

HOME BASED EXERCISE INTERVENTION IN PREGNANT INDIAN WOMEN: EFFECTS ON WEIGHT AND OBESITY MARKERS

Alka Pawalia^{1,✉}, Sivachidambaram Kulandaivelan¹, Satya Savant², Vikram Singh Yadav³

¹ Department of Physiotherapy, Guru Jambheshwar University of Science & Technology, Hisar, Haryana, India.

² Savant Hospital, Hisar, Haryana, India.

³ College of Physiotherapy-PGIMS, Pt. Bhagwat Dayal Sharma University of Health Sciences, Rohtak, Haryana, India.

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Abstract

Background and Aims: The purpose of this study was to investigate the effect of a home based physical activity intervention during pregnancy on weight and various obesity markers resulting in metabolic syndrome in future. **Methods:** The paper presents a pilot experimental study (pre-post comparison) from a larger ongoing trial, with 40 pregnant women (20 each) having singleton pregnancy of >16 weeks of gestation, BMI >18.5 Kg/m² and declared fit by gynecologist for physical activity during pregnancy. They were assigned to either home exercise group receiving antenatal weight loss intervention delivered via 2 exercise demonstration sessions and informative brochures with advised regular 30 minutes walking during pregnancy, while control group was advised once at initial recruitment for maintaining active lifestyle during pregnancy. The data was analyzed using IBM-SPSS-(version 21) software. **Results:** Though the exercise group had less weight gain and weight retention than the control group, the pregnancy home intervention alone was not effective in controlling obesity parameters like body mass index (BMI), waist circumference (WC), hip circumference (HC) and waist to hip ratio (W/H). **Conclusion:** Home based pregnancy exercise intervention should include other adjunct components, which could be diet advice or timely supervised exercise sessions to have appreciable obesity control during pregnancy.

key words: Metabolic syndrome, Abdominal obesity, Waist circumference, Pregnancy, Obesity

Background and Aims

Metabolic syndrome [MS] is a major healthcare problem that is present at a global level now [1]. It is seen in both developed and developing countries alike. The prevalence of metabolic syndrome and hence obesity is rapidly increasing in India and other South Asian

countries, leading to increased mortality and morbidity due to development of CVD and diabetes in the long run [2,3]. Metabolic syndrome and its associated risk in South Asians and hence Indians are also heightened by their relative increase in body fat mass, truncal fat mass, intra-abdominal fat mass, i.e. increasing waist size [2,3]. It is reported that cardiovascular

✉ H.No. 471/5, Krishna Nagar, Hisar-125001, Haryana, India. Phone: +919468349944
corresponding author e-mail: alkapawalia@gmail.com

risk cluster manifests at a lower level of adiposity and abdominal obesity [4,5]. The prevalence of MS is commoner in females than males [6]. There is growing evidence that *in utero* exposures also contribute to metabolic syndrome. This is presented by names of “Developmental programming” also referred to as “fetal origins of adult disease” or the “Barker Hypothesis” [7,8]. Pregnancy phase is associated with weight gain, but when this weight is gained in excess; or if retained for long could result in development of obesity in future [9,10]. Similarly, a woman’s lifestyle during pregnancy could determine long-term outcomes for her and the baby. Studies have reported, Indian women are more obese and less physically active than males [11,12]. Pregnancy adds to this view, when expecting women are least active and consume diet for two. This type of sedentary lifestyle could be a major factor in development of metabolic syndrome in later life [13]. Indian women are also more prone to develop abdominal obesity; that too in young age [14,15] which again is one of the major factors in development of metabolic syndrome.

