

The effect of regular daily walking on adverse pregnancy outcomes among overweight primigravidas: a prospective cohort study

Nahla W. Shady,¹ Hany F. Sallam,¹ Shymaa S. Ali,² Ahmed M. Abbas²

Keywords: Exercise, primigravidas, overweight, adverse pregnancy outcomes, regular walking

Abstract

Objective: The study aims to evaluate the effect of regular daily walking on the occurrence of adverse pregnancy outcomes among overweight primigravidas.

Materials and Methods: A prospective cohort study conducted at Aswan University Hospital from March 2015 to December 2016. The study included 360 overweight primigravidas, with singleton pregnancies, who were divided into two groups: Group I (control group) and Group II (study group) under supervised regular walking 5 times per week for 30 minutes, starting from 10-12 weeks of gestational age to 38-39 weeks of gestational age. The primary outcome of the study was the rate of gestational weight gain in participants in both groups. Secondary outcomes included the rate of gestational diabetes mellitus, gestational hypertension, preeclampsia, preterm labor (<37 weeks of gestation), postdate pregnancy, fetal macrosomia (> 4 kg), excessive maternal weight gain (>11.5 kg), and the rate of cesarean delivery.

Results: There were no significant differences between groups with regard to the basic criteria. The exercise program decreased the incidence of preeclampsia (OR=0.120; 95% CI=0.015-

0.970; p=0.037), postdate (OR=0.274; 95% CI=0.099-0.759; p=0.008), excessive weight gain (OR=0.220; 95% CI=0.114-0.424), p=0.000), and cesarean delivery (OR=0.519; 95% CI=0.316-0.841, p=0.007).

Conclusion: Regular maternal walking throughout the pregnancy may be a preventive tool for preeclampsia, postdate pregnancy, excessive weight gain and may decrease the incidence of cesarean delivery in primigravidas.

¹Department of Obstetrics & Gynecology, Faculty of Medicine, Aswan University, Aswan, Egypt

²Department of Obstetrics and Gynecology, Faculty of Medicine, Assiut University, Assiut, Egypt

Introduction

The National Institutes of Health (2000) classify adults according to body mass index (BMI) as: Normal weight (18.5 to 24.9 kg/m²); Overweight (25 to 29.9 kg/m²); and Obese (≥30 kg/m²).¹ Excessive weight is a major health problem as women who are overweight or obese before pregnancy are at increased risk for adverse maternal and

Please cite this paper as: Shady NW, Sallam HF, Ali SS, Abbas AM. The effect of regular daily walking on adverse pregnancy outcomes among overweight primigravidas: a prospective cohort study. Proc Obstet Gynecol. 2017;7(3): Article 2 [9 p.]. Available from: <http://ir.uiowa.edu/pog/> Free full text article.

Corresponding author: Ahmed M. Abbas, MD, Department of Obstetrics and Gynecology, Faculty of Medicine, Assiut University, Assiut, Egypt; Woman's Health Hospital, 71111, Assiut, Egypt, Cellular: +20 10033851833; Tel: +20882414698; email: bmr90@hotmail.com

Financial Disclosure: The authors report no conflict of interest.

Copyright: © 2017 Shady et al. This is an open-access article distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.

neonatal outcomes as compared to normal-weight women.² Moreover, long-term maternal and fetal effects include significant and increased morbidity and mortality rates. The adverse effects include gestational diabetes mellitus (GDM), gestational hypertension, preeclampsia, preterm birth, macrosomia, stillbirth, neonatal death and an increased risk of cesarean delivery (CD).³⁻⁸

Weight loss and lifestyle changes have been shown in adult populations as a whole to reduce associated metabolic syndrome.⁹ In 2015, the American College of Obstetricians and Gynecologists (ACOG) emphasized that even if not previously active, pregnancy is an ideal time to adopt lifestyle modifications because women should be seen by a health care provider more frequently than at any other time in their lives.¹⁰ Regular physical exercise or activity promotes and maintains physical fitness, prevents co-morbidities, manages weight, and improves psychological wellbeing.¹¹ A higher maternal BMI during the first trimester and increased maternal gestational weight gain was associated with higher rates of postdate pregnancy.¹²

