Development and Validation of a Questionnaire to Assess the Risk Factors, Facilitators, and Barriers to Postpartum Weight Management

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Abstracts

Background Postpartum period is associated with significant weight retention and weight gain. The aim of this study was to develop and validate a comprehensive questionnaire to assess the risk factors, facilitators, and barriers to postpartum weight management.

Methodology The development and validation were done in five major steps by applying a mixed-method study design. Items were generated through literature review, focus group discussions, and in-depth interviews, followed by the assessment of content validity, face validity, construct validity, and reliability.

Result The final questionnaire comprises 36 items which are split into five major domains assessing perceptions related to body weight, eating behaviour, physical activity, sleep pattern, and beliefs/myths associated with postpartum period. The questionnaire has a satisfactory construct validity through factor analysis (65.12) and good internal consistency and reliability with a Cronbach's alpha of 0.79.

Conclusion This is a comprehensive tool to assess the risk factors, facilitators, and barriers to postpartum weight management and will aid in developing women centric strategies to curb the problem.

Introduction

Globally, there has been an increase in the prevalence of obesity among women of reproductive age group [1]. Pregnancy increases the propensity for weight gain and weight retention among women. Post-delivery, almost three in four women fail to return to their pre-pregnancy body weight and many of them ultimately become obese [2]. The weight gained during this period is mostly in the form of visceral fat (central obesity) which leads to an increased risk of metabolic complications like diabetes, hypertension, and coronary artery diseases in later life [3].

Postpartum women require constant motivation and support for resuming a healthy lifestyle due to the interplay of several biological factors along with social, personal, and psychological barriers. Along with these, there are various crucial facilitators such as socio-familial support, and neighbourhood/environment reinforcers. But these factors (facilitators and barriers) often go unidentified by healthcare providers, due to the lack of knowledge and awareness while treating for obesity or any co-morbid condition [4]. This necessitates the healthcare providers to evaluate various risk factors, barriers, and facilitators for weight management before formulating strategies and/or interventions to assist postpartum women in weight loss [5]. Many studies have tried to assess these factors with the help of diet recalls and

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food frequency questionnaires that require trained experts for administration, making it hard to use in resource-limited settings [6]. Some other studies have used self-developed non-validated questionnaires that have limited use in scientific research [4].

Postpartum obesity being a rising concern is needed to be evaluated by healthcare professionals via use of a validated questionnaire. Hence, the present study aims to develop and validate an easy-to-use, comprehensive questionnaire to assess the risk factors, facilitators, and barriers to postpartum weight management that can be used by healthcare providers including primary care physicians, obstetricians, Auxiliary nurse midwife, *Anganwadi* workers and Accredited Social Health Activists in their regular practice.

Methodology

Study Design

The study was approved by the Institute Ethics Committee with Reference Number (IEC/236/3/2020). A mixed-method study design was used to develop and validate the questionnaire [7, 8]. A standardized research methodology was used for the present study consisting of five major steps elaborated below.

Step 1: Item Generation and Development of the Construct

In this step, firstly a comprehensive and exhaustive literature review was done by using the search string ("Weight Retention" OR "Weight gain" OR Obes*) AND (Postpartum* OR "Post-delivery" OR Pregnancy) AND (Determinants OR "Risk Factors") on PubMed and Wiley from which 2187 titles were screened. A total of 40 articles were selected and were studied in-depth from which 31 items were generated. Secondly, research experts from nutrition, psychology, and gynaecology conducted focus group discussions and in-depth interviews with postpartum women to generate further items. A total of 27 participants belonging to varied socio-economic classes were enrolled. After four focus group discussions and eight in-depth interviews, saturation was achieved from the sample. The discussion was transcribed verbatim, and codes were generated by statistical methods. This added another 21 items.

Lastly, the construct of the questionnaire was formulated by combining all the generated items with the attempt to keep the questionnaire concise and in simple language. The flow of the questions was kept from general to specific to avoid complexity. Double negative and leading questions were avoided. The questionnaire was divided into predetermined domains: perceptions related to body weight, eating behaviour, physical activity behaviour, sleep pattern, and common beliefs/myths associated with the postpartum period.

