



Effects of Self-perineal Care Education using a Mobile Application on Knowledge and Practice of Perineal Care among Primigravida Mothers: A Quasi-Experimental Study

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Abstract

Background: Poor self-perineal care (SPC) by new mothers due to inadequate knowledge can result in perineal pain and poor wound healing outcome.

Objectives: This study aimed to evaluate the effectiveness of self-perineal care education on knowledge and practice among primigravida mothers in Malaysia.

Methods: This quasi-experimental study was conducted in two public tertiary care hospitals from September 2019 to March 2020. In total, 125 mothers were recruited using consecutive sampling procedures from two tertiary care hospitals. The intervention group consisted of 62 mothers who received SPC education supplemented by the mobile app, while the other 63 mothers in the control group received only routine hospital care. The knowledge of mothers regarding SPC was assessed at 32 to 33 weeks of gestation and then at 4 h post-delivery. The mothers of both groups reported their perineal care practices on Day 1, Day 3, Day 5, and Day 7 post-childbirth using the SPCE mobile app.

Results: There was no significant difference in the SPC knowledge scores between the two groups at baseline ($P=0.155$). Post-analysis showed a significant increase in the SPC knowledge score in the intervention group ($P<0.001$) but not in the control group ($P=0.133$). At all-time points, the mothers in the intervention group performed better SPC practice than those in the control group ($P<0.001$). There were significant associations between changes in knowledge and practice on all four days ($P<0.001$).

Conclusion: The increased knowledge of SPC was significantly associated with improved SPC practice among the primipara mothers postnatally.

Keywords: Knowledge, Mobile app, Primigravida mothers, Self-perineal care education, Self-perineal care practice

1. Background

Approximately 85% of vaginal births are associated with an episiotomy or perineal trauma, such as a perineal tear (1). Following childbirth, self-perineal care (SPC) is crucial to minimize infection and hasten the recovery of the rectal and pelvic muscles (2). The SPC is one of the elements of self-care that the mother should practice to converse her health, thereby reducing maternal morbidity and mortality during postpartum. The SPC is important for skin integrity as the perineal region provides an ideal environment for pathogenic organisms to thrive due to moisture and a lack of ventilation (3). In addition, remnants from defecation, micturition, and lochia are good media for bacteria growth. In order to prevent infection, proper SPC is mandatory to enhance an episiotomy wound or perineal tear to heal within a short period without any complications (4-6).

According to a systematic review, childbirth-

related perineal trauma wound infection ranges from 0.1% to 23.6%, and wound dehiscence ranges from 0.21% to 24.6%, varying based on regional and ethnic differences. This demonstrates that the incidence of infection remains largely unknown despite the known high occurrence of perineal trauma during childbirth (1). A previous study also reported that 70% of cases of wound infection associated with perineal wounds were diagnosed between Day 7 and Day 14 post-partum (7). Primipara mothers need to be educated to create awareness of wound infection, detect early signs and symptoms, and practice good SPC, which together can reduce mortality and morbidity among post-natal mothers (4, 8).

Nurses play a significant role in preventing puerperal complications by empowering mothers with knowledge and providing early intervention and treatment by continuously monitoring their progress. Lack of SPC knowledge leads to complications, such

as puerperal perineal infection, wound breakdown, and other genital tract infections (9). The SPC also promotes wound healing, reduces pain (10, 11), and allows a mother to focus more on caring for her newborn.

Primipara mothers stay in the post-natal ward only for a short time due to the high demand for the facilities. Therefore, it can be difficult for healthcare providers to identify and respond to individual educational needs. Due to the limited time, the mothers usually only receive brief information about episiotomy care. This is insufficient, as many mothers are unaware of the importance of post-natal care (12). Once discharged, the mothers are expected to perform perineal care independently, but more often than not, they do not have sufficient knowledge about it. As the mothers have to take care of themselves post-delivery, knowledge of SPC is important to keep their external genitalia and surrounding area clean to prevent infection (13). Therefore, knowledge of SPC needs to be imparted to mothers to increase their awareness and ensure their engagement in proper practices to prevent infection, promote comfort, and build self-confidence.

There have been previous studies that have assessed the effects of perineal care education on knowledge and practice of perineal care using conventional methods, such as posters and pamphlets (14-16). As in previous studies, this SPC education (SPC education) program was designed to equip pregnant mothers with appropriate knowledge on perineal care to meet their health needs and guide them to seek medical help when needed. However, the SPC education in this study was supplemented with an SPCE mobile app to provide consistent perineal care information. This was a powerful tool as it allowed new mothers to obtain information anytime and anywhere by simply using a smartphone.

