Available Online at www.e-iph.co.uk
Indexed in Clarivate Analytics WoS, and ScienceOPEN

E-B Environment - Behaviour Proceedings Journal

CSSR2022
https://cssr.uitm.edu.my/2022/index.php
9th International Conference on Science & Social Research 2022
Universiti Teknologi MARA (UiTM), Shah Alam, Malaysia (Online), 14-15 Dec 2022
Organiser: Office of Deputy Vice-Chancellor (Research & Innovation), UiTM, Malaysia

e-IPH e-International Publishing House Ltd., United Kingdom

Examining Undergarment Preferences During Confinement Period Towards Designing Caesarean Undergarment Design for Plus-Size Patients

Juliana Osman[1], Rosita Mohd Tajuddin[1], Noorkardiffa Syawalina Omar[2], Shaliza Mohd Shariff[1]*
**Corresponding Author*

[1] College of Creative Arts (Art & Design), Universiti Teknologi MARA (UiTM), 40450 Shah Alam, Selangor Darul Ehsan, Malaysia.
[3] Faculty of Medicine, Puncak Alam Campus, Universiti Teknologi MARA (UiTM), 42300, Bandar Puncak Alam, Selangor Darul Ehsan, Malaysia.

shaliza478@uitm.edu.my*, juliana_osman@yahoo.com, rositatajuddin@uitm.edu.my, dyff80@uitm.edu.my

Abstract
A purposive sampling method on experienced Malaysian plus-size patients with a BMI of 30 to 40 and aged between 20 to 49 years old was conducted to investigate the preferences of undergarment design used during the confinement period and the influencing factors of clothing comfort throughout the recovery period. Results show that although 89.29% of respondents practised traditional confinement rituals, 93% of respondents preferred basic undergarments as opposed to compression garments such as '*bengkung*', or girdles due to the existence of an apron belly. An extended investigation of a plus-size caesarean patient had been conducted 24 hours before and 24 hours after surgery to confirm the issue. Based on the result, a theoretical framework for plus-size caesarean undergarment design was developed.

Keywords: plus-size, Caesarean, Undergarment, Clothing Comfort

DOI: https://doi.org/10.21834/e-bpj.v8iSI16.5234

1.0 Introduction

A caesarean section is a surgical procedure in which incisions on the abdomen and uterus's walls are performed for a child's delivery, which is often associated with delivery difficulties and health complications to prevent maternal and newborn mortality (Bhimavarapu, 2020). Caesarean section procedures were more prevalent in overweight women of BMI 25 to obese women of BMI 30 and above (Eloranta et al., 2023) by 57% (Simko et al., 2019). A study in Melaka, Malaysia, listed weight gain as one of the causes of a caesarean section procedure (Norshida & Hanafiah, 1997). It is common for overweight caesarean patients to have an apron belly, which is loose skin hanging from the belly covering the incision area. On top of known risks and complications due to maternal obesity and caesarean section, an apron belly may increase the possibility of surgical site infection (SSI) due to dampness between the skin, which acts as a perfect breeding ground for bacteria (Crider. C, 2020). Concerning that, overweight and obese people are often known by the term 'plus-size due to the nature of their above-average body size (Shin & Saeidi, 2022). The recovery challenges of Malaysian plus-size patients during the confinement period were rarely discussed. This study aims to investigate the preferences of undergarments for current plus-size caesarean women regarding recovery challenges and clothing comfort during the confinement period and provide useful information to create a design outline for plus-size caesarean undergarment design in terms of comfort and function.

2.0 Literature Review

2.1 Confinement Period

The post-partum recovery period in Malaysia is known as the '*berpantang'* or confinement period, which generally starts right after childbirth and lasts for 40 days of recovery, where mothers practice traditional rituals to restore physical and spiritual well-being that evolve around activity, hygiene, and diet (Yahya et al., 2023, Hussein, 2019 and Rozaimie. A, 2019). In the 5 areas of confinement

DOI: https://doi.org/10.21834/e-bpj.v8iSI16.5234

rituals, '*Berbengkung'* or body wrapping is one of the common practices contained in the heating and toning ritual (Rozaimie, 2019), where post-partum women wear a tight undergarment to provide compression and support to the belly. This method is believed to provide abdominal support, realign the spine, and return the woman's body to its original condition (Sitorus et al., 2023). Unfortunately, there is no proof of body wrapping effectiveness for caesarean women during the confinement period, and there is also no literature discussing post-caesarean care for Malaysian women.