Therefore, the aim of this study was to evaluate the role of regular walking throughout pregnancy on the incidence of adverse maternal and neonatal outcomes in overweight primigravida starting early in pregnancy (10-12 weeks of gestation). These outcomes include gestational diabetes mellitus (GDM), gestational hypertension, preeclampsia, preterm labor (PTL), premature rupture of membranes (PROM), and postdate pregnancy. The study also aims to evaluate the effect on

the mode of delivery, either CD or vaginal delivery (VD).

Materials and methods

This study was a prospective cohort study, conducted at Aswan University Hospital from March 2015 to December 2016. We included in our study all primigravidas with BMI ≥ 25 kg/m², non-smokers with singleton uncomplicated pregnancies from the Outpatient Obstetric Clinic. Overweight, including obesity, was defined by BMI ≥ 25 kg/m². We excluded women with a risk of preterm delivery, those with medical disorders during pregnancy, and those with a history of infertility treatment.

We obtained an informed consent from all women before participation after discussing the nature of the study and the benefit of walking in pregnancy. First, the participating women were enrolled in the screening phase of the study. This phase included taking a history, including parity and gestational age. Gestational age was calculated based on a reliable first day of the last menstrual period or having a first trimester ultrasound (US) defining gestational age, if it was unknown by the woman. Then, we measured the weight and height of each woman with calculation of BMI. Additionally, fasting blood glucose was done at inclusion to exclude DM and blood pressure measurement to exclude the presence of hypertension.

Then, the eligible women were allocated to either Group I (control group), who received the usual care during pregnancy, or Group II (study group), who were included in an adherence program involving regular walking for 5

days per week for 30 minutes, from 10-12 weeks of gestational age to 38-39 weeks of gestational age. Women were followed until delivery in the antenatal clinic of our hospital for assessment of any adverse outcomes. They were also encouraged to deliver in our delivery unit for final evaluation of the study outcomes.

The primary outcome of the study was the rate of gestational weight gain in both groups. Secondary outcomes included the rate of GDM, gestational hypertension, preeclampsia, preterm labor (<37 weeks of gestation), PROM, postdate pregnancy, fetal macrosomia (>4 kg), excessive maternal weight gain (>11.5 kg), and the rate of CD.

Data were entered and statistically analyzed using the Statistical Package for Social Sciences (SPSS), version 21. Qualitative data were described as

numbers and percentages. Chi square tests were used for comparison between groups. Quantitative data were described as mean SD± after testing for normality using the Kolmogorov-Smirnov test. Student's t-test was used for comparison between groups. Odds ratios (OR) and their 95% confidence intervals were calculated. P value ≤ 0.05 was considered to be statistically significant.

Results

Out of 370 eligible pregnant women who met our inclusion criteria, ten were excluded. Three of them had a history of previous PTL and seven women had a medical disorder, such as DM or rheumatic heart disease, which could have affected adherence to the walking program. The remaining 360 women were divided into two groups, each one comprised of 180 women.

Table 1: The characteristics of pregnant women at first visit in both groups

Parameters [#]	Control group (n:180)	Walking group (n:180)	t-test	p-value
Age (year)	25.02 ± 2.51	25.09 ± 2.47	0.254	0.80
Height (cm)	1.64 ± 2.80	1.64 ± 2.80	0.338	0.74
Weight (kg)	74.12 ± 2.56	74.13 ± 2.53	0.062	0.95
BMI	27.57 ± 1.02	27.56 ± 1.04	0.091	0.93
SBP	108.25 ± 5.08	108.44 ± 4.82	0.372	0.71
DBP	66.58 ± 7.76	66.83 ± 6.14	0.339	0.74
FBG	77.09 ± 4.39	77.24 ± 4.53	0.331	0.74
Mean BP	80.47 ± 6.18	80.70 ± 5.29	0.382	0.701

BMI (Body Mass Index), SBP (Systolic Blood Pressure), DBP (Diastolic Blood Pressure), FBG (fasting Blood Glucose), Mean BP (Mean Blood Pressure)

[#]All variables are presented as mean ± standard deviation and Student's T-test was used to calculate the difference.

