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# The Effectiveness of Life Style Intervention Program for Pregnant Obese Women: A Systematic Review

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**ABSTRACT**

The increasing of obesity occurs in almost every country in the world. The prevalence of obesity in pregnant woman has increased each year. There are some articles reported that lifestyle intervention program could prevent excessive weight gain during pregnancy. However, the mechanism of this program is still debated. The aim of the literature review was to identify evidence of the effectiveness of lifestyle intervention program to prevent excessive weight gain during pregnancy. A literature review. We conducted a systematic search of electronic databases to collect data from published literature in English from Januari 2011 to Januari 2021. Four databases included were CINAHL, Scopus, PubMed and Science Direct. We examined studies that analyzed and explained deeply regarding lifestyle to prevent excessive weight gain during prengnancy. All of studies reported Life style intervention program significantly improved behaviors to prevent excessive weight gain during pregnancy. Beside weight gain, the program also expected to prevent complications in pregnancy and childbirth.



## 1. INTRODUCTION

Obesity has reached epidemic proportions globally. The prevalence of obesity in the world has increased from 34.8% in 2016 to 40% in 2019 [26]. In Indonesia, based on Riskesdas data in 2018, there was an increasing in obesity from 11.4% in 2014 to 21.8% in 2018 [12]. The incidence of obesity is more happened in women (29-32%) than men (14.5-25%) [1], [10], [13]. Based on the age group, it is higher in the early adult age group (18-29 years) as 27.2-35.4% [3], [19].

Obesity in pregnant women will have an impact on the occurrence of excess weight gain. it has become a common obstetric high-risk condition. The impact of obesity on labor and newborns has been reported to increase cesarean deliveries and babies born with macrosomia, shoulder dystocia, fetal death, congenital abnormalities and obesity in childhood. In economic field, treatment for obesity had spent 17-22,3 % of the total health cost [11]. In America, it was reported that they spent about 117 billion dollars/year, while in UK spent about 16 billion/year [11] and Indonesia had spent 45,258 billion dollars/year [27]. Thus, preventing excessive weight gain for obese women during pregnancy is very important to reduce economic burden.

The obesity and overweight can be influenced by behavioural and environmental factors including high-calorie diet habits, lack of physical activity, sedentary life and unhealthy lifestyles [4], [6]. The environmental factors including the living environment, health services, access for healthy food, promotion and marketing and also the culture [5], [28]. The study results showed that obese people have a sedentary lifestyle, sit a lot and rarely do exercise [17], [23]. a healthy lifestyle are the most important actions to prevent pregnancy complications in obese women [15].

There are various studies that have shown that obese women have attempted to prevent excessive weight gain. It includes the nutrition intervention, exercise and lifestyle changes. However, the obese women will face some obstacles; namely the failure to maintain that program [7]. Prior to our review, much of the literature focused on non-pregnant women. Publication on the influence of lifestyle intervention to prevent excessive weight gain during pregnancy are limited. The primary aim of this study is to conduct a comprehensive review of the scientific literature on the lifestyle intervention to prevent excessive weight gain during pregnancy. The secondary aim of this study is to review the scientific literature on lifestyle intervention to improve maternal and fetal health.

## 2. Methods

### *2.1 Search Strategy*

We conducted a systematic search of electronic databases to collect data from published literature in English from Januari 2011 to Januari 2021. Four databases included were CINAHL, Scopus, PubMed and Science Direct. We developed a search strategy with consultation to subject expert librarian. The review question was specified by using the PICO framework. The medical subject headings (MaSH) terms and search strategy used a combination of the following: (obesity OR obese OR “excessive weight gain” OR woman OR “reproductive age” OR pregnant) AND (nutrition OR diet OR activity OR exercise OR Lifestyle) AND (fetal health” OR “maternal health”). The details of literature search strategy are shown in figure 1.