2.2 Undergarments for caesarean patients

Many believe that caesarean women can benefit from body-wrapping undergarments, not for weight reduction purposes, but as post-surgery body support up to 100 days post-caesarean. Conventional products such as support belts, compression tubes, caesarean panties and girdles can also be used to encourage caesarean recovery as long as it provide the same compression and support (Santi & Sukarni, 2022). Since the Malaysian plus-size patient's actual recovery struggles had never been studied, there is no literature to support the effectiveness of this undergarment or whether it is a primary option during the confinement period.

2.3 Comfort perception and comfort

Comfort can be defined as a pleasant feeling of contentment and freedom from pain or restraint, which are very subjective and differ from each individual's experience (Kuleshova, 2021). Clothing comfort is measured through three indicators: sensorial comfort, thermal comfort, and acoustic comfort (Hu et al., 2023).

3.0 Methodology

A mixed-mode research method was conducted for this study. First, a pilot sample of n = 28 (Cocks and Togerson, 2013) of experienced Malaysian plus-size caesarean patients is recruited for the purposive sampling method (Obilor, 2023). Respondents were chosen based on these requirements: experienced caesarean patients, Malaysian age between 20 and 49 years old (NOR, 2017), and wearing clothing sizes between 2XL to 6XL based on the ASTM D6960/D6960M standard (ASTM International, 2023) during early pregnancy. Participants were recruited through three channels: social media platforms (Facebook Messenger), digital applications (WhatsApp), and existing plus-size patients from Hospital UiTM Puncak Alam, Malaysia. Survey links were distributed to online survey respondents, while printed questionnaires were distributed to offline survey respondents. The questionnaire contained five sections: demographic profile, caesarean recovery challenges, preferred undergarments during the confinement period, comfort performance of preferred undergarments, and undergarment choice factors. Multiple-answer surveys were used to identify the most common undergarments chosen during the confinement period by providing a set of pictures containing all undergarments available on the market. Multiple-answer surveys were also used to identify the recovery challenges faced by plus-size caesarean patients in Malaysia. The ordinal scale method (Celko, 2010) was applied to measure satisfaction with the comfort performance of preferred undergarments using (1) Very Poor (2) Poor (3) Neutral (4) Good (5) Very Good and its influencing factors using (1) Highly disagree (2) Somewhat disagree (3) Neutral (4) Agree (5) Highly agree. Secondly, based on the results collected from the first method's data, one on-site observation was done on a plus-size caesarean patient one day before surgery and one day after surgery to further confirm the issue. An obese patient with a BMI of 31 was recruited, and her body was measured using ISO 18890:2018 Clothing—Standard method of garment measurement (ISO, 2018). The measurement of the belly was taken three times for each session, and the existence of the apron belly was observed before and after surgery. As caesarean patients are considered a high-risk and extremely vulnerable group, especially 24 hours after surgery, only one (n = 1) person was recruited for observation. Since the needs of this observation are very specific and limited, the minimum BMI of 30 from the Class-1 obesity category (Dewar et al., 2023) was pre-set during the respondent's selection. The data collection was assisted by an obstetric and gynaecologist (OBGYN) doctor and two (n = 2) medical officers inside a hospital setting.

3.1 Limitations of study

There are certain limitations while conducting this research, including the lack of previous studies, especially for Malaysian demography, and dated literature related to these subjects. The survey was conducted specifically to study undergarment design and clothing comfort and not focus on confinement practices or medical subjects.

4.0 Findings

4.1 Respondent's parameters

The main criteria for respondents are based on a BMI of 25 to 40, with an age group between 20 to 40 years old. Although recorded plus-size caesarean cases in this study displayed more town residences over rural residences, location does not play a significant part in maternal obesity cases as obesity by itself is influenced by lifestyle, eating habits, genetics, and environmental factors (Ghosh et al., 2023). According to Shahrir et al. (2021), maternal obesity cases in Malaysia are not influenced by marital status, household income, or smoking habits. Through a pilot sample of 28 participants, we can see that the clothing sizes before, during, and after the caesarean section are either increased during pregnancy and decreased to their original size after the caesarean or stagnant throughout the gestation period. The data can be seen in Table 1 below.