Table 1 summarizes the age, height, weight, BMI, systolic blood pressure, diastolic blood pressure and fasting blood glucose of the participating women, with no significant difference between groups.

In fact, for the study group, regular walking actually reduced the incidence of GDM, gestational hypertension and

macrosomia as compared to the control group, although there was no statistically significant difference ($p=0.06, 0.07, 0.1$; respectively). On the other hand, regular walking significantly reduced the occurrence of preeclampsia ($p=0.037$) and postdate pregnancy ($p=0.008$). There was no significant difference in preterm labor and PROM ($p=0.836, 0.205$; respectively) (Table 2).

Table 2: The rate of adverse pregnancy outcomes in both groups

Outcomes #	Control group (n:180)	Walking group (n:180)	Odds ratio	95% confidence interval		p-value
				lower	upper	
GDM	9 (5.0%)	2 (1.1%)	0.213	0.045	1.002	0.061
Gestational hypertension	12 (6.7%)	4 (2.2%)	0.318	0.101	1.006	0.070
PE	8 (4.4%)	1 (0.6%)	0.120	0.015	0.970	0.037*
PTL	12 (6.7%)	13 (7.2%)	1.090	0.483	2.458	0.836
PROM	9 (5.0%)	15 (8.3%)	1.727	0.736	4.056	0.205
Postdate	17 (9.4%)	5 (2.8%)	0.274	0.099	0.759	0.008*
Macrosomia	9 (5.0%)	3 (1.7%)	0.032	0.086	1.210	0.139

GDM (Gestational Diabetes Mellitus), PE (Preeclampsia), PROM (Premature Rupture of Membranes)

*Statistical significant difference

#All variables are presented as number (percentage) and Chi square test was used to calculate the difference.

Regarding weight gain during pregnancy, there was a statistically significant difference between the two groups ($p=0.000$). Women with regular walking had less mean gestational weight gain than the control group. Additionally, the walking group (Group II) had a significantly decreased ($p=0.007$) incidence of CD compared to the control group (Group I) (Table 3).

Discussion

This study examined the effects of regular walking throughout pregnancy on the occurrence of adverse pregnancy outcomes in overweight primigravidas. The important finding of our study was that the exercise intervention during pregnancy significantly reduced excessive gestational weight gain in the study group (26.1% versus 7.2% in the control group).

Table 3: Weight gain, excessive weight gain and mode of delivery in both groups

Outcomes	Control group (n:180)	Walking group (n:180)	p-value
Weight gain, mean±SD	10.86 ± 1.36	10.34 ± 1.22	0.000*
Excessive weight gain, n/%	47 (26.1%)	13 (7.2%)	0.000*
Mode of Delivery:			
- CD, n/%	56 (31.1%)	34 (18.9%)	0.007*
- VD, n/%	124 (81.1%)	146 (68.9%)	

CD (Cesarean delivery), VD (vaginal delivery)

* Statistical significant difference

The association between exercise intervention and gestational weight gain identified in our study was consistent with published literature. Women, who practiced exercise three or more times per week, more frequently meet gestational weight gain recommendations (32.7% vs. 18.7%), and the OR of excessive gestational weight gain was lower (aOR= 0.43, 95% CI=0.24–0.78) than women who did not have the same intensity of exercise according to the study of Harris, et al.¹³