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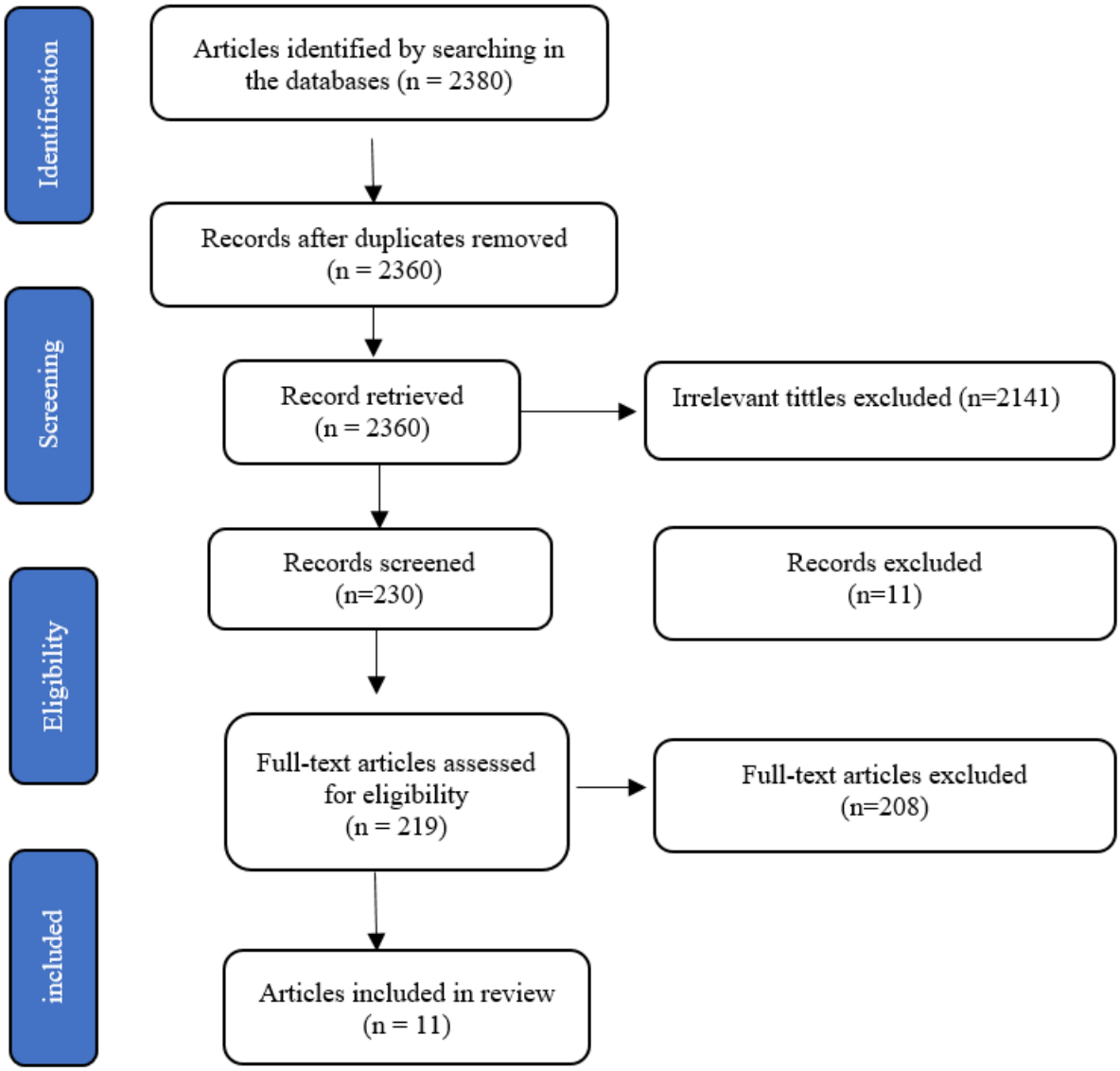


**Figure 1.** Selection process of studies based on PRISMA-ScR

### *2.2 Inclusion and Exclusion Criteria*

Randomized controlled trials (RCTs) studies were included if they met the following inclusion criteria: (1) study of lifestyle intervention program (including, but not restricted to diet, physical activity and behavioral change) in obese pregnant women. We did not apply the limitation according to outcomes. The age of sampel 19-44 years old. Studies were excluded when the main exposure is not specify yhe age of the sample and types of publication such as reviews, conference papers, chapters, editorial, and dissertation.

### *2.3 Study selection*

The process of selecting studies for this systematic review is shown in figure 1. Article identified by searching in the database (n=2380). Screened titles and abstracts of retrieved studies after duplicate removal was retrieved (n=2360). The next step was references of selected articles were checked and ensured for additional eligible articles. In this step, authors applied for selection of inclusion and exclusion criteria. The full texts article was assessing for further eligibility (n= 219) and 208 studies were excluded becauses did not dulfill yhe pre-defined inclusion and exclusion criteria. Thus, 11 studies were included. We used the Preferred Reporting Items for Systematic Reviews and Meta-analyses Statement (PRISMA) [16].

### *2.4 Data Extraction and Quality Assesment*

Co-author (SW and ZN) performed literature search, screened titles and abstract. Disagreement were resolved by discussion among co-authors. We extracted data from the eligible studies including the following information for each selected study: source, methods (including sample size, study design, location, statistical analysis) and measured outcome.

## 3. Result

Overall, 11 studies were included in the review, having fulfilled all eligibility criteria. The number of respondents was in the range of 35 to 1108 people. the total respondents are 6285 people. The study was conducted in 10 countries with respondents in the age range > 18 years - 40 years. Most of the respondents had a BMI > 25 kg/m2 before the intervention.