Step 2: Content Validity

The determination of content validity was done by expert validation. Ten experts were invited to formulate a panel for the evaluation of questionnaire. The grading of each item was done using a four-point Likert scale. The rating of each item was based on relevance/clarity, which also determined the content validity index (CVI) and content validity ratio (CVR). The CVI value of 0.7 was set as cut-off value for grading. Any item valuing less than 0.7 was removed. Items with a rating between 0.7 and 0.79 were modified as per the experts, and items with ≥ 0.79 value were accepted without any changes. Based on this, nine non-essential and seven repetitive items were eliminated.

Step 3: Face Validity

In this step, cognitive interviewing was done to determine whether the questionnaire items were being interpreted correctly by the target population. Eight women were selected via purposive sampling, and their cognitive interviews were taken. These women were given questionnaires in their preferred language (English or Hindi) and were asked to mark the questions as clear (1) or unclear (0). The unclear questions were read aloud, and participants were asked to vocalize their opinions. The questions were changed as per their suggestions by adding instructions in each domain, reducing technical terms, and incorporating more user-friendly terms to increase the ease for participants while filling the questionnaire. The questionnaire was modified by rewording seven items.

Step 4: Construct Validity

Exploratory factor analysis with varimax rotation was used to finalize the questionnaire. Recruitment was done from a convenience sample using snowball sampling technique. The sample size was calculated as per the rule of thumb, five participants per variable were recruited, and as there were 36 variables, a sample size of 180 was calculated ($36 \times 5 = 180$) [9]. Hence, a total of 181 postpartum women were contacted to fill out the questionnaire. The principle of maximum diversity was followed, and written informed consent was taken. Participants were motivated to give honest responses. The confidentiality and anonymity of data were ensured. Data were analysed by using SPSS (version 25, IBM Corp, Armonk, NY, 2017). The adequacy of the sample was assured by Kaiser–Mayer–Olkin (KMO) values, and a KMO value of less than 0.05 indicates that the sampling is

inadequate [10]. Bartlett's test of sphericity was used based on the assumption that the correlation matrix is an identity matrix. If Bartlett test values are less than 0.05, the difference is significant in the variance, while if it is more than 0.05, the difference is not significant. Exploratory factor analysis was done to condense the large set of data variables into fewer factors. This was done to extract maximum common variance and to put it into a common score [11]. A scree plot was used to determine the number of factors to be retained after factor analysis, an eigenvalue of 1 was used for the identification of factors [12]. After the analysis of the factors, the structure of the questionnaire was finalized.

Step 5: Reliability

The internal consistency of the questionnaire was measured by Cronbach's alpha. It was assessed to see how closely the items in the questionnaire are related. A Cronbach's alpha value of more than 0.70 is considered to be adequate and indicates that the items are measuring the same construct [13].

Results

The final questionnaire comprises 36 items that aim to assess the risk factors, facilitators, and barriers to postpartum weight management (Fig. 1). It is divided into five comprehensive domains, namely perceptions related to body weight (2 items), eating behaviour (11 items), physical activity behaviour (12 items), sleep pattern (4 items), and common beliefs/myths associated with the postpartum period (7 items). The scoring scheme of the questionnaire is provided in Supplementary Table 1.

Socio-Demographic Profile

The socio-demographic characteristics of survey participants ($n = 181$) are mentioned in Table 1. The mean age of the participants was 29.45 ± 4.35 years with a mean postpartum period of 6 ± 2.15 months. Most of the participants belonged to the middle-socioeconomic status (72.89%).

Validity and Reliability of the Questionnaire

A five-point Likert scale has been used throughout the questionnaire to gather responses. The inter-correlation matrix is given in Supplementary Table 2. It was used to assess the singularity and similarity between pairs of variables in the distribution of the items of the questionnaire. The correlation matrix was satisfactory implying that though the items are fairly homogeneous, they do contain sufficient unique variance to avoid any similarity with each other.

Construct Validity

The sampling adequacy and factorial validity were determined by running principal component factor analysis accompanied by varimax rotation. The obtained factorial validity was found to be 65.12, which is satisfactory. Furthermore, the adequacy of the sample was determined by KMO value (0.700) and Bartlett's test of sphericity ($p < 0.01$) (Table 2).

Reliability

The Cronbach's alpha value of the questionnaire was found to be 0.79, indicating that multiple items of the questionnaire are measuring the same prime construct. The scale statistics are given in Table 3.

