Physical activity and prevention and treatment of weight gain associated with pregnancy: current evidence and research issues

STEPHAN RÖSSNER

Obesity Unit, Huddinge University Hospital, S-141 86 Stockholm, SWEDEN

ABSTRACT

RÖSSNER, S. Physical activity and prevention and treatment of weight gain associated with pregnancy: current evidence and research issues. Med. Sci. Sports Exerc., Vol. 31, No. 11, Suppl., pp. S560–S563, 1999. Purpose: The purpose of this study was to examine the evidence in the literature for a relationship between physical activity and weight development during and after pregnancy. Methods: A retrospective analysis of the literature, mainly based on an extended MEDLINE search and the Pregnancy and Childbirth Database (Cochrane), was conducted. Results: Weight development during pregnancy is the result of numerous interacting factors, with physical activity being one important determinant of weight outcome and eventually also overweight and obesity. Several methodological matters complicate the interpretation of the interrelationships: generally body weight and not fat has been measured, sociobehavioral confounders have rarely been accounted for, and the time frame to determine the effect of pregnancy on later weight development has been highly variable. Most studies concentrate on the role of physical activity, such as recreational activity and sports, on the safety of the pregnant mother and the fetus. The few studies that address the question of exercise and fat deposition found slightly a smaller increase in skinfold measures in pregnant women who exercised. Factors such as the self-selection of well-educated women under study and of normal body weight, as well as the lack of controls, limit the possibilities to which these results can be extrapolated. Conclusion: Little information is available on these issues and the quality of information is at most at the evidence type D level, according to the NHLBI classification system. Future research priorities include proper prospective control trials of this important aspect of an obesity preventing lifestyle tool, as well as studies concerning the preventive effects of physical activity on weight retention after pregnancy, an issue not as yet addressed in the literature. Key Words: BODY WEIGHT, EXERCISE, OBESITY, PHYSICAL ACTIVITY, PREGNANCY

The assessment of the interaction between energy intake, physical activity, and pregnancy-associated body weight increase is complex for a number of reasons. An examination of the literature makes it clear that a sequence of events makes the analysis of the relationship between physical activity and obesity in pregnancy difficult.

1. The study of the weight development itself during and after pregnancy is full of inherent complications in analyzing these relationships.

2. The study of physical activity during pregnancy has generally focused on the potential risk of such activity on the well-being of mother and child rather than on the possible relationship with a later accumulation of adipose tissue during and immediately after the pregnancy.

WEIGHT DEVELOPMENT DURING AND AFTER PREGNANCY: METHODOLOGICAL ISSUES

Whereas the objective of this review is to focus on obesity related problems, almost all studies in this area have measured body weight rather than body fat. For obvious ethical reasons, some of the more complex but precise techniques to measure adipose tissue are not available in studies of this type.

Numerous sociobehavioral confounders responsible for the apparent effect of parity on body weight often have not been accounted for or are sometimes impossible to account for. Longitudinal studies partly overcome these problems by using each mother as her own control.

Three main methodological constraints have to be overcome: 1) accurate measurements of body weight from conception and onwards must be obtained; 2) sufficient time for weight lost after delivery must be allowed; and 3) the parallel effect of aging during pregnancy and follow-up must be accounted for.

In the extensive review by Harris (8) the general outcome can be summarized as follows: Ninety percent of all studies
reviewed found a body weight greater after pregnancy than before (by 0.2 to 10.6 kg). Only 3 of 71 studies (11,15,20) complied with all three aforementioned methodological criteria.

In this subgroup (11,15,20) the average “cost” of a pregnancy was 0.9 to 3.3 kg. These differences in weight gain became slightly smaller (0.4 to 3.0 kg) after control for several sociobehavioral confounders. Thus in the literature it is generally rare that factors obviously of importance in evaluating the role of physical activity, such as age, height, education, parity, giving up work, smoking habits, prepregnant weight and activity, alcohol consumption, marital status, morbidity, and dieting behavior, are accounted for (8). This evaluation is further complicated by the fact that changes in these confounders may take place in different ways and during various phases of the pregnancy (24).

