demonstrated a positive impact on wound healing, postnatal depression, and pain management, aligning with existing literature that emphasises the importance of structured postnatal care [15].

A similar study conducted by El Saied Mahmoud Dawoud S et al., on the implementation of the clinical pathway led to a notable improvement in nurses' knowledge and performance. Maternity nurses demonstrated significantly higher scores in both knowledge and practice related to postpartum care after the intervention, with statistical analysis confirming a significant difference between pre and postintervention scores. Additionally, the clinical pathway had a positive impact on maternal satisfaction. Postnatal mothers who received care according to the clinical pathway expressed greater satisfaction compared to those in the control group. Maternal outcomes also improved, as evidenced by a reduction in postpartum complications and shorter hospital stays. Overall, statistically significant differences were observed between the clinical pathway and control groups in terms of maternal satisfaction, duration of hospitalisation, and incidence of complications [15].

The incidence of elderly primigravida, defined as first-time pregnancy at age 30 or above is increasing due to higher education, effective contraception, and career priorities [3]. A study by Pradhan K et al., at Burla, Odisha, India, found an incidence rate of 2.51%, with higher prevalence among women from higher socioeconomic backgrounds. Women aged 30 and above faced increased risks of complications, including anaemia (28.57%), preeclampsia (18.09%), foetal distress (33.33%), and caesarean delivery (29.52%). Despite these risks, proper antenatal care can lead to safe pregnancies and favourable outcomes [6].

Effective pain control facilitates early mobilisation, reduces the risk of complications, and enhances overall maternal well-being thus making pain management a critical aspect of post-Caesarean recovery [16]. A greater proportion of participants in the experimental group reported being pain-free, highlighting the effectiveness of the MCCM in addressing post-surgical discomfort.

The present study showed that giving proper wound care right after a C-section helps healing. Similarly this study also showed that using a planned care path reduces wound problems and speeds up recovery. The present study support the idea that special nursing care like MCCM can help mothers heal faster and avoid infections.

Limitation(s)

The MCCM has some notable limitations even though it provides a structured approach to postnatal care for elderly mothers following caesarean section. These include age-related physiological challenges, comorbidities, mental health factors, and potential barriers related to staff training, cultural differences, and resource availability. To optimise maternal and neonatal outcomes, the MCCM must be adapted and personalised to address the unique needs of elderly mothers, guaranteeing that these limitations are considered during the care planning and implementation phases.

CONCLUSION(S)

The study demonstrated that the MCCM was quite successful in improving key maternal and neonatal outcomes among elderly postnatal mothers who had undergone a CS. The intervention significantly enhanced wound healing, reduced postnatal depression, and improved pain management in the experimental group compared to the control group. While improvements in fastening and sucking effectiveness were noted, further research with larger sample sizes may be necessary to establish statistical significance in neonatal feeding outcomes. The findings support the integration of MCCM into postnatal care protocols to optimise recovery for elderly primigravida mothers. Given the increasing

trend of delayed pregnancies, structured care interventions such as MCCM may play a crucial role in addressing the unique challenges faced by this population. Future research should focus on refining the MCCM and assessing its long-term impact on both maternal and neonatal health

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