Table 1: Respondent's BMI and clothing size.

Age group	Location	BMI	Size early pregnancy	Size during 3rd trimester	Size after caesarean
20-24	Town	28	2XL	5XL	2XL
	Town	32.5	2XL	2XL	2XL
	Town	35.3	3XL	3XL	3XL
	Town	35.6	3XL	3XL	2XL
	Town	37.6	2XL	3XL	2XL
	Town	37.6	2XL	3XL	2XL
25-30	Rural	29.4	2XL	2XL	2XL
	Town	33.3	3XL	4XL	3XL
	Town	34.6	2XL	2XL	2XL
	Rural	36.3	3XL	4XL	3XL
	Town	37.6	2XL	3XL	2XL
	Rural	38.9	5XL	5XL	3XL
	Town	40.3	3XL	4XL	2XL
31-34	Town	29.1	2XL	3XL	2XL
	Rural	31.1	2XL	4XL	2XL
	Rural	32.9	2XL	2XL	2XL
	Town	34.8	2XL	3XL	2XL
	Rural	34.9	3XL	3XL	3XL
	Town	35.4	2XL	3XL	3XL
	Town	35.8	2XL	4XL	2XL
	Rural	42.2	3XL	5XL	3XL
	Town	42.5	4XL	5XL	4XL
	Town	43.8	5XL	5XL	4XL
	Town	44.6	3XL	4XL	3XL
35-40	Town	30.1	2XL	3XL	2XL
	Town	31.6	2XL	2XL	2XL
	Rural	32	2XL	2XL	2XL
	Town	38.6	4XL	5XL	4XL

4.2 Caesarean recovery challenges for Malaysian plus-size women during the confinement period.

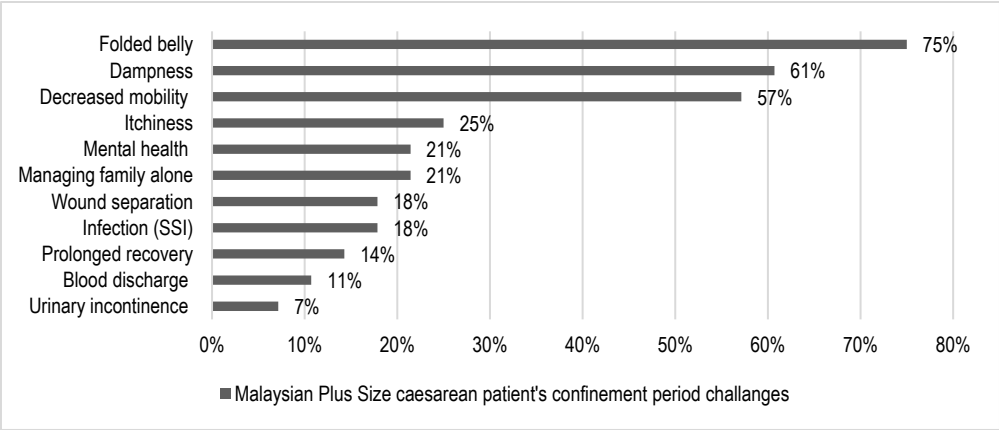

Fig. 1: Malaysian plus-size caesarean patient's confinement period challenges

Based on the result shown in Fig. 1 below, 75% of respondents agreed that having a folded belly is a huge challenge for a caesarean plus-size woman, followed by dampness around the incision area (60.71%), decreased mobility (57.14%), itchiness (25%), managing

household (21.43%), mental health (21.43%), SSI (17.86%), wound separation (17.86%), prolonged recovery (14.29%), blood discharge (10.71%), and finally urinary incontinence (7.14%). All respondents' daily rituals evolved around cleaning and keeping the incision dry as a way to cope with pain and discomfort as well as to promote faster recovery. 89.29% of respondents from all ethnicities claimed they had practised traditional confinement rituals during the confinement period, with 28.57% of respondents claiming they had at least attempted to include body binding in the confinement period as an attempt to reduce pain and support the belly through the undergarment's compression. As each respondent's recovery length varies from case to case, the data shows that traditional confinement practices with or without body binding did not influence the recovery period nor increase the patient's quality of life during the confinement period. The reason for this statement is that, from the collective data, there is no relevant connection between the length of the recovery period and the type of recovery method as displayed in Table 2.