Like any normal healthy women, pregnant women should also be advised for exercise and physical activity. American College of Obstetricians and Gynecologists (ACOG 2015) guidelines suggest continuing exercising during pregnancy if women were previously active. It also recommends at least 20-30 minutes of moderate, regular physical exercise for sedentary women too who are expecting and are free of any kind of pregnancy related or medical contraindications to exercises [16]. Indian women have very less awareness regarding the importance of physical activity during pregnancy [17,18]. Hence expecting women should be guided to be physically active during pregnancy. Various studies have shown the benefits of physical activity during pregnancy on preventing

development of lifestyle diseases in later life affecting both mother and the baby. Majority of such studies are from western countries and hence their applicability in Indian women is doubtful. Hence, objective of this study was to observe the effect of a home-based life-style intervention in pregnancy on weight and metabolic syndrome risks parameters, such as weight gain, WC and BMI in Indian pregnant women.

Materials and Methods

Present study was an experimental study with different-subjects design. Inclusion criteria for study were, women with more than 18 years of age with a live singleton pregnancy of at least 16 weeks of gestation confirmed on ultrasound scan, understanding Hindi or English language and having access to a mobile phone. Pregnant women were excluded from the study if they were 1) over 35 years of age; 2) had any pregnancy complication such as cardiovascular, digestive, endocrine and reproductive system diseases at the time of inclusion and declared unfit by study gynecologist 3) had multiple gestation. All the participants were pre-screened for similar physical activity and socio-economic status using standard questionnaires as per the study protocol [19]. Women were minimally to not physically active before being included in the study and were of similar socioeconomic status.

Outcome variables were measured at three-point intervals of pregnancy- The baseline reading was taken while enrolling for the study between >16 weeks gestation (reading 1) followed by second reading at full term or at the time of delivery (reading 2) and then finally at two months post-delivery (reading 3). Study was undertaken at a maternity hospital, which is on the panel of Guru Jambheshwar University of Science & Technology in Hisar, Haryana, India

from June 2016 to July 2017. Necessary ethical approval for the study was obtained from the Institutional Ethical Committee. This study is part of an ongoing doctoral research registered with Clinical Trial Registry India vide no CTRI/2017/04/008322.

Participants

This paper gives details about two groups with 40 subjects (20 in each group) who were found eligible for the trial as per the selection criteria, also gave their consent for measuring baseline readings, and completed follow up data at 2 months post-delivery too. For recruiting subjects for the study posters and pamphlets were put up in the waiting area of the hospital in both Hindi and English language, highlighting the benefits of being physically active during pregnancy. The same were also distributed in local newspapers too for increasing the awareness about the availability of such exercise teaching sessions in Hisar city. The hospital staff also personally contacted women coming for regular antenatal check up in the waiting area. Women those who showed interest in intervention were screened for inclusion and exclusion criteria and were randomized in two groups i.e. group 1- Life-style intervention group that included regular home antenatal exercise training and counseling and group 2-Control group, which received general health care advice once at initial recruitment only. All participant's written consent was obtained.

Pregnant women coming to the study hospital received routine prenatal care. It also included counseling about the importance of a healthy lifestyle during pregnancy with the help of educational brochures. They were also encouraged to be more physically active during pregnancy and to include regular antenatal exercise especially walking in daily activities. As per the study protocol, antenatal exercises

were taught to women by a trained physiotherapist having expertise in pre and postnatal fitness.

Intervention

Women in this group were encouraged to be physically active during pregnancy by the study staff. The gynecologist also counseled them about the importance of the same and encouraged them to learn pregnancy specific exercises taught without any charges at the hospital. These exercises were demonstrated to them by physiotherapist in an hour session and included aerobic exercises, simple stretching, muscle strengthening, flexibility, back care and pelvic floor exercises. The importance of each exercise was explained along with making the women do exercises in front of the physiotherapist. This was done for teaching them these exercises correctly and to prevent any deviations or wrong moves while doing the same. Women were encouraged to do these exercises at least 4 times a week. In case they forgot any of these exercises, they were provided with an option to ask again in their next antenatal visit or before it as per their convenience. Along with these, women were also encouraged to do regular walking for at least 30 minutes duration on most days of the week, this component was emphasized the most. All the exercises met the recent standards of the American Congress of Obstetricians and Gynecologist for exercise during pregnancy (ACOG, 2015). The exercise intensity was patient specific and was ideally advised to be not more than the range of 12-14 (somewhat hard) of the perceived exertion scale. Advice about a good warm and cool down regime before and after the exercises was provided. These included simple stretching, walking for warm up and relaxation exercises like meditation and few yoga poses for cool down. While walking,