The interventions provided varied, namely a combination of nutrition and physical activity (10 studies) and there was 1 study with only physical activity intervention [8]. Measurement of research results was carried out during pregnancy (11 articles) and there were 2 articles with monitoring of research results until post-partum [14], [20].

The approach used in implementing behavior change is through individual counseling activities [7]. Counseling activities through face-to-face are carried out at the beginning of the interaction to explain the recommended nutrition and physical activity program. In this study, the risk of respondent drop-out was anticipated by monitoring through mobile phone applications [2], email and telephone [9]. Giving interventions during pregnancy provides a higher chance of adherence because mothers and partners make better efforts to improve their lifestyle. Table 1 summarizes the characteristics of studies.

**Table 1** Characteristics of studies

| Sources | Sample | Intervention | Results |
|---|---|---|---|
| Antenatal lifestyle advice for women who are overweight or obese: LIMIT **randomised trial** [9] **Australia** | Women with a BMI ≥25 and singleton pregnancy at 10+0 to 20+0 weeks' gestation | Intervention (n= 1108): **dietary, exercise, and behavioural strategies** control (n=1104): *standard care* | Infants born to women allocated to lifestyle a however, were less likely to weigh above 4000 g (164 (15%) v 201/1067 (19%); 0.82, 0.68 to 0.99; nu needed to treat (NNT) 28, 15 to 263; P=0.04) compared with infants born to women allocated to sta |
| Adherence to a lifestyle programme in overweight/obese pregnant women and effect on gestational diabetes mellitus: a **randomized controlled trial** [7] Modena, **Italy** | Pregnant women with a pre-pregnancy BMI ≥ 25 kg/m2,an age >18 years and a singleton pregnancy | Intervention (n=69): **lifestyle programme** control (n=62): *standard care* | The diet adherence was higher in the I (57.9%) than SC (38.7%) group. GDM occurred less frequently in (18.8%) than in the SC (37.1%, P=0.019) g The rates of hypertension, preterm birth, induct labour, large for gestational age babi birthweight>4000g were significantly lower in I g |
| A reduction in sedentary behaviour in obese women during pregnancy reduces neonatal adiposity: the DALI **randomised controlled trial** [24] **Netherlands** | Pregnant women with a pre-pregnancy BMI ≥29 kg/ m2, <20 weeks of gestation, a singleton pregnancy and age ≥ 18 years | Intervention: Counselling on healthy eating and physical activity (n= 108) Counselling on healthy eating (n= 113) Counselling on physical activity (n= 110) control (n=105): *usual care* | **Neonatal adiposity** A reduction in sum of skin folds mm; 95% CI −3.5, −0.2; p =0.03), fat mass (−63 g; 9 −124, −2; p = 0.04), fat percentage (−1.2%; 95% CI − −0.04%; p =0.04) and leptin (−3.80 µg/l; 95% CI − −0.45; p = Reduced sedentary time, but not gestational weigh |

