

Special Article - Breast Feeding

Research Progress on Breastfeeding and Postpartum Weight Retention

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Abstract

Obesity is a major public health Problem and Postpartum Weight Retention (PPWR) may cause a vicious cycle of postpartum women's obesity and it is highly likely to increase the risk of adverse health outcomes. Breastfeeding is an unparalleled way to provide ideal food for the infants and an integral part of the reproductive process, which has an important impact on the health of mothers and infants. There may be an association between breastfeeding and PPWR and that effect may be affected by breastfeeding method and/or duration, but it still have controversies. In this review, we will discuss the association between breastfeeding and PPWR and explore the potential impact factors.

Keywords: Breastfeeding; Lactation; Postpartum weight retention; PPWR; Review

Introduction

Over the past 30 years, obesity has become increasingly popular worldwide, especially among women of childbearing age [1]. Obesity is a major public health problem and it is estimated that medical expenses due to obesity exceed 700 billion dollars per year [2]. For most women, pregnancy and childbearing will cause the weight changes, and that may change their weight of trajectory [3], which will have a profound impact on themselves and their offspring [4-7].

Postpartum Weight Retention (PPWR) is the difference between the weight at a certain time after delivery minus the weight before pregnancy [8]. 47% of American women gain too much weight during pregnancy and thus 13% of them cannot regain their pre-pregnancy weight after delivery, and their weight increases by about 5 kg at 6-18 months after delivery [9]. Longitudinal studies have shown that Gestational Weight Gain (GWG) and pre-pregnancy Body Mass Index (BMI) are related to postpartum weight retention [10-13]. Every increase of 1 unit of BMI before pregnancy will increase the weight of 0.51 kg after delivery [14] and every gain of 1 kilogram of body weight during pregnancy will be retained in the body by 35% at 9 months postpartum [15], which may cause a vicious cycle of postpartum women's obesity [16-18] and it is highly likely to increase the risk of adverse health outcomes, including insulin resistance, metabolic syndrome and cardiovascular disease [3]. Therefore, studies have proposed that maintaining pregnancy weight at 6 months after delivery can be used as a predictor of long-term obesity [19].

In addition to pre-pregnancy BMI and GMG, there are many other factors that affect the occurrence of PPWR, including parity, age, race/ethnicity, education, diet, physical activity, breastfeeding time and so on [20-24]. Among these factors, breastfeeding is particularly worthwhile attention because it is an unparalleled way to provide ideal food for the healthy growth and development of infants; it is also an integral part of the reproductive process and has an important impact on the health of mothers [25,26]. However, scholars still have controversies about the relationship between breastfeeding and

postpartum weight retention. Research includes but is not limited to the time, duration and method of breastfeeding. Therefore, in this review, we intend to summarize the current research results and conclusions, analyze the underlying mechanisms, and point out the direction for future research.

The Effect of Breastfeeding on Postpartum Weight Retention**Breastfeeding improves postpartum weight retention**

Some studies have shown a significant correlation between breastfeeding and PPWR. Waits [27] et al. obtained a dose-response relationship between breastfeeding duration and PPWR in a cross-sectional study of 52, 367 women in Taiwan, China. The PPWR of women who exclusively breastfed for 1 month was significantly lower than those who did not breastfeed or partly breastfed during the same period, and PPWR decreased by an average of 0.1-0.2 kg per month. The PPWR of mothers who exclusively breastfed for 6 months was reduced by 0.7 kg compared with partial breastfeeding, and 1.3 kg less than those without breastfeeding.