In addition, Ruchat et al. found that women undergoing moderate-intensity exercise had lower total gestational weight gain than low-intensity exercise and control groups (14.9±3.8, 15.3±2.9 and 18.3±5.3 kg respectively). In addition, excessive gestational weight gain was prevented in 70% of the women in the low-intensity group and 77% of those in the moderate-intensity group.¹⁴ Another study by Jiang et al., 2012, concluded that physically active pregnant women

have less weight gain during pregnancy, and the OR of excessive gestational weight gain decreased with an increased level of physical activity (p <0.05).¹⁵

Regular walking reduced the incidence of preeclampsia (0.6% versus 4.4%). This suggests that an exercise program started early in gestation in asymptomatic overweight women can prevent the occurrence of hypertension (and, potentially, preeclampsia) linked to excessive gestational weight gain. Thus, a healthy lifestyle initiated preconception and in early gestation may perhaps be the key to preventing chronic disease risk in both mother and baby.

In addition, epidemiological studies based on retrospective questionnaires, suggest that women who are physically active are less likely to develop gestational hypertension; however, none examined the interaction of exercise and prevention of excessive gestational weight gain.¹⁶⁻¹⁸ Maternal exercise has

many benefits and has been associated with the lowering of BP¹⁹ and an increase in aerobic and cardiovascular conditioning.²⁰ Engaging in exercise may be particularly important for nulliparous women, in much the same way, as we found that the incidence of hypertension and preterm delivery was reduced in overweight primigravidas. Exercise may also protect against preeclampsia by reducing maternal by-products of oxidative stress, preventing endothelial dysfunction, and stimulating vascularity and placental growth.

In our study, regular walking reduced the rate of postdate pregnancy ($p=0.008$). This finding was consistent with a 2008 study by Denison et al.,¹² which demonstrated that increased maternal gestational weight gain was associated with prolonged length of gestation.

Additionally, we found that the overall percentage of CD decreased (18.9% versus 31.1%) compared to standard-care women, after controlling for confounding factors. Regular walking also reduced the incidence of macrosomia (1.7% versus 5%). The route of delivery was influenced by exercising in study participants as in other studies examining exercise as a form of intervention during pregnancy.^{19,21} Gestational obesity and excessive maternal weight gain are associated with macrosomia, postdates pregnancy and high rates of CD.^{9,11}

ACOG recommends that pregnant women should exercise moderately for 30 minutes on most days of the week. However, very few women meet the minimum recommendations.²² The data in our study also showed that only a

small proportion of pregnant women performed moderate to high (1.2%) physical activity during pregnancy. The reasons for this might be that pregnancy is a very special period in a woman's life. Pregnant women are very careful about their actions during pregnancy,²³ and they might not receive adequate advice and information concerning exercise from professionals.²⁴ Considering the prominent role of exercise during pregnancy in previous research and in our study, strengthening the research on exercise-related issues for pregnant women, such as the optimal forms of exercise and intensity, will be of great value in improving pregnant women's physical exercise level.

The major strength of our study was the high adherence in our walking group; without an exercise intervention and weekly accountability, few pregnant women will continue exercising on their own. One limitation of our study is that we did not assess nutrition or energy intake. However, all women had standard care with information regarding a healthy lifestyle during pregnancy; the difference between the two groups was the initiation of the exercise program. Additionally, the lack of randomization between both groups is another limitation of our study.

Conclusion

Our findings provide some insights into the association of exercise intervention in the form of daily regular walking with overweight and overweight-related adverse outcomes. Regular maternal walking throughout the pregnancy may be a preventive tool for preeclampsia, postdate pregnancy, excessive weight

gain, and may decrease the incidence of cesarean delivery in primigravidas.