women were advised to follow the 'talk test' rule. According to this, if the woman was not able to continue a normal conversation during exercise due to breathlessness or other reasons then she is overexerting herself and hence should reduce the pace of walking. This allowed them to exercise at a safe pace without getting exhausted or too tired. All women were advised how to exercise cautiously and stop immediately if any warning signs were observed during the exercises [16-18]. They were free to enquire about any exercise or clear doubts regarding the same during any of their next antenatal visits or before.

Women were advised for not following a relatively sedentary lifestyle i.e. taking more rest especially during pregnancy and to find ways to be active and about in the house while doing their daily chores without getting fatigued or causing aches or pains. Ways to include the antenatal exercises in their daily schedule were discussed. It included frequent walks in and around the house, doing calf raises in kitchen while cooking or prolonged standing, correct posture care while standing, sitting, sleeping, stair climbing etc. in daily household activities. Regular reinforcement strategies like motivation, counseling was done during these visits to make them adhere to the exercises throughout pregnancy.

Women in control group received standard regular antenatal consultations with the gynecologist. During the prenatal check, the investigator provided routine health education and advised about the benefits of a balanced diet and being physically active throughout pregnancy. They were also guided about the ill effects of gaining excess weight on pregnancy outcomes. Some women wanted to switch to exercise group during pregnancy after allocation to control group due to initial refusal for exercises. Such subjects were allowed in

exercise classes and taught exercises for home, as not doing so would have been ethically wrong but they were excluded from the study in final analysis to prevent contamination. Participants were weighed at the postpartum visit, which occurred after 2 months of delivery.

Outcome measures

Pre-pregnancy weight was self-reported by the women and height was measured using standard procedure at the hospital. Weight & height were used to calculate the pre-pregnancy BMI by using formula Kg/m^2 . GWG was calculated by subtracting the participant's self-reported pre-pregnancy weight (obtained at the time when the investigator first contacted with the participant) from the weight at the time of delivery (obtained from the hospital medical record). Waist circumference was measured to the nearest 0.5 cm mid-way between the lower margin of the last palpable rib and the top of the iliac crest. Hip circumference was measured at the widest part of the hip with the measuring tape parallel to the floor. W/H ratio was measured as the ratio of waist to hip circumference. Post-partum weight retention (PPWR) was calculated by subtracting the participant's pre-pregnancy weight from the final weight measured at the 2 months post-partum visit.

Statistical Analysis

Both descriptive (mean, standard deviation, 95% CI (confidence interval) and inferential (related and unrelated 't' tests) were used to analyze the results. Related 't' test was used to compare the within group (pre-post) differences; unrelated 't' test was used to compare the between group (experimental-control) differences. Significant level was set at $p < 0.05$. Data was analyzed using IBM-SPSS (21.0 version) software.

Results

The groups were compared at the time of enrollment. [Table 1](#) shows statistically non-significant differences between the groups in

age, height, pre-pregnancy weight, Body mass index (BMI), waist circumference (WC) and hip circumference (HC) and infant birth weight at the time of enrolment (baseline).

Table 1. Baseline demographic and birth data of the trial participants.

Participants Characteristics	Control Group (20)	Intervention group (20)	p value
Age	27.15±3.16	26.35±3.52	0.455
Height (m)	1.60±0.06	1.60±0.06	0.920
Pre Wt. (Kg)	60.5±7.48	57.35±8.8	0.231
WC (cm)	78.9±7.27	77.0±6.95	0.398
HC (cm)	94.77±7.36	92.15±7.81	0.281
W/H	0.83±0.04	0.83±0.04	0.281
BMI (Kg/m ²)	23.66±3.60	22.27±3.27	0.210
Infant Gender M/F, N (%)	10/10(50/50)	11/9(55/45)	-
Birth Weight (Kg)	3.10±0.29	2.78±0.38	0.143

Mean±SD for the study participants

Table 2. Comparison of pre-pregnancy and post-partum parameters between groups.

