The body mass index as a determinant of balance in the postpartum women: A comprehensive review

[1]Bhavana PS, [2] Dr. Belle Sharvani (PT) , [3] Dr Manjunatha H (PT), [4] Dr Ashila T P (PT), [5] Dr Nikita Das (PT)

[1]BPT graduate, [2] Associate Professor, [3] HOD, Principal, [4] Assistant Professor, [5] Lecturer
[1]Physiotherapy,
[1]Akash Institute of Physiotherapy, Bangalore, India
[1] reddybhavana215@gmail.com [2]sharuphysio@gmail.com [3]manjuinlife@rediffmail.com
[4] ashilaashi.2806@gmail.com [5] nikitadas19991212@gmail.com

Background
The puerperium, or postpartum period, is the phase that begins after childbirth and lasts until the mother's body has physically, biomechanically, and psychologically attuned back to its pre-pregnancy state. Understanding this physiological component of balance during this phase is essential for mothers who undergo changes in their body mass index (BMI). Balance refers to the ability to maintain the body's centre of gravity through the integrated functioning of the visual, vestibular, and proprioceptive systems, in coordination with the musculoskeletal and central nervous systems. Body Mass Index (BMI) is widely used anthropometric measure that assesses an individual's body weight relative to height.
Objective: To comprehensive review the articles on relationship of Body mass index as key determinant in balance on postpartum women.
Methodology: Articles identified through systematic searches on PubMed, Google Scholar, and ScienceDirect, Cochrane. Based on Level of Evidence and 10 articles were identifies based on PRISMA guidelines and CASP >7 and comprehensive evidence-based literature study was carried out.
Result: This comprehensive review of 10 articles strongly indicate that Body Mass Index (BMI) plays a critical role in influencing both postpartum recovery and postural balance. The reviewed literature highlights that BMI significantly affects body composition during the postpartum period where women with elevated BMI tend to experience greater weight retention after delivery and are at increased risk of developing biomechanical complications.
Conclusion: Women who maintain a healthy BMI and engage in structured postpartum exercise programs, particularly those involving pelvic floor training, strengthening of core muscles can have a improved balance.

I. *INTRODUCTION*

The puerperium, or postpartum period, is the phase that begins after childbirth and lasts until the mother's body has physically, biomechanically, and psychologically attuned back to its pre-pregnancy state. During this time, the body undergoes various changes as it recovers from pregnancy and labour, gradually returning to its optimal condition.[1,2] The postpartum phase is a transformative period for a woman's body, triggering numerous physiological changes that has occurred during foetal development, these changes affect nearly every system of the body, from hormonal fluctuations to alterations in cardiovascular, respiratory, musculoskeletal, and renal functions. Understanding this physiological component of balance during this phase is essential for mothers who undergo changes in their body mass index (BMI). Physiological changes being the most in post-partum, post birth there is an abrupt decline estrogen, progesterone and relaxin which increases during pregnancy. Relaxin and estrogen increase ligament laxity during pregnancy and peaking in later trimesters and begin to decrease in postpartum.[3,4]

Balance refers to the ability to maintain the body's centre of gravity through the integrated functioning of the visual, vestibular, and proprioceptive systems, in coordination with the musculoskeletal and central nervous systems. In postpartum women, balance is notably affected due to significant physiological and biomechanical changes like lumbar lordosis, which increases approximately from 32 degrees to 50 degrees during pregnancy and may not fully return to pre-pregnancy alignment. This persistent curvature contributes to altered load distribution and back pain, thereby impacting postural stability. In puerperium women, both

static and dynamic balance are affected due to ongoing physiological and biomechanical changes that occur after childbirth. In Static balance Elevated center of pressure, sway persists up to 6 months of postpartum when compared to non-pregnant women in dynamic balance, postpartum changes can impact on postural control during functional activities.[5]

Body Mass Index (BMI) is widely used anthropometric measure that assesses an individual's body weight relative to height. It is calculated by dividing a person's weight in kilograms by the square of their height in meters (kg/m^2), and is used to categorize individuals as underweight, normal weight, overweight, or obese. During the postpartum period, an increased BMI can adversely impact postural control due to several factors, including biomechanical alterations, a weakened core, and a shifted centre of gravity.[7] These changes may affect their stability and increase the risk of imbalance.BMI is not only a widely used indicator of body composition but also plays a critical role in determining physical function. Recognizing BMI as a key determinant of balance is particularly important in vulnerable populations such as puerperium women and the elderly, where compromised stability can lead to functional limitations and increased risk of injury.[6]