Table 2: The length of the recovery period and the usage of body binders during the confinement period.

Recovery length (Month)	Practised traditional confinement (n=28)		Tried/used body binder at the beginning of confinement (n=28)		Use body binder throughout confinement (n=28)	
	Yes	No	Yes	No	Yes	No
3	13	3	4	12	2	14
6	4	0	0	4	0	4
12	5	0	2	3	0	5
18	3	0	2	1	0	3

4.3 Preferred undergarments used by plus-size caesarean women during confinement.

According to the previous result, 29% of the respondents admitted they had bought and tried traditional or modern bengkung for the sake of confinement rituals during the start of confinement but decided not to wear it due to extreme discomfort. In the end, modern bengkung, which are vastly marketed towards Malaysian plus-size caesarean patients, recorded zero (n = 0) users throughout the confinement period, together with specially designed caesarean pants (n = 0), traditional bengkung (n = 0), tube binder (n = 0), girdle (n = 0), and compression pants (n = 0). The majority of 42.86% preferred oversized undergarments to be worn throughout the confinement period, followed by maternity pants (21.43%), high-waisted stretch pants (14.29%), disposable pants (10.71%), combination Velcro binder (7.14%), and bikini pants (3.57%). This data shows that four out of six preferred undergarments do not contain any compression strength at all. To further investigate this issue, respondents rated the chosen undergarment's comfort performance on a Likert scale of (1) very poor, (2) poor, (3) neutral, (4) good, and (5) Very good on these seven (n = 7) parameters of breathability, support and compression, material feel, moisture removal, overall comfort, size availability, and design and aesthetic. The three most notable characteristics of the preferred undergarment are the material feel on the skin, the perfectly sized product, and the breathable fabric. The chosen undergarments provided some kind of support and compression, as well as moisture-removal characteristics. The design and aesthetic of the undergarment are deemed neutral, as it is not necessarily poorly designed but rather not a priority when it comes to the perception of recovery comfort. The result is shown in Fig. 2 below.

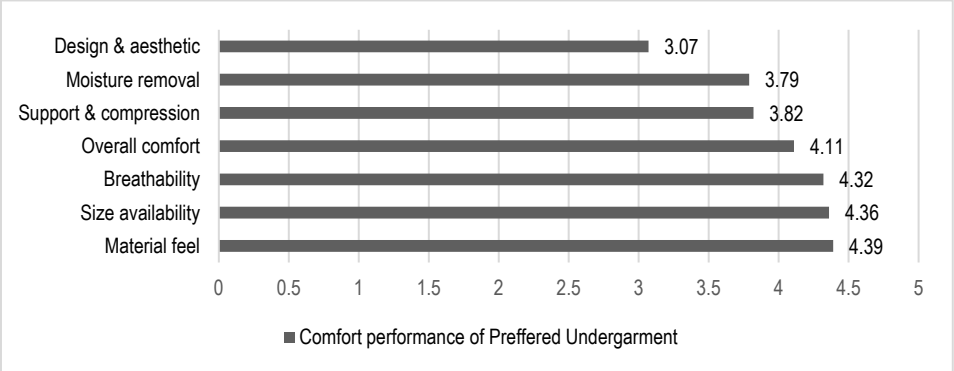

Fig. 2: Comfort performance of preferred undergarments based on Likert scales; (1) Very poor (2) Poor (3) Neutral (4) Good (5) Very Good.

4.4 Undergarment Choice Factors

Moving forward from the plus-size caesarean patient's experience, respondents also completed a survey on influencing factors when choosing an undergarment. Fifteen (n = 15) influencing factors are listed, covering comfort clothing, consumer behaviour, the undergarment's functionality, and the design component of the undergarment. Respondents' satisfaction is measured using (1) highly disagree, (2) somewhat disagree, (3) neutral, (4) agree, and (5) highly agree. The result is ranked based on the highest to lowest rating in terms of influencing factors and is displayed in Fig. 3 below.