References

1. Institute of Medicine (US) and National Research Council (US) Committee to Reexamine IOM Pregnancy Weight Guidelines; Rasmussen KM, Yaktine AL, editors. Weight gain during pregnancy: reexamining the guidelines. Washington (DC): National Academies Press (US); 2009. PubMed PMID: 20669500.
2. Catalano PM. Management of obesity in pregnancy. *Obstet Gynecol.* 2007 Feb;109(2 Pt 1):419-33. <https://doi.org/10.1097/01.AOG.0000253311.44696.85> PubMed PMID: 17267845.
3. Li C, Liu Y, Zhang W. Joint and Independent Associations of Gestational Weight Gain and Pre-Pregnancy Body Mass Index with Outcomes of Pregnancy in Chinese Women: A Retrospective Cohort Study. *PLoS One.* 2015 Aug 27;10(8):e0136850. <https://doi.org/10.1371/journal.pone.0136850> PubMed PMID: 26313941; PubMed Central PMCID: PMC4552294.
4. McDonald SD, Han Z, Mulla S, Beyene J; Knowledge Synthesis Group. Overweight and obesity in mothers and risk of preterm birth and low birth weight infants: systematic review and meta-analyses. *BMJ.* 2010 Jul 20;341:c3428. <https://doi.org/10.1136/bmj.c3428> PubMed PMID: 20647282; PubMed Central PMCID: PMC2907482.
5. Murakami M, Ohmichi M, Takahashi T, Shibata A, Fukao A, Morisaki N, Kurachi H. Prepregnancy body mass index as an important predictor of perinatal outcomes in Japanese. *Arch Gynecol Obstet.* 2005 Apr;271(4):311-5. Epub 2004 Jun 5. <https://doi.org/10.1007/s00404-004-0629-7> PubMed PMID: 15185098.
6. Tsai IH, Chen CP, Sun FJ, Wu CH, Yeh SL. Associations of the pre-pregnancy body mass index and gestational weight gain with pregnancy outcomes in Taiwanese women. *Asia Pac J Clin Nutr.* 2012;21(1):82-7. PubMed PMID: 22374564.
7. Liu Y, Dai W, Dai X, Li Z. Prepregnancy body mass index and gestational weight gain with the outcome of pregnancy: a 13-year study of 292,568 cases in China. *Arch Gynecol Obstet.* 2012 Oct;286(4):905-11. <https://doi.org/10.1007/s00404-012-2403-6> Epub 2012 Jun 14. PubMed PMID: 22695822.
8. Torloni MR, Betr n AP, Horta BL, Nakamura MU, Atallah AN, Moron AF, Valente O. Prepregnancy BMI and the risk of gestational diabetes: a systematic review of the literature with meta-analysis. *Obes Rev.* 2009 Mar;10(2):194-203. <https://doi.org/10.1111/j.1467-789X.2008.00541.x> Epub 2008 Nov 24. PubMed PMID: 19055539.
9. Crist LA, Champagne CM, Corsino L, Lien LF, Zhang G, Young DR. Influence of change in aerobic fitness and weight on prevalence of metabolic syndrome. *Prev Chronic Dis.* 2012;9:E68. Epub 2012 Mar 8. <https://doi.org/10.5888/pcd9.110171> PubMed PMID: 22405475; PubMed Central PMCID: PMC3368700.
10. ACOG Committee Opinion No. 650: Physical activity and exercise during pregnancy and the postpartum period. *Obstet Gynecol.* 2015 Dec;126(6):e135-42. <https://doi.org/10.1097/AOG.0000000000001214> PubMed PMID: 26595585.
11. Artal R. Exercise in pregnancy: guidelines. *Clin Obstet Gynecol.* 2016 Sep;59(3):639-44. <https://doi.org/10.1097/GRF.0000000000000223> PubMed PMID: 27398880.