Relationship of BMI and Balance

The relationship between Body Mass Index (BMI) and balance is closely linked, as changes in body weight can significantly affect postural control and stability. An increased BMI, especially in the overweight and obese categories, often results in a forward or upward shift of the body's centre of gravity.[7] This shift alters normal biomechanics and making it more difficult to maintain both static and dynamic balance. Additionally, excess weight may also weaken the core and lower limb muscles, which are crucial for stability and controlled movement. As a result, individuals with elevated BMI may be at a higher risk of postural instability and falls.[8]

OBJECTIVE

To comprehensive review the articles on relationship of Body mass index as key determinant in balance on postpartum women.

METHODOLOGY

Study design: Comprehensive literature review
Search engine: Google scholar, PubMed, research gate, science direct
Inclusion Articles: Randomized controlled trials, cohort studies, case series, systematic reviews, metanalysis
Search Year: 2019 to 2025
Study Population: The target population includes postpartum women aged 20–40 years who are between 6 weeks to 1 year of post-delivery regardless of the type of childbirth (vaginal or caesarean)
Key words: Body mass index, Balance, puerperium, pelvic floor dysfunction, postural instability.

PROCEDURE

Step 1

Source: Articles that were Relevant to study were identified through systematic searches on established academic databases including PubMed, Google Scholar, and ScienceDirect, Cochrane. Based on Level of Evidence the articles and the sources were selected for their comprehensive access to peer-reviewed journals and evidence-based literature.

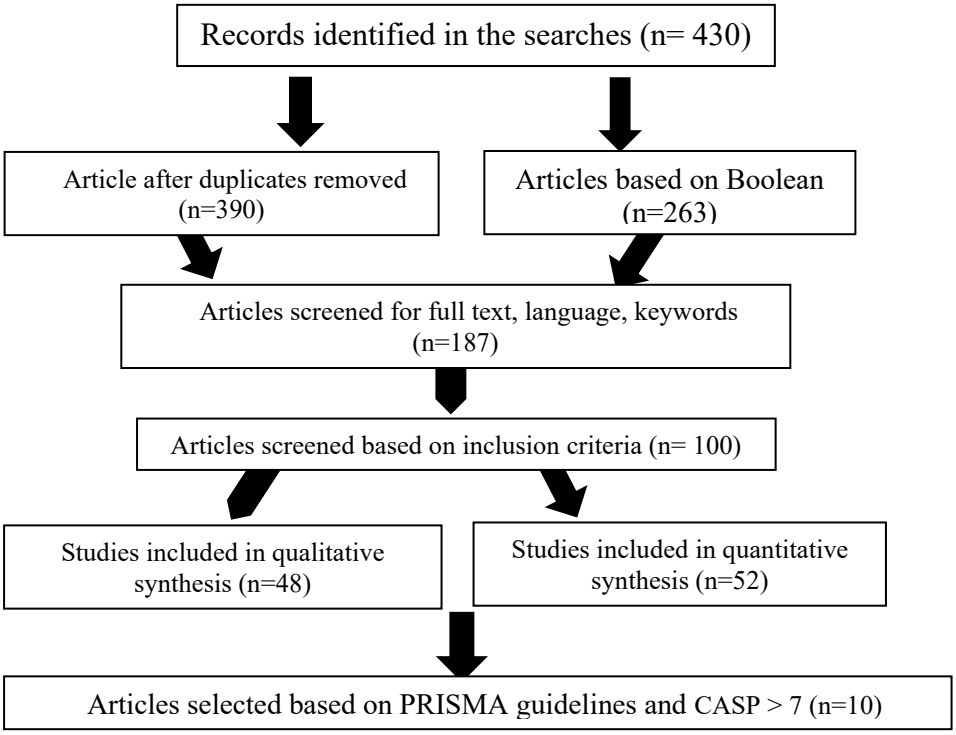
Step 2

Data selection: The articles were searched based on Keywords, inclusion criteria and bolero words and scrutinized. All retrieved articles were first screened by reviewing their titles and abstracts to assess relevance to the research topic, which focuses on the influence of Body Mass Index (BMI) on postural balance in women during the puerperium period. Preliminary screening was done to remove duplicates and clearly irrelevant studies based on exclusion criteria like studies that did not involve postpartum women or