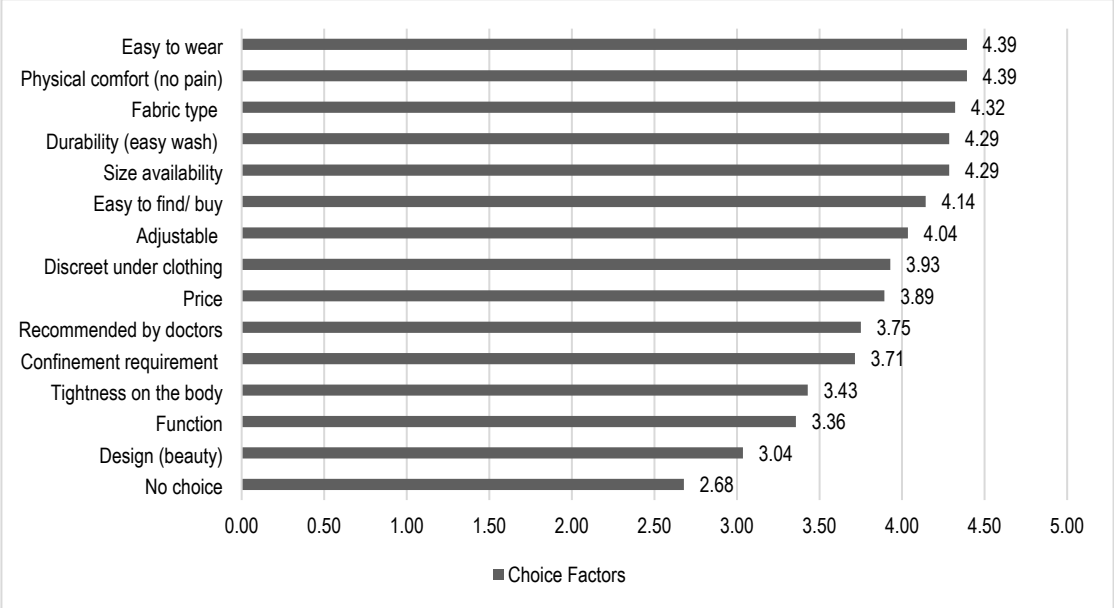

Fig. 3: Undergarment's choice factors based on Likert scales of (1) Highly disagree (2) Somewhat disagree (3) Neutral (4) Agree (5) Highly agree.

As undergarments act as an essential piece of clothing, this data shows that undergarments shouldn't add any inconvenience or discomfort to the existing surgical pain. After physical comfort and easy-to-wear factors, most agreed that fabric type, product durability, and size availability play an important role when it comes to purchasing an undergarment. Reflecting on the confinement experience from the previous data, strong compressive strength, slimming function, and design aesthetics were not the main priorities when choosing an undergarment. Contrary to popular beliefs about product limitations for plus-size women, most respondents disagreed that there are limited choices available for them. It is not difficult to understand why, as most respondents had chosen basic underpants that are easily available in the market and fit the influencing factors mentioned above. The reason why caesarean-centric products that promote compression and support are not popular amongst Malaysian plus-size caesarean patients is related to the first determining factors, which are the fear of physical pain and the need for easy-to-wear products.

4.5 Apron belly post-caesarean

An extended investigation was done to further confirm the issue above by observing a plus-size patient before and after surgery. The patient is a 30-year-old woman, admitted under a planned caesarean section procedure, without any health complications related to obesity or other health concerns. The respondent is an experienced caesarean patient, and during observation, it was her second time undergoing a caesarean procedure. The respondent's belly was observed 24 hours before surgery and 24 hours after surgery to see any discrepancies in the belly measurement and changes in the pregnant belly. An obvious apron belly covering the incision area can be seen 24 hours after surgery, confirming the immediate effect faced by caesarean section patients. The before and after images can be seen in Fig. 4 below.