Discussion

The present questionnaire has been developed in a scientifically validated and reliable manner and captures a varied range of important variables to study the risk factors, barriers, and facilitators associated with weight retention and weight gain in the postpartum period. The questionnaire has five domains. The first domain evaluates perceptions related to body weight which is considered important in determining long-term motivation and willingness for weight loss [14]. The questions are related to the opinion of postpartum women on their current body weight and their preparedness for weight loss. The second domain focuses on eating behaviour as postpartum women encounter various barriers to healthy eating due to time constraints, childcare responsibilities, and social conditioning. The consumption of a healthy and diverse diet becomes difficult and hence affects weight management. [15]. The third domain encompasses questions related to physical activity behaviour because postpartum women mostly have low levels of physical activity due to lack of time, support, and motivation, along with lack of knowledge, accessibility, and affordability of physical activity programs [16]. The fourth domain addresses issues associated with sleep. In the first postpartum year, there are substantial alterations in the sleep pattern. Persistent sleep deprivation leads to an increase in the stress hormone like cortisol and increases the appetite-stimulating hormone, ghrelin which leads to overeating and resultant obesity. Therefore, fewer hours of sleep is associated with substantial postpartum weight retention [17]. The fifth domain assesses common beliefs/myths associated with the postpartum period. Every culture and region have its own sets of myths and beliefs related to postpartum lifestyle

Section A:
Socio-demographic information including the Kuppuswamy scale
Anthropometric measurements

Section B:
Information about obstetric variables

Section C:
Risk factors, facilitators, and barriers to post-pregnancy weight management
Perceptions related to body weight
Statements 1C and 2C describe perception about current weight status and readiness to achieve appropriate body weight. Based on your current practice, mark the option that best describes your opinion.

1C. In your opinion, which statement does define your present body weight status?
(i)My weight is slightly less. (ii) My weight is appropriate. (iii) My weight is slightly more. (iv) My weight is significantly more. (v) Prefer not to comment.

2C. In your opinion, which statement most closely describes your intention/motivation to initiate lifestyle-related changes (i.e. diet, exercise etc) to attain appropriate body weight?
(i)I have already initiated. (ii) I am planning to initiate within 1-2 weeks. (iii) I am planning to initiate within 1-2 months (iv) I am planning to initiate within 3-4 months. (v) I have no intention to initiate in the near future.

Eating Behaviour
Statements 3C-13C describe eating behaviour. Based on your current practice, mark the option that best describes your eating behaviour.

3C. How often do you maintain a regular meal pattern comprising three major and two-three minor meals?
(i)Not routinely (ii) 1-2 days a week (iii) 3-4 days a week (iv) 5-6 days a week (v) Almost daily

4C. How often do you include protein-rich foods (milk or milk products/pulses/egg/meat/fish/chicken) in every major meal (breakfast, lunch, dinner) of your daily diet?
(i)Not routinely (ii) 1-2 days a week (iii) 3-4 days a week (iv) 5-6 days a week (v) Almost daily

5C. How often do you include 4-5 servings of fruits and vegetables in your daily diet? (1-2 seasonal locally available fruits 75-100gm each, 1 serving of green leafy vegetable, 1 serving of roots and tubers and 1 serving of other vegetables)
(i)Not routinely (ii) 1-2 days a week (iii) 3-4 days a week (iv) 5-6 days a week (v) Almost daily

6C. How often do you consume HFSS (High in Fat, Salt and Sugar) food products such as namkeens, samosa, pakoras, mathri, kheer, halwa, sweets, puddings, cakes, pastries, sweet biscuits, chocolates, fast foods etc?
(i)Once in a month or less (ii) Once in 15 days (iii) Once in a week (iv) 3-4 times in a week (v) Almost daily

Reasons associated with inability to follow a healthy eating behaviour.
Please select a response that best explains your opinion regarding the reason associated with inability to follow a healthy eating behaviour.
Mark the responses on a five-point Likert scale from strongly agree to strongly disagree (Strongly agree, Agree, Neither agree nor disagree, Disagree, Strongly disagree).
7C. My food intake has increased as I have to breastfeed my child.
8C. I don't have knowledge about food and dietary habits to be followed during this period for achieving appropriate body weight.
9C. I don't make/am unable to make conscious dietary efforts (such as following a diet plan prescribed by a professional/reliable source) to reduce my weight.
10C. Managing house, child and work leaves me with little time and energy to focus on healthy eating behaviour.
11C. Mismatched eating habits of my family members make it difficult for me to follow healthy eating patterns for myself.