lacked outcome measures related to BMI or balance. Following the initial filtering, full-text articles were obtained and assessed in detail against predefined inclusion criteria. The studies that were published between 2019 to 2025, involved human subjects who were within the postpartum period, and reported data on BMI in relation to any aspect of balance or postural control were considered for further reviewing. Priority was given to English language articles, original research articles that had CASP >7 and met the critical appraisal such as randomized controlled trials (RCTs), cohort studies, cross-sectional analyses, and systematic reviews with clear methodologies.

Study 3

Data extraction: A systematic process was followed to extract relevant data from the studies that met the inclusion criteria. Essential details such as the authors, publication year, research design, participant demographics, and postpartum duration were screened and recorded. Special consideration was given to keywords like how BMI was defined or categorized in each study and the specific tools used to assess balance or postural stability, such as force plates, balance scales, or motion analysis systems. Key findings regarding the association between BMI and balance outcomes were carefully noted to identify patterns or inconsistencies across the studies. Additional data, such as outcome measures, risk of bias, and the authors' interpretations, were also captured to provide context for the results. This structured extraction helped ensure that each study's contribution to the topic was clearly understood and allowed for effective comparison and synthesis of evidence. The collected information was then organized for analysis to inform conclusions about the role of BMI in influencing balance during the puerperium period.



Flow Chart 1: Procedure for Selection of Articles for Review

Literature Review

Section 1: Literature Review on BMI

Author and year	Study design	No. of participants	Result	Level of Evidence
Relationship of Pre-pregnancy BMI with Maternal and Infant Outcomes in the First 6 Months Postpartum. **Ahmadi Beni et al., 2023**	Cohort Study	180 mothers	Higher pre-pregnancy BMI is linked to more maternal weight retention and impacts infant nutrition and weight.	III
BMI Changes Before, During, and After Pregnancy and Their Link with Metabolic Syndrome in Lactating Women. **Chen et al., 2023**	Cross-sectional Study	540 lactating women	BMI fluctuations are strongly associated with increased risk of postpartum metabolic syndrome.	II
Impact of Pre-pregnancy BMI and Weight Gain on Postpartum Pelvic Floor Muscle Function. **Shao et al., 2025**	Retrospective Cohort Study	512 primiparous women	High BMI and weight gain correlate with impaired pelvic floor muscle structure and function.	III

Section 2: Literature Review on Balance

Author and year	**Study design**	**No. of participants**	**Result**	**Level of Evidence**
Postpartum Walking Balance and Anthropometry. **Rothwell et al., 2020**	Observational Study	36 postpartum women	Reduced postpartum balance is associated with changes in body structure and size.	II
Changes in Static Balance During Pregnancy and Postpartum: A Systematic Review. **Goossens et al., 2022**	Systematic Review	21 studies	Balance is consistently impaired postpartum; recovery varies across time and individuals.	I
Anthropometry and Center of Mass Changes Postpartum **Catena et al., 2019**	Longitudinal Study	17 Women	Center of mass shifts impact standing posture and balance during the postpartum period.	II

Section 3: Literature Review on BMI relation in Postpartum

Author and year	**Study design**	**Participants**	**Result**	**Level of Evidence**
Maternal BMI Changes and Cardiometabolic Risk Postpartum **Zhang et al., 2024**	Longitudinal Cohort Study	756 women	Increased BMI postpartum is linked with higher cardiometabolic risks such as glucose intolerance and hypertension.	II
Association between postpartum BMI changes and pelvic floor muscle recovery in primiparous women: A 6-month follow-up study. **Gervais et al. (2023)**	Prospective longitudinal cohort study	210 primiparous women	Increased BMI from early to late postpartum was significantly associated with poorer PFM recovery. Stable or reduced BMI correlated with better muscle tone and function.	II
Body image and pelvic floor dysfunction in pregnancy and postpartum: A prospective one-year follow-up cohort study **Cattani et al. (2024)**	Prospective cohort study	174 pregnant women followed to 1 year postpartum	A significant correlation was found between poor body image and increased pelvic floor dysfunction symptoms (e.g., urinary incontinence, prolapse, constipation) both during late pregnancy and postpartum.	II