However, not all studies have obtained or explored a dose-effect relationship. A prospective cohort study conducted by Tahir [28] et al. of 370 mothers in the United States found that the PPWR of mothers breastfeeding for more than 3 months decreased significantly than those who breastfed for only 1-3 months. However, there is no statistically significant between breastfeeding for 3 months and 6 months at 6 months postpartum. A retrospective cohort study conducted by Krause [29] et al. on 14, 330 women who breastfed for 3 months and 4, 922 women who breastfed for 6 months in the United States, and found that breastfeeding status had no effect on weight retention at 3 months postpartum, but it has a significant impact on weight retention at 6 months postpartum. The effectiveness of reducing postpartum weight are as follows: complete breastfeeding > mixed feeding > formula feeding, full breastfeeding has greater protective effects. Other previous studies [30-34] (different populations, different research methods) have come to the

same conclusion, that is, breastfeeding has a significant reduction in PPWR and that effect may be affected by breastfeeding method and/or duration.

Breastfeeding has nothing to do with postpartum weight retention

There are also some evidences that breastfeeding has nothing to do with PPWR. Neville [35] conducted a systematic review of all observational studies (8 retrospective studies and 37 prospective studies) published before June 12, 2012 on breastfeeding and postpartum weight changes as well as body composition changes, then concluded: most studies reported little or no association between breastfeeding and changes in body weight ($n=27$, 63%) or changes in body composition ($n=16$, 89%). In studies that do show breastfeeding has a positive effect on weight loss, this association is often relatively weak and often confused by other factors such as GWG, age, and pre-pregnancy BMI. However, four of five studies with higher methodological quality in terms of weight measurement and adjustment of key covariates showed a positive correlation between breastfeeding and weight change. Nevertheless, the overall study findings emphasize that there is currently insufficient evidence to suggest a direct link between breastfeeding and postpartum weight changes.

Subsequent studies confirmed Neville's conclusions. A prospective cohort study of 1,035 women in Ireland conducted by Mullaney [36] et al. showed that, there was no difference in the weight change of women who exclusively breastfed (+2 kg), mixed breastfed (+1.7 kg) and formula fed (+1.1 kg) at 4 months postpartum. Moreover, compared with formula fed women, breastfed women had a greater increase in body fat percentage at 4 months postpartum (-0.03% vs +1%, $P=0.02$). And the results of a cluster randomized trial conducted by Oken [37] et al. on 17,046 women in Belarus showed that the proportion of women in the intervention group (6,321) who exclusively breastfed for greater than or equal to 3 months was 44.5%, and the control group (5,546) was 7.1%. At 11.5 years postpartum, the average results of the intervention group mothers were lower than those of the control group mothers' BMI (-0.27 kg/m²; 95% CI: -0.91, 0.37) and body fat (-0.49%; 95% CI: -1.25, 0.27). However, the effect is a million to one and the range of confidence interval is wide. Moreover, the results decays to zero after adjusting the baseline characteristics.

Current meta-analysis researches

Meta-analysis is a method of combining different results from multiple studies to obtain a comprehensive effect value [38]. Currently, there are only two related articles. He [39] et al. made a systematic review and meta-analysis to reveal the relationship between breastfeeding and postpartum weight retention. The study included 11 articles (8 cohort studies and 3 Randomized Controlled Trials (RCT)) published before October 2014. The results showed that whether breastfeeding can reduce body weight is related to the duration of breastfeeding. Compared with formula feeding, breastfeeding for 3-6 months has a positive effect on weight change (0.87 kg 95% CI: 0.57-1.17); If breastfeeding lasts for more than 6 months, or less than/ equal to 3 months, it may have little or no effect on weight change. However, the problem with this article is that the two included RCT studies equate mixed feeding with formula feeding

[40,41], but in fact mixed feeding also includes breastfeeding; except that, another included RCT study compares the effects of early infant food supplementation on the mother's PPWR, breastfeeding time, and delivery interval [42]. It is not relevant to our research topic and relevant data cannot be extracted and used. The results of these three studies reduce the credibility of this study.