12. Denison FC, Price J, Graham C, Wild S, Liston WA. Maternal obesity, length of gestation, risk of postdates pregnancy and spontaneous onset of labour at term. *BJOG*. 2008 May;115(6):720-5. <https://doi.org/10.1111/j.1471-0528.2008.01694.x> PubMed PMID: 18410655; PubMed Central PMCID: PMC2344995.
13. Harris ST, Liu J, Wilcox S, Moran R, Gallagher A. Exercise during pregnancy and its association with gestational weight gain. *Matern Child Health J*. 2015 Mar;19(3):528-37. <https://doi.org/10.1007/s10995-014-1534-8> PubMed PMID: 24912945.
14. Ruchat SM, Davenport MH, Giroux I, Hillier M, Batada A, Sopper MM, Hammond JM, Mottola MF. Nutrition and exercise reduce excessive weight gain in normal-weight pregnant women. *Med Sci Sports Exerc*. 2012 Aug;44(8):1419-26. <https://doi.org/10.1249/MSS.0b013e31825365f1> PubMed PMID: 22453250.
15. Jiang H, Qian X, Li M, Lynn H, Fan Y, Jiang H, He F, He G. Can physical activity reduce excessive gestational weight gain? Findings from a Chinese urban pregnant women cohort study. *Int J Behav Nutr Phys Act*. 2012 Feb 9;9:12. <https://doi.org/10.1186/1479-5868-9-12> PubMed PMID: 22321640; PubMed Central PMCID: PMC3306269.
16. Cedergren MI. Maternal morbid obesity and the risk of adverse pregnancy outcome. *Obstet Gynecol*. 2004 Feb;103(2):219-24. <https://doi.org/10.1097/01.AOG.0000107291.46159.00> PubMed PMID: 14754687.
17. Ovesen P, Rasmussen S, Kesmodel U. Effect of prepregnancy maternal overweight and obesity on pregnancy outcome. *Obstet Gynecol*. 2011 Aug;118(2 Pt 1):305-12. <https://doi.org/10.1097/AOG.0b013e3182245d49> PubMed PMID: 21775846.
18. Salihu HM, Dunlop AL, Hedayatzadeh M, Alio AP, Kirby RS, Alexander GR. Extreme obesity and risk of stillbirth among black and white gravidas. *Obstet Gynecol*. 2007 Sep;110(3):552-7. <https://doi.org/10.1097/01.AOG.0000270159.80607.10> PubMed PMID: 17766599.
19. Catalano P. Weight loss in overweight and obese pregnant women (OW/OB): What is the effect on fetal growth? *Am J Obstet Gynecol*. 2013 Jan;208(1 Suppl):S155. <http://doi.org/10.1016/j.ajog.2012.10.514>
20. Petrella E, Facchinetti F, Bertarini V, Pignatti L, Neri I, Battistini NC. Occurrence of pregnancy complications in women with BMI>25 submitted to a healthy lifestyle and eating habits program. *Am J. Obstet Gynecol*. 2013 Jan;208(1 Suppl):S33-S34. <http://doi.org/10.1016/j.ajog.2012.10.229>
21. Vahratian A, Zhang J, Troendle JF, Savitz DA, Siega-Riz AM. Maternal prepregnancy overweight and obesity and the pattern of labor progression in term nulliparous women. *Obstet Gynecol*. 2004 Nov;104(5 Pt 1):943-51. <https://doi.org/10.1097/01.AOG.0000142713.53197.91> PubMed PMID: 15516383.
22. Barakat R, Pelaez M, Montejo R, Luaces M, Zakyntinaki M. Exercise during pregnancy improves maternal health perception: a randomized controlled trial. *Am J Obstet Gynecol*. 2011 May;204(5):402.e1-7. <https://doi.org/10.1016/j.ajog.2011.01.043> Epub 2011 Feb 26. PubMed PMID: 21354547.
23. May LE, Suminski RR, Langaker MD, Yeh HW, Gustafson KM. Regular maternal exercise dose and fetal heart outcome. *Med Sci Sports Exerc*. 2012 Jul;44(7):1252-8. <https://doi.org/10.1249/MSS.0b013e318247b324> PubMed PMID: 22217566.

24. Oken E, Kleinman KP, Belfort MB, Hammitt JK, Gillman MW. Associations of gestational weight gain with short- and longer-term maternal and child health outcomes. *Am J Epidemiol.* 2009 Jul 15;170(2):173-80. <https://doi.org/10.1093/aje/kwp101> Epub 2009 May 13. PubMed PMID: 19439579; PubMed Central PMCID: PMC2727269.