In addition, the mobile app allowed the researcher to communicate directly with and obtain feedback from the mothers. In sum, the novelty of this study was that the mobile app was used as a module package that included knowledge-sharing interaction and monitoring besides providing information on SPC, which effectively replaced the traditional use of posters and pamphlets.

2. Objectives

This study aimed to assess the effect of SPC education on knowledge and practice of perineal care among primigravida mothers. In addition, the association between knowledge change and the practice of SPC was assessed.

3. Methods

3.1. Study Design, Setting, and Participants

This quasi-experimental study was conducted to

evaluate the effectiveness of SPC education on the knowledge and practice of perineal care among primigravida mothers. This study was conducted from August 2019 to March 2020 and followed the Declaration of Helsinki's principles and standard clinical practice guidelines. This study was conducted at two selected tertiary care hospitals in Malaysia. Both selected hospitals provide tertiary care services and act as referral centers. The selected hospitals are similar in hospital policies and inpatient care management. The mean monthly birth rate in both selected hospitals at the time of this study was 1,500 per month. The hospitals were randomly assigned as the "intervention group" or the "control group" to prevent information contamination among the mothers in the same hospital and selection bias.

The intervention group was provided with SPC education besides information on routine care, while the control group was given information on routine care only. Participants were recruited from the antenatal clinic using a consecutive sampling procedure. The Consolidated Standards of Reporting Trials 2010 guidelines explained the interventional study as mentioned in the previous study (17). In total, 186 participants were enrolled in the study. However, 34 participants did not meet the inclusion criteria, 10 participants declined to participate for various reasons, and 12 subjects could not participate due to not owning a smartphone.

Therefore, the final total sample size of the study was 130 primigravida mothers. The total sample size of the intervention group was 65 primigravida mothers. Meanwhile, 65 primigravida mothers were assigned to the control group. Three participants from the intervention group dropped out as these primigravida mothers had a Caesarean section for fetal distress. Two participants from the control group also dropped out due to instrumental delivery and Caesarean section. Finally, this study consisted of 62 participants in the intervention group and 63 primigravida mothers in the control group, respectively (17).

The inclusion criteria were: primigravida normal pregnancy at 32 to 33 weeks of gestation, ability to communicate and read in Malay or English, and possession of a smartphone. The exclusion criteria were primipara pregnancy with hematoma or abscess at the perineum region, and systemic disorders in pregnancy, like diabetes mellitus, hypertension, and obesity. These were excluded because these variables would interfere with the SPC practice.

The G* Power software (version 3.1) was used to calculate the sample size. A medium effect size was taken into consideration; therefore, a significance level of 0.05 and a power of 0.80 were set. The minimum required sample size was 65 participants for each group.

3.2. Data Collection

The researcher approached primigravida mothers at 32-33 weeks of gestation to invite them to attend the first SPC education at the antenatal clinic. The aim and methods of the study were explained to the mothers who met the study criteria in both groups. The participants then completed the informed consent form. The SPCE mobile app was downloaded on the smartphones of mothers with their permission. Mothers used their mobile phone numbers as passwords to generate individual ID numbers. They were taught how to access the mobile app and its content using their smartphones. The mobile app was used to complete the demographic information and answer the questionnaires. The information of all the primigravida mothers was recorded and saved on the server for the researcher to access later.

The SPC education was conducted face-to-face in two phases at two different time points. The first SPC teaching session was conducted at the antenatal clinic when mothers were at 32-33 weeks of gestation. Before the first SPC teaching session, a pre-test was conducted using the mobile app for the primipara mothers in both intervention and control groups to assess their knowledge at baseline. The SPC education program was only downloaded on the phones of mothers in the intervention group, while the SPC checklist was uploaded in the mobile app for all the mothers in both groups. The primigravida mothers were guided on how to key in data using the mobile app. The primigravida mothers in the intervention group could access information on SPC education. All the primigravida mothers in both groups were followed up till their delivery date.

Four hours post-childbirth, a post-test was conducted via the mobile app for the mother in the intervention and control groups using the same questionnaire. The approximate time between the pre-test and post-test was at least four weeks. The second SPC education session consisted of 10 steps of SPC and hands-on practice 4 h post-childbirth. Each session lasted for 30-45 min. On Days 1, 3, 5, and 7 post-childbirths, the mothers in both groups were asked to complete the SPC checklist using the SPCE mobile app. Mothers in both groups self-reported their daily SPC practice using the SPCE mobile app on Days 1,3,5, and 7 post-delivery. It took the primigravida mothers 10-15 min each day to record the information.