MAIN FOCUS ON MATERNAL FITNESS AND FETAL WELL-BEING

In the discussion of physical activity, a great deal of attention in the literature is addressed to one particular form of physical activity, namely, the question of exercise. In many cases this trend seems to have developed in response to the fitness interest of the 1970s and onwards. The safety of aerobic exercise, the duration of a running program, etc., have been more the focus than the potential benefit of adipose tissue mass control by increasing energy expenditure through physical activity (16). Furthermore, most studies on physical activity in pregnancy have analyzed its role from an obstetrical point of view. Examples include importance of exercise during pregnancy on labor and labor associated variables (such as length of labor (10), Apgar scores of newborns (7,22), and postpartum recovery (18,19,23)).

FACTORS AFFECTING PHYSICAL ACTIVITY DURING PREGNANCY

Numerous psychological factors may indirectly affect eating behavior, food selection, and thus body weight as a consequence of physical activity during pregnancy.

In the study by Sibley et al. (14) women exercised by swimming during the second trimester; they found, surprisingly enough, no improvement in several fitness parameters but an increased sense of well-being, improved appetite, and a more restful sleep pattern.

Wallace et al. (18) also reported higher self-esteem in exercising pregnant women. Indirectly it has been suggested that physical activity during pregnancy may reduce depression and mood swings (6).

In the descriptive, nonexperimental, and uncontrolled study by Horns et al. (9) the only characteristic that differed between active and inactive groups was educational level, which was higher in active women, whereas race, marital status, and cesarean section rates or age did not differ significantly.

REVIEWS OF PHYSICAL ACTIVITY/EXERCISE AND PREGNANCY

Searches in MEDLINE and the Pregnancy and Childbirth Database (Cochrane Collaboration) reviewed by Bell et al. (1) in 1994 illustrate that physical activity to control adipose tissue development receives little attention. This review with 136 references mainly deals with the effects of exercise on the maternal cardiorespiratory system (49 references), the effects of exercise induced trauma on mother and fetus (8 references), the effects of exercise on maternal heat production and fetal consequences (17 references), and the fetus and uterus response to exercise (42 references). This review concludes by identifying the need for randomized trials in which sedentary women and recreational athletics are studied separately.

The review by Sternfeld (16) contains a table of observational studies of exercise and pregnancy outcome. Of the 14 studies reviewed only three mention maternal weight development as an outcome in the findings: the studies of Clapp et al. (2,3) and Dale et al. (5). The other studies mainly report effects on pregnancy complications, risk of prematurity, labor time and complications, and birth weight. No studies ranks higher than evidence level D on the NHLBI classification system.

Clapp and Little (4)

One of the few studies addressing the question of recreational exercise on pregnancy weight gain and subcutaneous fat deposition is that by Clapp and Little (4). The study is prospective, but not randomized. Women planning a child were studied; 44 chose to remain physically active during pregnancy, and 35 stopped their exercise habits when they learned of their pregnancy. No differences in any parameters studied were observed during the first and second trimester, but in the third trimester exercising women had a reduced rate of weight gain and significantly less increase in five skinfold measures. This study thus demonstrates that well-educated nonsmoking highly motivated women who maintained a balanced diet and were not obese before pregnancy accumulated slightly less fat in the last trimester. Although this is one of the few studies addressing the issue of physical activity and control of obesity, several limitations remain. Self-selection, nonquantification of the amount exercised, and a very selective group of women, whose weight throughout the pregnancy remained well within the normal range, limit the possibilities for extrapolation of these results to the population at risk, for whom a pregnancy is a major trigger for weight retention and subsequent obesity (12).