Fig. 1 Questionnaire to assess the risk factors, facilitators, and barriers to post-pregnancy weight management

12C. I am bound to eat high calorie foods as per my family's advice.

13C. I tend to overeat or consume high calorie foods to make me feel better.

Physical Activity Behaviour

Statements 14C-25C describe physical activity behaviour. Based on your current practice, mark the option that best describes your physical activity behaviour.

14C. Household chores include cooking, dish washing, laundry, cleaning etc. To what extent do you perform household chores on an average per day?
(i)Not at all (ii) Up to 25% (iii) 25-50% (iv) 50-75% (v) 75-100%

15C. How often do you participate in household chores?
(i)Not routinely (ii) 1-2 days a week (iii) 3-4 days a week (iv) 5-6 days a week (v) Almost daily

16C. Low-intensity exercises for the post-pregnancy period generally include walking slowly, pelvic floor exercises and gentle abdominal exercises. How much time do you currently spend doing low-intensity exercises in a day?
(i)Not at all (ii) Up to 15 minutes (iii) 15-30 minutes (iv) 30-45 minutes (v) 45 minutes or more

17C. Moderate-intensity exercises for the post-pregnancy period generally include brisk walking, yoga, low-impact aerobics, and light weight training. How much time do you currently spend doing moderate-intensity exercises in a day?
(i)Not at all (ii) Up to 15 minutes (iii) 15-30 minutes (iv) 30-45 minutes (v) 45 minutes or more

18C. How often do you indulge in any physical activity (low intensity/moderate intensity)?
(i)Not routinely (ii) 1-2 days a week (iii) 3-4 days a week (iv) 5-6 days a week (v) Almost daily

19C. How much time do you spend being sedentary [sitting, resting (other than sleep and naps), reading, watching television, using social media] in a day?
(i)Less than 2 hours (ii) 2-4 hours (iii) 4-6 hours (iv) 6-8 hours (v) More than 8 hours

Reasons associated with inability to follow a physical activity routine.

Please select a response that best explains your opinion regarding the reason associated with inability to follow a physical activity routine.

Mark the responses on a five-point Likert scale from strongly agree to strongly disagree (Strongly agree, Agree, Neither agree nor disagree, Disagree, Strongly disagree).

20C. I don't have knowledge about physical activities to be followed during this stage that will lead to weight loss.

21C. I don't make/am unable to make conscious physical activity efforts (such as participating in physical activities/exercises advised by a professional/reliable source) to reduce my weight.

22C. I find it difficult to initiate/carry out physical activities due to excessive body pain/backache.

23C. Managing house, child and work leaves me with little time and energy to engage in physical activity.

24C. My family does not let me engage in physical activity during this stage.

25C. I have no access to parks, walking tracks and fitness centres.

Sleep Pattern

Statements 26C-29C describe sleeping patterns. Based on your current practice, mark the option that best describes your sleep patterns.

Adequate sleep is defined as 7-9 hours sleep per day with the person not feeling sleep deprived throughout the day.

26C. On average, how many hours do you sleep at night?
(i)<5 hours (ii) 5-7 hours (iii) >7 hours

27C. On average, how much time do you nap during the day?
(i)<30 minutes (ii) 30 minutes to 1 hour (iii) >1 hour (iv) Not applicable

28C. How would you rate your current sleep quality?
(i)Excellent (ii) Good (iii) Average (iv) Poor (v) Very poor

29C. How often do you get family support to meet high infant needs at nighttime so that you can have comfortable sleep?
(i)Always (ii) Mostly (iii) Sometimes (iv) Rarely (v) Never

Common beliefs/myths associated with the post-pregnancy period

Fig. 1 (continued)

Statements 30C-36C describe common beliefs associated with the post-pregnancy period. Based on your practice, mark the option that best describes you.
Mark the responses on a five-point Likert scale from strongly agree to strongly disagree (Strongly agree, Agree, Neither agree nor disagree, Disagree, Strongly disagree).
30C. I choose to overeat so that my baby gets adequate nutrition.
31C. Galactagogues are foods such as Ladoos-mawa ladoo, saunth ladoo, til ladoo, gond ladoo / Dry fruit panjiri / Gud-jeera sheera / Dry fruit milk / Excessive ghee that are believed to increase breast milk formation. I believe that excessive galactagogue consumption during the first 40-days post-pregnancy leads to higher breast milk formation.
32C. I believe that reducing calories in my diet may lead to reduced breast milk production.
33C. I had excessive consumption of ghee in the last trimester of my pregnancy.
34C. I believe that physical activity may affect the breast milk composition.
35C. I believe that breastfeeding helps in natural weight loss automatically.
36C. A 40-day period of confinement post-delivery involves no restriction on high calorie food intake, but involves restricted physical activity with the belief of healing of a new mother. I believe that this period of confinement after delivery is essential.