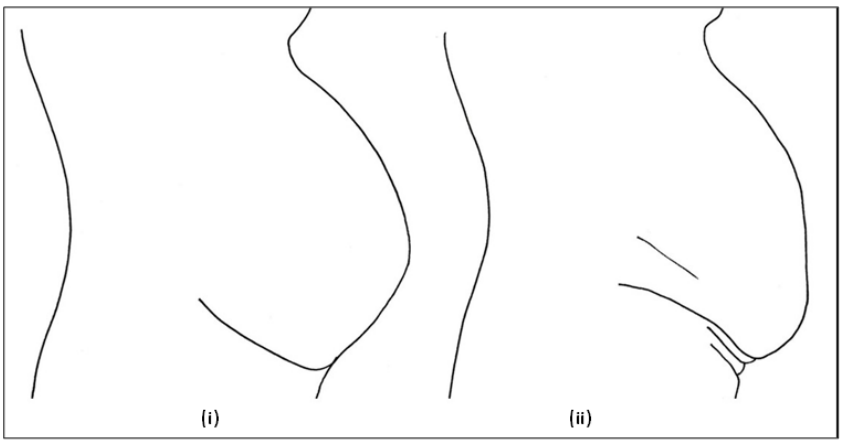

Fig. 4: Apron belly after a caesarean section procedure on a plus-size patient (ii)

As an experienced caesarean patient, the respondent claimed that none of the female undergarments available on the market is comfortable to wear during recovery, let alone the usage of '*bengkung*' during the confinement period. Furthermore, no external health devices or undergarments can ease the pain without being too bulky, warm, or difficult to wear. Much like the previous quantitative

result, the respondent also claimed that the most important process during recovery is to ensure maximum dryness around the incision area to avoid any possible infection and discomfort.

5.0 Discussion

A theoretical framework for plus-size caesarean undergarment design.

From the collective data, we understood that plus-size caesarean patients preferred simple and basic undergarments regardless of the benefits promoted by caesarean-centric products. High-waisted stretch pants are quite popular due to their snug compression strength, but they still maintain the design of a basic oversized undergarment. As mentioned earlier, while nearly 90% of respondents are practising traditional confinement rituals and almost 30% have attempted to include body binding during recovery, in the end, the closest undergarment that can be related to this is the use of high-waisted stretch pants. We can confirm that the priorities of Malaysian plus-size caesarean patients lie in maximum physical comfort and convenience. Although several studies have encouraged the use of compression garments with proven health benefits for caesarean patients, the current caesarean-centric products in Malaysia do not meet the clothing comfort needs of plus-size women. More studies on plus-size caesarean women's undergarment design should be further explored and produced. In addition, the exploration of suitable fabrics that'll fit with the intended functionality is also recommended since material feel and breathability are so important for this specific group, especially in Malaysian tropical weather. From this research outcome, a design outline for plus-size caesarean patients' undergarments was developed, and a theoretical framework was formed, as illustrated in Fig. 5.

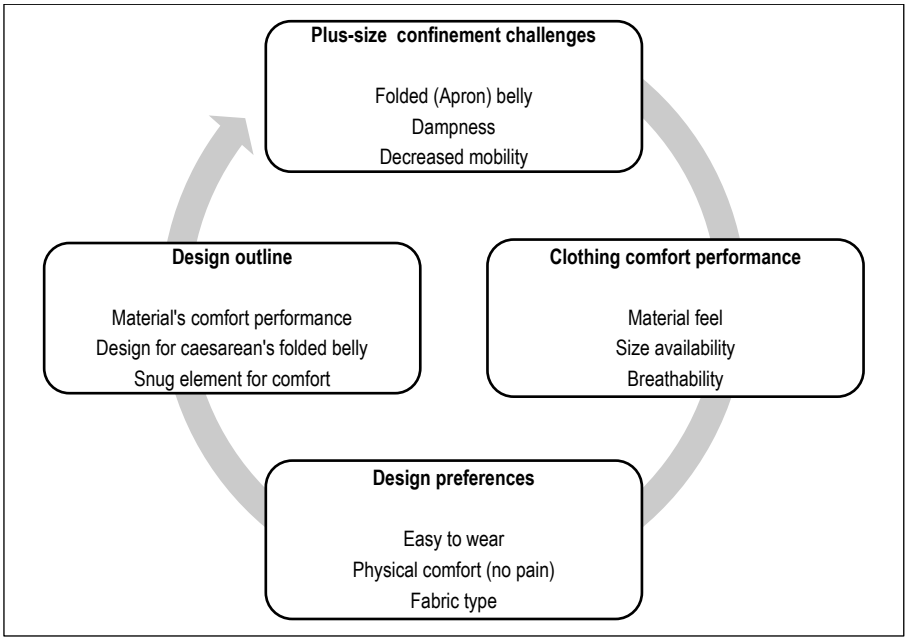

Fig. 5: A theoretical framework for plus-size caesarean undergarment design.