3.3. Educational Intervention and Mobile App

The content of the educational intervention was designed to enhance the knowledge and SPC skills of mothers. The SPC education tool uploaded to the smartphones of mothers consisted of a PowerPoint presentation and pamphlets (soft copy) with information on 10 steps of SPC, the sitz bath, Kegel exercises, a balanced diet, and the benefits of perineal

care. The 10 steps of SPC included washing hands, cleaning the perineum from front to back, pouring warm water from front to back, bathing regularly, patting dry the wound, observing the wound using the mirror, changing the sanitary pad at least four times a day, and applying the pad from front to back. The researcher adapted the SPC education content based on the previous literature review (16-19).

Six experts on the expert panel, consisting of two doctors and four nursing personnel with specialties in obstetrics and gynecology reviewed and validated the content of the SPC education in terms of its appropriateness and accuracy. The experts carried out an independent evaluation of the quality of the content using an ordinal four-point scale, including 1: not relevant to current practice, 2: somewhat relevant to current practice, 3: relevant to current practice, and 4: highly relevant to the current practice (Grove & Gray, 2018). The content validity index (CVI) was determined based on the assessments of experts, which indicated that the content validity was excellent as the I-CVI was 0.89-1.00, and the S-CVI/Ave was 0.89. Minor editing was done to the content as suggested by the experts.

Five prospective mothers also assessed the final version of the SPC education intervention for face validity. These mothers were asked to read the information and evaluate whether it reflected the concept the researcher intended to measure. The SPCE mobile app was self-constructed and validated by two domain experts from the Computing and Creative Media Department. The SPCE mobile app consisted of four sections for all the mothers in both groups, and each session had an English and a Malay version. The modules included demographic information, an SPC questionnaire, an SPC checklist, and SPC information.

First, the login interface was developed. Later, the home interface was designed, including Section A with the demographic information of the participants, Section B with the knowledge questionnaire that was activated during the pre and post-test, and Section C with checklists for the perineal care practice. The SPCE app contained all the information regarding SPC education, PowerPoint slides, and the soft copy of the pamphlet in Section D.

Following the development of the SPC modules, uploading and installing them on the smartphone, a pilot study was conducted to validate the usability and functionality of the app. After the pilot study, a specific session in the module that dealt with user registration was corrected: the mobile phone number was chosen as a password instead of an email address for each mother, as many mothers did not have an email address.

3.4. Routine Care

Mothers usually receive unstructured SPC post-delivery or upon discharge at home. In the normal

course of events, the nurse-midwife or a doctor discusses episiotomy care with the mother. Most of the time, this advice will be given to the mother during discharge or the actual stitching of the episiotomy or perineal tear in the labor room. The episiotomy wound is checked routinely before discharging the mother.

3.5. Instruments to Measure Outcomes

Data were collected using a self-administered questionnaire. The questionnaire consisted of three components.

3.5.1. Social Demographic Characteristics

The demographic characteristics included ethnicity, age, education, occupation, family income, family type, SPC awareness, and sources of information.

3.5.2. Knowledge Questionnaire

The pre-test and post-test were conducted using the SPCE mobile app. The questionnaire was adapted from a previous study (9). Knowledge of SPC was assessed using 16 multiple-choice questions with a single response on meaning, purpose, process, rationale, complications, and tips for performing perineal care. Some of the questions were worded negatively. The knowledge score ranged from 0 to 16. A score of "1" was given for each correct answer, and a score of "0" was given for every wrong answer. The overall knowledge score was the sum of the correct answers to the 16 questions. The scores of 1-5, 6-11, and 12-16 were graded as 'poor knowledge level', 'average knowledge level', and 'good knowledge level', respectively. In other words, the higher the score, the greater the knowledge of perineal care.

The clarity, content validity, and comprehensiveness of the instrument were examined and commented on by a panel of six obstetric experts, including obstetricians and senior nursing personnel. The questionnaire and checklist were written in English and then translated into Bahasa Malaysia by two bilingual translators. The instrument was pilot-tested among 30 primipara mothers. The Kuder Richardson 20 reliability test was used to measure the internal consistency of the items in the knowledge section. The internal consistency was 0.70.