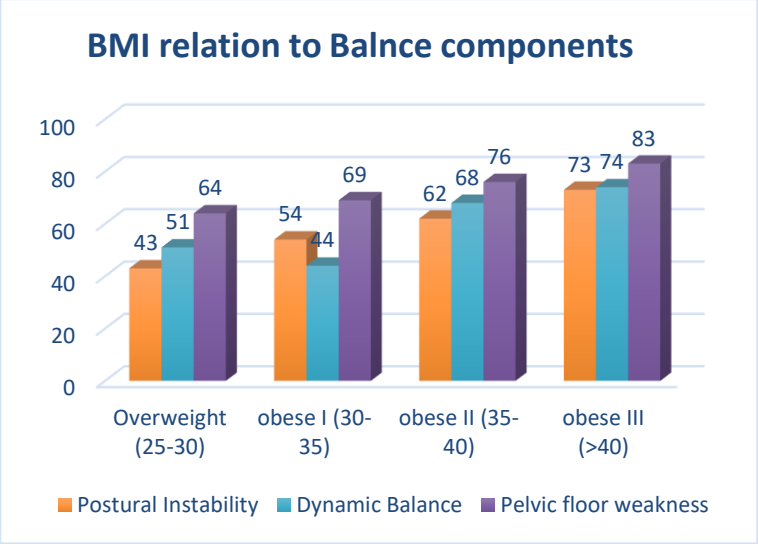
Result

This comprehensive review included 16 peer-reviewed studies focusing on postpartum women aged 20–40 years, within six weeks to one year after childbirth. 10 articles strongly indicate that Body Mass Index (BMI) plays a critical role in influencing both postpartum recovery and postural balance. The reviewed literature highlights that BMI significantly affects body composition during the postpartum period where women with elevated BMI tend to experience greater weight retention after delivery and are at increased risk of developing biomechanical complications. In addition, abnormal BMI whether underweight or overweight has been related to impaired pelvic floor muscle function, which can negatively impact postural stability and overall balance.

In terms of postural control, evidence shows that balance generally improves during the postpartum period; however, the rate and extent of recovery are influenced by BMI due to changes in pelvic floor muscle function, dynamic stability and postural sway which can negatively impact overall balance. Changes in body structure and weight distribution during and after pregnancy also lead to shifts in the body's centre of mass, affecting both static and dynamic posture. Increases in BMI from the prepregnancy to the postpartum period are consistently linked to Biomechanical changes of the body where articles showed that components of Balance can be directly proportional to the BMI. Conversely, women who maintain a healthy BMI and engage in structured postpartum exercise programs, particularly those involving pelvic floor training, strengthening of core muscles.

BMI	Postural Instability	Dynamic Balance	Pelvic floor weakness
Overweight (25-30)	43	51	64
Obese I (30-35)	54	44	69
Obese II (35- 40)	62	68	76
Obese III (>40)	73	74	83

Table 1: BMI relation in Balance Component



Discussion

The postpartum period is marked by substantial physical and hormonal changes that directly impact a woman's balance and overall functional stability. Body mass index (BMI) emerges as a key influencing factor in postural control during the puerperium phase. An increased BMI often leads to biomechanical alterations, such as shifts in the centre of gravity and reduced core and pelvic floor strength, resulting in greater postural sway and slower recovery of dynamic stability. On the contrary, a lower BMI also reflects reduced muscle mass and endurance, which also compromises balance.

Research shows that women who maintain a healthy BMI and engage in targeted postpartum exercise particularly involving pelvic floor and core strengthening demonstrate more efficient balance recovery and improved functional outcomes. There are substantial evidence that supports both underweight and overweight

conditions can disrupt balance in the postpartum period, and BMI should be considered a modifiable risk factor

Conclusion

This comprehensive review highlights the significant role of Body Mass Index (BMI) in influencing postural balance during the puerperium period. Both elevated and reduced BMI levels are associated with compromised balance, and altered biomechanical function. Excessive BMI contributes to greater postural sway and impaired pelvic floor function, while low BMI may reflect insufficient muscle mass and stability. Maintaining an optimal BMI through appropriate weight management, physical activity, and postpartum rehabilitation can promote better postural control and functional mobility. These findings emphasize the importance of individualized postpartum care strategies that address BMI as a modifiable factor to enhance recovery and reduce fall risk in postpartum women

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