Fig. 1 (continued)

behaviours. These behaviours often impart unhealthy dietary and physical activity practices that ultimately lead to weight retention and further gain in postpartum women [18].

In the recent literature, many studies have assessed the risk factors, barriers, and facilitators of weight management in postpartum women. This has been mostly done by two methods: (1) self-developed survey, recall assessing lifestyle-related factors, and/or [4, 6] (2) multiple standardized questionnaires [4]. The self-developed surveys are comprehensive and measure the required components but have their own limitations. The self-developed questionnaires can be only used as a preliminary assessment method. They lack validity and reliability to generate comparable datasets across different population groups. Also, traditional recall methods are time-consuming and mostly require training and expertise for administration. While some studies [19, 20] have used previously standardized questionnaires to measure varied sets of problems like postpartum depression, anxiety, physical activity, and sleep, the administration of multiple questionnaires creates mental fatigue and a burden on the participants which may develop a bias. The developed questionnaire integrates all the above-mentioned factors specifically for postpartum women and is easy to administer.

There are numerous applications of the present questionnaire. This questionnaire is a simple, concise, and freely available tool. The questionnaire has a relatively less participant burden and will help the healthcare providers in the comprehensive assessment of risk factors of weight retention and various barriers associated with postpartum weight management. This questionnaire will aid in bridging the service delivery gap for postpartum women. The questionnaire can be administered in diverse healthcare settings and will help in curbing the problem of obesity in the target population.

Conclusion

The postpartum period is an opportune window to prevent and address the problem of obesity and its associated complications among reproductive women. The present questionnaire will serve as a validated and reliable tool for the assessment of risk factors, barriers, and facilitators associated with postpartum weight management. Moreover, this newly developed questionnaire can be potentially used in future cross-sectional and longitudinal studies to assess weight-related as well as lifestyle-related issues among postpartum women. Consequently, this will help in better

Table 1 General characteristics of the sample ($n = 181$)

Characteristics		n (%)
Age (years) (mean ± SD)	29.45 ± 4.35	
Parity	Primiparous	98 (54.14)
	Multiparous	83 (45.86)
Education	Profession or honours	62 (34.25)
	Graduate	83 (45.86)
	Intermediate or diploma	17 (9.39)
	High-school certificate	11 (6.08)
	Middle-school certificate	3 (1.66)
	Illiterate	5 (2.76)
Socio-economic status (SES)	Lower SES	17 (9.39)
	Middle SES	132 (72.89)
	High SES	32 (17.68)
Postpartum period (months) (mean ± SD)	6 ± 2.15	
Postpartum weight retention (PPWR) (kg) (mean ± SD)	5.32 ± 5.21	
Mode of delivery	Normal	84 (46.41)
	Instrumental	3 (1.66)
	Caesarean	94 (51.93)
Pre-pregnancy BMI (kg/m^2) (mean ± SD)	23.05 ± 3.97	
	Underweight (< 18.5)	16 (8.83)
	Normal (18.5–22.9)	89 (49.17)
	Overweight (23–24.9)	32 (17.67)
	Obese (≥ 25)	44 (24.30)
Present BMI (kg/m^2) (mean ± SD)	25.22 ± 4.54	
	Underweight (< 18.5)	9 (4.9)
	Normal (18.5–22.9)	46 (25.41)
	Overweight (23–24.9)	41 (22.65)
	Obese (≥ 25)	85 (46.96)

Table 2 KMO and Bartlett's test

Kaiser–Meyer–Olkin measure of sampling adequacy		.700
Bartlett's test of sphericity	Approx. Chi-square	2190.763
	df	630
	Sig	.000

Table 3 Scale statistics

Mean	Variance	Standard deviation	Cronbach's alpha	Factorial validity	No. of items
97.36	172.80	13.15	0.79	65.12% or 0.65	36

understanding of the problem and devising solutions for the management.

Declarations

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