3.5.3. Self-Perineal Care Checklist

Based on a previous study (17), a 10-item self-perineal checklist was adapted and used to measure the SPC practice and uploaded onto the SPCE app. A panel of six obstetric experts from the study hospitals examined and commented on the clarity, content validity, and comprehensiveness of the instrument. The checklist consisted of washing hands before and after perineal care, cleaning the perineum from front to back, pouring warm water from front to back,

regular bathing and showering, patting dry after washing, voiding and bowel movements, observing the wound using a mirror, air drying the perineum, changing the sanitary pad at least four times a day, and applying the pad from front to back without touching the inner part of the sanitary pad. Primipara mothers reported their practice according to the checklist provided in the SPCE app. An answer reflecting the correct procedure was awarded 1 point, otherwise, it was scored 0. The final scores ranged from 0 to 10, where a higher scorer indicated good practice.

3.6. Ethical Consideration

This study was conducted at two tertiary care hospitals in Malaysia after obtaining ethical approval from the Institutional Review Board of the study hospitals (NMRR -18-3852-44776(IIR)). The patients participated in the study voluntarily, and no incentives were offered for participation. The anonymity and confidentiality of the data of mothers were safeguarded through secure storage. The data will be kept for five years after the completion of the study and discarded subsequently.

3.7. Data Analysis

The data were analyzed in IBM SPSS software, version 25.0 (Armonk, NY: IBM Corp). Medians and interquartile ranges presented the quantitative variables, while frequencies and percentages were used to describe qualitative variables. The Pearson Chi-Squared test was performed to test the homogeneity of demographic variables between the groups. McNemar's test was used to determine the differences in a dichotomous dependent variable between two related groups. Changes in the knowledge scores, from baseline to post-delivery within the groups, were tested using the Wilcoxon Sign Rank test. The differences between the two groups in terms of the mean knowledge scores at baseline and post-delivery were tested using the Mann-Whitney U test. Spearman's correlation analysis determined the association between knowledge and practice. For all tests, the level of significance was set as 0.05.

4. Results

4.1. Socio-Demographic Characteristics

The socio-demographic characteristics of 62 participants in the intervention and 63 participants in the control group were mentioned in the previous study (17). The majority of participants (74.4%) were Malays and their mean age was 25.52±4.21 years old. Most of the participants (85%) had secondary education or above. It was noted that more than half of the primipara mothers were from nuclear families. At baseline, the awareness of SPC among the primipara mothers was only 38.4%, and 39.6%

claimed their primary source of information was social media. There were no significant differences between the intervention and control groups in terms of socio-demographic characteristics according to our previous study (17).

4.2. Comparison of Baseline Pre-Test and Post-Test of Self-Perineal Care Knowledge

4.2.1. Intervention group

The number of mothers who gave the correct answers in the pre-and post-assessments is shown in Table 1. McNemar's test was used to determine the number of primigravida mothers who gave the correct answers in the pre-and post-assessments. At baseline, in the intervention group, most mothers were aware of the importance of perineal care, the

signs and symptoms of perineal infection, precautionary and preventive measures of perineal infections, the type of food to avoid, and aspects of washing the perineum. However, many mothers in this group did not know the appropriate pad change frequency, the type of work to prevent during confinement, and which solutions were unsuitable for perineal care. Post-assessment showed improvement in almost all areas ($P<0.05$). Almost all the participants answered the post-test correctly for these four items: "time to do perineal care", "signs and symptoms of perineal infection", "precaution to prevent perineal infection", and "food to take to prevent constipation" which contributed to 98.38% of knowledge in these particular areas after SPC education.

Table 1. Knowledge of self-perineal care of the intervention and control groups

Knowledge Items	Intervention group (n=62)		P-value	Control group (n=63)		P-value
	Pre-test	Post-test		Pre-test	Post-test	
1. Meaning of perineal care	41	57	<0.001**	40	49	0.022**
2. Time to do perineal care	42	61	<0.001**	41	41	1.000
3. Importance of perineal care	51	59	0.039**	44	44	1.000
4. Washing the perineal area	52	56	0.454	51	44	0.118
5. Solution that is not to be used for perineal care	32	56	<0.001**	28	37	<0.001**
6. Hand washing before and after cleaning	51	59	0.039**	43	49	0.057
7. Drying the perineal area after Washing	36	59	<0.001**	33	43	<0.001**
8. Frequency of changing sanitary pads	35	45	0.046**	25	21	0.303
9. Type of work that can be done during the confinement period	28	45	0.005**	25	27	0.897
10. The preferred position for mothers with episiotomy	39	55	0.002**	38	41	<0.001**
11. Signs and symptoms of perineal infection	50	61	0.001**	51	53	0.774
12. Precaution to prevent perineal infection	57	61	0.001**	54	56	0.687
13. Food to prevent constipation	57	61	0.219	56	54	0.774
14. The area that should be cleaned lastly, during perineal care	42	54	0.029**	31	31	1.000
15. Time to visit the doctor	45	58	0.002**	40	42	0.904
16. Type of undergarments to wear after childbirth	45	59	0.001**	39	48	0.064