Recommendations to the family physician by Wang and Apgar (17)

A 1998 review in American Family Physician (17) is interesting for what it does not tell about exercise during pregnancy as a method to improve weight control. The review concludes that “a firm basis for exercise recommendations is lacking.” Weight control is only mentioned in that
“maternal weight should be routinely followed,” which probably does not come as a major surprise to either physician or pregnant woman. Nor is it surprising to note that boxing and wrestling are not recommended during pregnancy, whereas walking, stationary cycling, low impact aerobics, and swimming are encouraged. The latter activities obviously agree with recommended program to control inappropriate gain of adipose tissue. Wang and Apgar underscore that there remain major deficits in our knowledge: The outcome of several sports have not been analyzed, and mainly middle-to-upper class women have been studied.

As part of an extensive analysis of NHANES I data, the relationship between parity-associated weight gain with sociodemographic and behavioral factors was analyzed in white and Afro-American U.S. women (21). Data from 2952 women were examined at baseline and 10 yr later, and as part of the analysis, factors increasing the probability of gaining more than 11.4 kg during that time period were assessed. Data show that weight increase is more likely in women with several indicators of lower socioeconomic status, but surprisingly nonrecreational physical activity was associated with substantial weight gain, even after some adjustment. However, when follow-up rather than baseline measurements (simple three-level questions on activity) were used, the association disappeared. Because of sample size limitations, no data on inactivity and weight gain were available in the Afro-American group. These findings underscore the problem in interpreting data on physical activity because half the sample changed their reported activities between baseline and follow-up. As Wolfe et al. (21) point out, few studies on postpartum weight retention and physical activity have been published. In Öhlin and Rössner (24) factors associated with weight retention were studied and related to trends in behavioral patterns which were constructed a priori. Major determinants of weight retention 1 yr after delivery were changes in eating habits relating to higher intake, more snacking, and irregularity. The subgroup of women who had retained more than 5 kg 1yr after delivery were less often physically active in their leisure time, 54% versus 46%, P < 0.05. In our extreme group with a weight development corresponding to the NHANES figures, 23% of women retaining more than ≥ 10 kg 1yr after delivery were quite inactive in their leisure time versus 4% of women with less weight retention (P < 0.001). More women with BMI < 24 kg−2 returned to a higher level of physical activity after pregnancy than did women with higher prepregnancy body weight (23% vs 15%, P < 0.005) (25).

RESEARCH PRIORITIES

This review demonstrates that data, primarily focusing on the role of physical activity to control inappropriate weight gain during pregnancy and after delivery is scarce and unsystematic. Data on prevention—as is outlined in the title of this chapter—is completely lacking. MEDLINE searches and an analysis of review articles underscore that the main interest has been stimulated by the needs of obstetricians to identify behavioral traits during pregnancy that improve the chances of a successful pregnancy outcome. Focus has been more on the importance of maternal weight development for the well-being of the fetus and the newborn than on the fact that inappropriate weight gain during pregnancy, as a recognized high risk period, may in the long run expose the woman to several serious consequences associated with obesity. The fact that a pregnancy may be an important trigger for future accelerated weight increase and obesity is documented in the literature (13) but rarely addressed.

Weight data, although often of moderate quality, is often available in previous studies, and it is possible that further retrospective analyses of already existing material could be useful in elucidating the role of physical activity for prevention and treatment of obesity. This review clearly indicates that to study the potential of physical activity on future weight development, prospective, randomized, controlled studies are essential. On the other hand, the limited amount of data available illustrate the scope of the problem. Complete randomization to activity/nonactivity may be impossible to obtain, blinding may be difficult, and the long time span makes interpretations more difficult. We still do not know, for example, whether the role of physical activity is most important for the overall weight outcome before, during, or after pregnancy. The few data available (24) suggest that effects on weight can only be observed in the third trimester and that postpartum overall weight retention correlated in particular with the physical activity 6–12 months after delivery.

Address for correspondence: Professor Stephan Rössner, Obesity Unit, M73, Huddinge University Hospital, S-141 86 Stockholm, Sweden. E-mail: Stephan.Rossner@meds.ki.SE.

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