Groups	N	Variables	Pre Pregnancy	Post Partum (2 months)	t	p value
Control	20	BMI (Kg/m ²)	23.66±3.60	26.64±3.33	7.73	<0.001
		WC (cm)	78.92±7.27	87.87±6.84	-12.36	0.001
		HC (cm)	94.77±7.36	100.75±8.47	-6.97	<0.001
		W/H	0.833±0.04	0.87±0.04	-5.68	<0.001
		PPWR(Kg)	60.50±7.38	68.30±7.92	-7.32	<0.001
Home exercise	20	BMI (Kg/m ²)	22.27±3.27	24.88±3.35	-7.61	<0.001
		WC (cm)	77.0±6.95	86.62±8.04	-8.57	<0.001
		HC (cm)	92.15±7.81	97.87±7.79	-4.90	<0.001
		W/H	0.83±0.04	0.88±0.04	-5.74	<0.001
		PPWR(Kg)	57.3±8.83	64.15±10.18	-7.26	<0.001

Table 3. Comparison of Obesity markers between groups.

Characteristics	N	Control	Intervention	t value	P	C.I
GWG (Kg)	20	12.8±4.69	11.95±5.68	0.515	0.609	-2.49, 4.190
PPWR (Kg)	20	7.95±5.10	6.8±3.8	0.807	0.425	-1.736, 4.036
BMI (Kg/m ²)	20	2.98±1.72	2.60±1.52	0.734	0.467	-0.664, 1.420
WC (cm)	20	8.950±3.23	8.62±5.01	-0.506	0.616	-3.378, 2.028
HC (cm)	20	5.97±3.83	5.72±3.22	0.173	0.864	-2.681, 3.181
W/H	20	0.04±0.03	0.04±0.03	-0.738	0.465	-0.030, 0.014

Table 4. Comparison of percent increase in WC, W/H and BMI in trial participants.

Variable	Pre reading	%	Post reading	%
WC>80 cm	21/40	22.5%	31/40	77.5%
W/H>80	31/40	75%	38/40	97.5%
BMI>22.9Kg/m ²	20/40	50%	31/40	77.5%

Comparison of pre-pregnancy & post-partum BMI, WC, HC, W/H ratio & PPWR in control group & intervention group using related t test shows statistically significant differences within groups ([Table 2](#)). It showed that the

treatment in both groups was effective when compared by pre and post results with all having statistically significant differences.

The average GWG of the life-style intervention group was 12.8±4.69 Kg; and for

the control group average GWG was 11.95 ± 5.68 Kg. Independent samples t-test determined that the life-style intervention group retained less weight at 2 months post-partum (PPWR) than the control group (MD 1.15 Kg, 95% CI -1.736 to 4.036). The intervention group had central obesity markers for WC (MD 0.33 cm, 95% CI -3.378 to 2.028) and HC (MD 0.25 cm, 95% CI -2.681 to 3.181) as compared to control group which are not statistically significant ([Table 3](#)).

Discussion

To the best of our knowledge, this is the first study of its kind to see the effectiveness of a home-based exercise intervention on various maternal obesity markers in Haryana, India. The study results report the significant changes when seen for before and after measurements of the weight and obesity parameters in both the groups. However, the home-based exercise intervention did not support the benefits of exercise performed during pregnancy in preventing excess weight gain or other obesity parameters evaluated when compared to control group in Indian pregnant women. Though, a recent RCT by SG Da Silva et al indicated no effect of even a supervised exercise program during pregnancy on GWG and pregnancy outcome [[20](#)], despite them using retention strategies like door-to-door transportation, fitness clothes to the intervention group, printed laboratory results for the blood and urine samples and T-shirts for all participants of the trial, they had a higher number of dropouts in the intervention group and lower adherence to the protocol. Such findings show the real difficulties faced in implementing pregnancy exercise trials. On the other hand, Indian women are not inclined towards exercises during pregnancy due to cultural and social factors prevalent here in the country. They even have very less awareness regarding the benefits of antenatal exercises