Theoretically, undergarments based on the design outlined above may be beneficial in assisting a plus-size patient's confinement recovery through breathable materials and design by encouraging air and moisture movement, specifically to decrease dampness around the incision area. Moderately snug sensation on a certain part of the body may be beneficial in providing the hugging and lifting effects of the sagging belly without causing any pain. Plus-size caesarean undergarments based on these outlines should be further explored to test their effectiveness.

6.0 Conclusion& Recommendations

This study uncovered several important pieces of information about plus-size caesarean women's confinement period in Malaysia. First, plus-size women's main challenges during the confinement period are the sagging apron belly, dampness around the incision area, and decreased mobility due to pain and physical discomfort. Second, traditional confinement rituals did not significantly improve the recovery period for overweight or obese women, as they may have other health-related complications influencing the speed of recovery. Finally, the caesarean-centric undergarment available in the Malaysian market was seen as adding more pain rather than elevating pain or promoting recovery. In conclusion, while many are still following the traditional confinement period, 'berbengkung' may no longer be relevant despite the many modern compression garments available to replace the traditional wrap for today's users, as it does not have any progressive impact in overcoming recovery challenges. As compression undergarments were recommended for better caesarean recovery, plus-size women may have a chance to benefit from compression undergarments' functionalities if more thoughtful designs

and suitable materials are produced specifically for them. In the end, non-compressive to minimal compressive undergarments provided the best physical comfort for Malaysian plus-size caesarean patients during the confinement period. An extensive exploration of plus-size caesarean patients' undergarment design is highly encouraged.

Acknowledgement

This research was done in collaboration with the Faculty of Medicine, University Teknologi MARA, Malaysia. Medical professionals distributed all on-site questionnaires in a hospital setting. We would like to thank them for their support and guidance during this research. This research was conducted under research ethics approval by the Research Ethics Committee UiTM with the reference number REC/12/2021 (MR/972).
This paper was funded by Penerbitan Yuran Prosiding Berindeks (PYPB) by Research Nexus UiTM (ReNeu).

Paper Contribution to Related Field of Study

This paper contributes to the fields of social studies, health, and clothing design, where the findings lead to an understanding of the challenges faced during the confinement period for Malaysian plus-size caesarean sections, the preferences of undergarment types to provide basic comfort during recovery, as well as the design outline to design functional clothing for these specific users.

References

ASTM International (2023). ASTM D6960/D6960M – 16: Standard Tables for Body Measurements for Plus Women's Figure Type, Size Range 14W – 40W.

Bhimavarapu, K. (2020). Assessment of the hospital records to determine the rate of caesarean deliveries and various indications of the procedure. International Journal of Clinical Obstetrics and Gynecology, 4(1), 407-410. https://doi.org/10.33545/gynae.2020.v4.i1f.1359

Cocks, K., & Torgerson, D. (2013). Sample size calculations for pilot randomized trials: a confidence interval approach. Journal of Clinical Epidemiology, 66(2), 197–201. https://doi.org/10.1016/j.jclinepi.2012.09.002

Crider, C. (2023). Apron Belly: Why It Happens and What You Can Do. Healthline. Retrieved February 28, 2023, from https://www.healthline.com/health/pregnancy/apron-belly

Dewar, S., Montoya, A., Kumar, N., Kabeto, M., & Alexander, N. (2023). Does Severe Obesity Affect Postacute Care Outcomes in Older Adults? Annals for Long-Term Care.