McNemar's test

**Significant at the $P<0.05$ level (2-tailed)

4.2.2. Control Group

Most mothers in the control group were aware of the meaning of perineal care, aspects of washing, the type of food that helps prevent constipation, signs and symptoms of perineal infection, precautions to prevent perineal infection, and food that help to prevent constipation. It should be mentioned that 28 participants were unaware of the solutions that are unsuitable for perineal care, and 25 participants were unaware of the appropriate sanitary pad change frequency. The types of activities to perform during the confinement were unknown to 25 participants. In the post-assessment, there were some improvements only in the meaning of perineal care, knowledge of solutions that are not suitable, drying the perineal area after washing, and the preferred position for the mother with an episiotomy.

4.3. Effect of SPC Education on the Mean Total Score of Knowledge

The pre-and post-knowledge scores were not normally distributed; hence, they were summarized

as medians and interquartile ranges. The results are summarized in Table 2. The intragroup differences were tested using the Wilcoxon Sign Rank Test, while intergroup differences were tested using the Mann-Whitney U test. At baseline, there was no significant difference between the two groups in terms of knowledge scores ($P=0.155$). There was a significant increase in the knowledge score of the intervention group at the post-test stage ($P<0.001$); however, there was no significant change in the knowledge scores of the control group ($P=0.133$).

4.4. Self-Perineal Care Practice Score

There were 10 items on the practice list, and the practice score ranged from 0 to 10, where high scores indicated good practice. The results are presented in Table 3. The differences in the level of practice were tested using the Mann-Whitney U test. For all time points, the mothers in the intervention group performed better than those in the control group ($P<0.001$).

Table 2. Mean differences in total knowledge score within and between groups

Group	Pre-test median (IQR)	Post-test median (IQR)	P-value
Intervention (n=62)	10.5 (3)	13(3)	<0.001**
Control (n=63)	10(3)	10(2)	0.133
P value	0.155	<0.001**	

IQR: Interquartile range, *Wilcoxon sign rank test

**Mann-Whitney U test

Significant at the $P<0.05$ level (2-tailed)**Table 3.** Self-perineal care practices score

Practices	Intervention group median (min-max) n=62	Control group median (min-max) n=63	P value
Day 1	9 (5-10)	2 (0-4)	<0.001**
Day 3	10 (6-10)	2 (0-6)	<0.001**
Day 5	10 (7-10)	2 (1-6)	<0.001**
Day 7	10 (6-10)	2 (0-4)	<0.001**

**Significant at the $P<0.05$ level (2-tailed)

4.5. Association between Change in Knowledge Score and Self-Perineal Care Practice Score

Associations between change in knowledge and SPC practice were tested using Spearman's correlation. The results are presented in Table 4. There were significant associations between changes in knowledge score and practice score on all four days ($P<0.001$).

Table 4. Association between change in self-perineal care knowledge score and practice score

Day	Spearman's rho	P value*
1	0.429	<0.001**
3	0.451	<0.001**
5	0.459	<0.001**
7	0.464	<0.001**

Spearman's Correlation Test

**Significant at the $P<0.05$ level (2-tailed)

5. Discussion

Based on the results, there was a significant increase in the level of SPC knowledge in the mothers who completed the SPC education in the intervention group, compared to the mothers in the control group. Similarly, mothers in the intervention group performed SPC practices better than the mothers in the control group. Moreover, a significant association was found between changes in knowledge and practice suggesting that practice is better as knowledge acquisition increases. This finding is similar to those of a study performed by Sarona in India (21), which revealed a positive correlation between knowledge and practice of SPC.

At baseline, less than 40% of the primigravida mothers were aware of SPC. Furthermore, 39.6% of the participants stated that their source of information was social media, compared to only 16.7% who depended on information from healthcare providers. This emphasizes the need for SPCE among primigravida mothers in the studied

hospitals. Healthcare workers should provide expectant mothers with more consistent and accurate information to ensure their good understanding of SPC, rather than their potential misinformation from other sources. The pregnant mother is a significant target group, and there is a high possibility for them to come back with a subsequent pregnancy. Therefore, the knowledge imparted will benefit them in the long term.