Jiang [43] et al. also did a meta-analysis to explore the relationship. A total of 14 original studies published before June 2016 were included. The results showed that: compared with mothers who used formula feeding, the postpartum weight of breastfed mothers can reduce 0.38 kg (95% CI: -0.64, -0.11). Subgroup analysis showed that breastfeeding duration is an important influencing factors for PPWR. The PPWR of the breastfeeding group showed a U-shaped trend compared with the formula feeding group and no dose-effect relationship was observed. Breastfeeding had the most significant effect on reducing PPWR at 6-12 months postpartum. In addition, breastfeeding can lower the PPWR of childbearing women with these conditions: developing countries, primiparas, age less than 30 years, and normal BMI before pregnancy. However, as the author said, this meta-analysis still has certain limitations. PPWR is the result of a combination of multiple factors [22], and the confounding factors can only be adjusted in the original study, hence, we cannot rule out the residual confounding of the original study. Whether these potential confounding factors are more related to PPWR is still unclear.

The possible mechanism of breastfeeding to reduce postpartum weight retention

Excessive or abnormal accumulation of fat or adipose tissue in the body can lead to obesity [44]. As we all know, the way to lose weight is nothing more than reducing energy intake and increasing energy expenditure. There are two potential mechanisms that explain why breastfeeding may reduce PPWR. The first potential mechanism is that lactation itself is an energy-consuming process. Studies have shown that breastfeeding mothers need to spend 500 kcal per day to produce milk [45]. At the same time, lactation can helpfully mobilize the fat reserves in the body to achieve weight loss.

The second underlying mechanism is the changes in maternal hormone levels. The lactation process promotes the synthesis and releases the prolactin. Increased levels of prolactin in the body will reduce the level of estrogen, which in turn enhances the mobilization of adipose tissue; in addition, prolactin can also inhibit the production of fat and inhibit the uptake of glucose by adipose tissue [46]. But the release of prolactin is a double-edged sword. On the one hand, it increases the mobilization of adipose tissue and reduces the production of fat. On the other hand, it also stimulates the lactating mothers' appetite, leading to the increase of food intake [47]. Brewer [48] et al. conducted a study on the weight and body fat changes of 56 American women from the beginning of delivery to 6 months postpartum and showed that, lactating mothers consume more energy (exclusive breastfeeding, 2055±435 kcal; mixed breastfeeding, 2005±515 kcal) than non-lactating mothers (formula feeding, 1453±503 kcal) ($P<0.01$).

Since the mobilization and metabolism of fat is a gradual process; and the prolactin level, which impacts the appetite and food intake, also shows a downward trend over time. Therefore, short-term breastfeeding may not have a significant effect on weight. McClure

[49] et al. explored the relationship between breastfeeding duration and visceral obesity in 89 American women and showed that, in the fully adjusted model, the visceral fat of mothers who had never breastfed is 36.96 cm larger than those who breastfed for 3 months after delivery (95% CI: 20.92, 53.01); The visceral fat is 20.38 cm higher in mothers who breastfed for less than 3 months than those who breastfed for 3 months or more (95% CI: 2.70, 38.06).

Maybe this is one of the reasons for the global public health recommendations. The WHO recommend that the infants should be fed by exclusive breastfeeding for the first 6 months after birth to achieve optimal growth, development as well as health should be continued feeding by breastfeeding with other nutritionally adequate and safe complementary foods until age 2 or order [25,50].

Conclusion and Inspiration

The effect of breastfeeding may not be a real risk factor for PPWR, but a common cause of PPWR. However, many results and potential mechanisms indicate that breastfeeding may help reduce PPWR, and the potential beneficial effects of breastfeeding need to be weighed against other risks of PPWR.

Due to the inability to implement high-quality RCT researches, we suggest that a multi-center, large sample, cohort study instead of cross-sectional research (in order to obtain causal inference) should be conducted in the future. And we should try to avoid using self-reported height and weight to prevent information bias and try our best to record the detail measurement and the information on many all known and potential confounding factors. In addition, the follow-up time should be longer, in order to obtain the weight information at a longer time point after delivery and learn about the long term impact.

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