Eloranta, A., Gunnarsdóttir, I., Þórisdóttir, B., Gunnlaugsson, G., Birgisdóttir, B. E., Þórsdóttir, I., & Einarsdóttir, K. (2023). The combined effect of pre-pregnancy body mass index and gestational weight gain on the risk of pre-labour and intrapartum caesarean section—The ICE-MCH study. PLOS ONE, 18(1), e0280060. https://doi.org/10.1371/journal.pone.0280060

Ghosh, S., Dhar, S., Bhattacharjee, S., & Bhattacharjee, P. (2023). Contribution of environmental, genetic and epigenetic factors to obesity-related metabolic syndrome. The Nucleus, (66), 215–237. https://doi.org/10.1007/s13237-023-00420-y

Hu, X., Chen, Z., & Sun, F. (2023). Digitization of fabric comfort: A multidimensional evaluation strategy to human perceptions of sensorial, thermal and acoustic comfort in clothing. International Journal of Clothing Science and Technology, 35(1), 162-175. https://doi.org/10.1108/IJCST-02-2022-0022

Hussien, S., & Alzahrah, S. F. (2019). The Fading Birth Practice: Urban Malay Mothers in Malaysia Negotiating Confinement Practices. IIUM Journal of Human Sciences, 1(2), 11–19. http://irep.iium.edu.my/76869/

ISO (2018). ISO 18890:2018. Clothing — Standard method of garment measurement

Joe Celko (2010). Ordinal scales, Joe Celko's Data, Measurements and Standards in SQL, 1st edition. Retrieved May 1, 2021, from https://www.sciencedirect.com/topics/computer-science/ordinal-scale

Kuleshova, S., Zakharkevich, O., Koshevko, J., & Shvets, G. (2020). Improvement of the Methodology for Assessing the Clothing Psychological Comfort using Semantic Differential. Fibres and Textiles, (28(1), 2021).

Noorhaida Ujang, and Hanafiah Mohd Salleh, (2006) Caesarian section and demographic factors in Muar Hospital, Johor, 1997. Jurnal Kesihatan Masyarakat, 12 (1). ISSN 1675-1663

Obilor, E. I. (2023). Convenience and Purposive Sampling Techniques: Are They the Same? International Journal of Innovative Social & Science Education Research 1. Ravichandran Jeganathan and Shamala Devi Karalasingam (2017), 'National Obstetric Registry (NOR) 4th report of National Obstetric Registry 2013-2015', A publication of the NOR and the clinical research centre, Ministry Of Health Malaysia, page 49-59.

Rozaimie, A., Bolhassan, R., & Johari, A. (2019). Sarawak's Malay: The Traditional Ways of Confinement Care. Borneo Journal of Social Science & Humanities. https://doi.org/10.35370/bjssh.2019.1.2-04

Santi, A. A., & Sukarni (2022). The Effectiveness Of Using Corsets On Reducing Pain Scale In Post SC Patients At Eka Hospital, South Tangerang In 2022. International Journal of Health and Pharmaceutical, 677-682.

Shahrir, N. F., Jalil, R. A., Jeganathan, J. R. R., Karalasingam, S. D., Nordin, N. M., Abdullah, M. F., & Sa'at, N. (2021). Maternal Obesity and Its Associated Factors and Outcomes in Klang Valley, Malaysia: Finding from National Obstetric Registry. Malaysian Family Physician : The Official Journal of the Academy of Family Physicians of Malaysia, 16(3), 56–67. https://doi.org/10.51866/oa1138

Shin, E., & Saeidi, E. (2022). Body shapes and apparel fit for overweight and obese women in the US: The implications of current sizing system. Journal of Fashion Marketing and Management, 26(5), 759-775. https://doi.org/10.1108/JFMM-09-2020-0213

Simko, M., Totka, A., Vondrova, D., Samohyl, M., Jurkovicova, J., Trnka, M., Cibulkova, A., Stofko, J., & Argalasova, L. (2019). Maternal Body Mass Index and Gestational Weight Gain and Their Association with Pregnancy Complications and Perinatal Conditions. International Journal of Environmental Research and Public Health. https://doi.org/10.3390/ijerph16101751.

Sitorus, E. Y., Martini, S., & Mulyaningrum, F. M. (2023). Correlation Between the Use of Bengkung Towards Uterine Involution in Postpartum Mothers. Jurnal Profesi Bidan Indonesia (JPBI), 3(1).

Yahya, N. F. S., Mohd Fahmi Teng, N. I., Othman, S. A., Juliana, N., & Das, S. (2023). Confinement Practices and its Associated Factors Among Malay Postpartum Mothers in Malaysia. Journal of Health and Translational Medicine (JUMMEC). https://doi.org/10.22452/jummec.sp2023no2.16