[[17](#)]. Owing to such factors, women would have not strictly adhered to the exercises prescribed especially in a comfortable and unsupervised environment of their homes. On the lines of the current trial, a previous research has shown the positive effect of a correspondence intervention (2 group sessions, written material and telephonic contact) on reducing PPWR in women [[21](#)], however our study did not include any telephonic contacts with these women. Although many pregnancy exercise studies suggest a reduction in GWG and PPWR in women, we did not find statistically significant differences between the intervention and control group for the same. Though there were clinical differences between groups where intervention group reported less GWG and PPWR, than the control. These measurements were at 2 months post-partum i.e. after the finish of culturally adopted resting period of approximately forty days post-delivery. It is a normal tradition in many Asian countries including India when the mother is confined indoors post-delivery with less to minimal activity and fed a calorie rich diet thought to accelerate her recovery after childbirth. Earlier too inconclusive and non-positive results have been reported by studies on the effect of unsupervised partially home-based exercise intervention on preventing gestational diabetes and other parameters like postpartum depression and fatigue in women of reproductive age group [[22,23](#)]. When taking both the groups together, when females started their pregnancy 22.5 % of women were above the normal WC ranges (>80 cm) (table 4). It reached to a startling 77.5% at 2 months post-delivery. Similarly, for W/H ratio 75% women were already above the recommended normal range when they started their pregnancy and this figure was at 97.5% at post-delivery readings. As for BMI 50%, women were above the normal ranges at enrollment and this value reached to 77.5% at

post reading for BMI. WC and W/H are the direct indicators of development of cardiovascular diseases or metabolic syndrome in future [24,25], while Indians are reported to be obese and susceptible to development of lifestyle diseases even at a normal BMI category [26]. Lawlor and Chaturvedi had cited the perinatal period as one of the three critical periods in life for the prevention of obesity [27]. This advocates for development of interventions during this phase of life in order to prevent obesity and its associated co-morbidities in future. Recruiting women and providing a free, cost effective exercise intervention to expecting women in a place where there is very less awareness regarding antenatal exercises is a major strength of the study. On the other hand, the present results could be possibly due to the small sample for comparison, which could be a limitation of the study. It could also be due to reluctance in change pertaining to exercise advice especially during pregnancy amongst most Indian women. The preference for unsupervised intervention was mainly to increase convenience for the participants, when compared to supervised sessions. However, earlier too such unsupervised interventions in normal subjects had inconclusive results due to noncompliance and non-adherence to the treatment prescribed [28-30]. Women were also advised to stop exercise in case they felt uncomfortable or owing to any risk factors. These could have prevented women from exercising on a regular basis on precautionary

conditions. The results from other studies that included pregnancy supervised exercise classes, with or without dietary advice or counseling and regular contact with participants by telephone or written materials have shown better results in such intervention trials [31-34]. Like many other pregnancy trials, researchers faced many challenges in recruiting women for this trial too with many dropouts. However, such cases are not included in the final data, eliminating the need for intention to treat analysis. The inclusion of those lost participants could have resulted in different outcomes for the study. The complete data set from the study might give a clear picture regarding the effectiveness of the trial in pregnant Indian women.

Conclusion

The present home-based exercise intervention does not provide enough evidence for its effectiveness in reducing weight and obesity markers in pregnant Indian women. However, more studies are needed for making precise judgment. Pregnancy exercise interventions aimed at preventing weight gain and obesity in women should be more comprehensive and should include various components in the form of diet advice, supervised exercise classes, regular contact with telephonic reminders or written material. Women should be constantly motivated regarding the benefits of the exercises in pregnancy & in deciding the long-term health of both mother and the baby.

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