The face-to-face method of teaching SPC education in this study is similar to many studies conducted by other researchers. Previous studies that used conventional teaching methods, such as posters and pamphlets, that were performed postnatally also showed improvement in SPC knowledge (5, 14-16, 22). The novelty of this study is that the SPC education was conducted during antenatal and The second SPC education sessions conducted at 4hours post-childbirth. Teaching as early as antenatal seems to allow pregnant mothers to integrate the theory into practice. In addition, the mothers in the intervention group of this study had fast, reliable, and accurate perineal care information readily available on their smartphones. Usage of the SPCE mobile app to access information regarding SPC enabled the mothers to refer to relevant information anytime and anywhere (23).

This new approach is more suitable as mothers do not need to spend so much time in the hospitals. This method is especially helpful during the pandemic when a movement control order was in place. A mobile app was also described in an earlier study as a useful tool for information sharing, interacting, and tracking the results of an educational intervention (24). The information in the mobile application may encourage primigravida mothers to be more interested in caring for themselves (25).

This study revealed that mothers in the intervention group improved their SPC practices. This may well have resulted from the knowledge gained through SPC education. It may be significant that over 80% of the participants in the intervention group already had a good general level of education (secondary school or above). These results align with those of previous studies in which knowledge of SPC has been shown to lead to good SPC practice (16, 19, 20).

Similar to those of other studies (10, 22), the results of the present study revealed that SPCE significantly improves the SPC practices of primipara mothers. The SPCE also reduces episiotomy pain among mothers and good wound healing outcomes (10, 26, 27). Regularly practicing SPC helps to prevent infection (28, 29). Oleiwi (22) also reported that the perineal practices of mothers improved after a teaching program. The SPCE mobile app in this study helped the researcher follow up with the mothers till childbirth and establish a good rapport with them. Such a mobile

app can play a significant role in patient care and monitoring, health education, communication, education, and research (24, 30, 31).

The strength of this study is using the "SPCE" mobile app, as it enabled faster access to healthcare providers, provided continuity of care, and empowered mothers to take charge of their health. The apps made out-of-hospital monitoring possible and easy, particularly significant in remote areas. Furthermore, the current study was performed in two tertiary care hospitals with similar inpatient care management and policies. It also included a control group as a counterpart, and there was homogeneity of participants in both groups, enabling the researcher to compare the groups. The findings of this study were reliable as the transmission of information among the mothers from the intervention group to the control group was prevented since the study was carried out in two separate settings.

However, there are several limitations to this study. This educational approach clearly depends on the ability of mothers to easily use the mobile app to self-report and access the internet. In addition, this study focused only on two areas in an urban setting, and the same cannot be assumed for healthcare facilities in remote areas. Moreover, self-reporting of SPC practices could be biased as the primipara mothers in this study may not have reported their practices accurately. The researcher recommends a multi-center study involving a heterogeneous population to be able to make more generalized conclusions.

6. Conclusion

Based on the findings of the present study, the SPC education provided for the primigravida mothers as early as the antenatal phase effectively improves their knowledge and contributes to good perineal care practice among the primipara mothers postnatally. Good SPC practice contributes to better wound healing outcomes and less pain. Self-reporting using the mobile app also empowers new mothers to take responsibility for their health and ensure that they were involved in their self-care. This is in line with the current healthcare concept that encourages patient engagement. It is hoped that this study will be an eye-opener for nurses to encourage them to implement a similar SPCE program as early as the antenatal phase to improve the knowledge and good SPC practice among primipara mothers, thereby improving early maternal-child bonding.

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Footnotes

Conflicts of Interest: This research project has no conflict of interest.

Ethical Approval: The Medical Research Ethics Committee of University Malaya (MREC ID:201952-7388) and the Medical Research and Ethics Committee of the Ministry of Health, Malaysia, with reference NMRR-18-3852-4476 (IIR) approved this study. Moreover, the voluntary, confidentiality, and anonymity of the participants were ensured.

Informed Consent Statement: Informed consent was obtained from all participants in the study.

Authors' contributions: L.M.L.: Methodology, data collection, data analysis, interpretation, drafting the article, and revising.

C.M.C., V.R., N.A.M.A., K.C., L.F.L.: Methodology and final approval of the manuscript.

S.M.: Critical review of the manuscript.

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