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| Sources | Sample | Intervention | Results |
|---|---|---|---|
| **Randomized trial** of a behavioral intervention to prevent excessive gestational weight gain: The fit for delivery study [20] **California** | Participants were pregnant (13.5 wk gestation), normal-weight (NW; n = 201) and overweight or obese (OW/OB; n = 200) women whose average age was 28.8 y. | Intervention (n=177): **one face-to-face visit; weekly mailed materials that promoted an appropriate weight gain, healthy eating, and exercise** control (n=184): *standard care* | decreased the percentage of NW women who exc IOM recommendations (40.2% compared with 52.1% 0.003) and increased the percentages of NW and OW women who returned to their pregravid weights or bel 6 mo postpartum (30.7% compared with 18.7%; P = 0 |
| The LiP (Lifestyle in Pregnancy) study: A **randomized controlled trial** of lifestyle intervention in 360 obese pregnant women [25] **Denmark** | obese pregnant women were included, and 304 (84%) were followed up until delivery. | Intervention (n=150): dietary guidance, free membership in fitness centers, physical training, and personal coaching control (n=154): *standard care* | The intervention group had a significantly lower m (range) GWG compared with the control group of 7.0 10.6) vs. 8.6 kg (5.7–11.5; P = Overall, the obstetric outcomes between the two g were not significantly diff |
| Effect of a behavioural intervention in obese pregnant women (the UPBEAT study): A multicentre, **randomised controlled trial** [21] **London** | pregnant women (15–18 weeks plus 6 days of gestation) older than 16 years and BMI ≥30 kg/m² | Intervention: **a behavioural intervention with an internet-based** (n= 629) control (n=651): *standard care* | Gestational diabetes was reported in 172 (26%) wom the standard care group compared with 160 (25%) intervention group (risk ratio 0·96, 95% CI 0·79- p=0·68). 61 (8%) of 751 babies in the standard care were large for gestational age compared with 71 (9 761 in the intervention group (1·15, 0·83–1·59; p= |
| Effectiveness and cost-effectiveness of **a cluster-randomized** prenatal lifestyle counseling trial: A seven-year follow-up [14] **Jepang** | BMI ≥25 kg/m2, GDM or a macrosomic newborn (≥4500 g) in any earlier pregnancy | Intervention: **combined dietary and physical activity counseling** (n= 85) control (n=88): *standard care* | Differences in BMI were non-significant among m (Intervention 27.3, Usual care 28.1 kg/m2, p = 0.3 children (I 21.3 vs U 22.5 kg/m2, p = 0.07). Children's was significantly lower among adherent group (I 20.5 22.5, p = The mean total cost per person was 30.6% lower intervention group than in the usual care group (I €2,9 U €4,243; p = 0.74). Interv |
| **A randomised trial** of a four-step multidisciplinary approach to the antenatal care of obese pregnant women [22] **Australia** | Pregnant woman with BMI ≥25 kg/m2 | Intervention (n= 63): **dietary and physical activity counseling** control (n=61): *standard care* | a significant reduction in the incidence of gesta diabetes (6 versus 29%, OR 0.17 95% CI 0.03–0.9 0.04). It was also associated with reduced weight g pregnancy (7.0 versus 13.8 kg, P < 0.0001). D |
| Sequential Introduction of Exercise First Followed by Nutrition Improves Program Adherence During Pregnancy: **a Randomized Controlled Trial** [18] **Canada** | Pregnant woman at 12–18 weeks gestation | Intervention: Grup A (n=17): nutrition and exercise simultaneously. Grup B (n=20): nutrition first Grup C (n=23) exercise first, and the second behavior was added at 25 weeks gestation for both groups | Group C (n = 23) had the highest adherence to the pr (80.2 ± 14.7%) compared with Groups A (n = 17; 17.9%) and B (n = 20; 66.8 ± 16.7%; p <0. 2 = 0.26). There was a significant effect for gesta weight gain (p 2 = 0.10) as Group C gained less weight (7.7 ± 2.2 kg Group B (9.8 ± 2.8 kg; p = 0.04), however, not Gr (9.1 p = 0.35). Non-signi |

| Sources | Sample | Intervention | Results |
|---|---|---|---|
| **A randomized controlled trial** of exercise during pregnancy on maternal and neonatal outcomes: Results from the PAMELA study [8] Brazil | healthy pregnant women 16-20 to 32-36 weeks' gestation | Intervention (n= 213): **An exercise-based intervention** control (n=426): *standard care* | The mean adherence to the exercise intervention wa 17.2 sessions (out of a potential 48) with 40.4% attend = 70% of the recommended exercise sessions. A t 594 participants (IG:198; CG: 396) were included ITT and 479 (IG: 83; CG: 396) were included in t protocol analyses. |
| Nutrition, Behavior Change and Physical Activity Outcomes From the **PEARS RCT**—An mHealth-Supported, Lifestyle Intervention Among Pregnant Women With Overweight and Obesity [2] **Ireland** | Pregnant women (BMI 25–39.9 kg/m2 | Intervention (n= 278): nutrition (low glycaemic index and healthy eating) and exercise advice, a smartphone app and fortnightly emails control (n=287): *standard care*. | The proportion of participants at "maintenance" sta change for physical activity was higher in the interv group (56.3 vs. 31.2%). App use was associated with glycaemic index and less energy from free sugars, b with physical a |

## 4. Discussion

### *4.1 The effect of nutrition and physical activity programs on the health of pregnant women*

Nutrition and physical activity programs for obese pregnant women are aimed at limiting weight gain during pregnancy. The recommended weight gain is a maximum of 7 kg. There were 4 studies showing that in the intervention group fewer mothers experienced weight gain of more than 7 Kg compared to the control group [18], [20], [22], [25]. The results of this study are in line with the research of Kheirouri & Alizadeh which states that the increase in excess body weight in pregnancy is more common in mothers with their first child pregnancy and age less than 30 years.

Weight gain during pregnancy has an impact on increasing the mother's Body Mass Index (BMI). There is one study which states that nutrition and physical activity programs have no impact on the BMI of pregnant women [14]. Excess BMI has an impact not only during pregnancy, but also in the post-partum period. There is one study which states that nutrition and physical activity interventions have an impact on post-partum mother's weight which returns more quickly to the mother's pre-pregnancy weight [20].

The success of the nutrition program for obese mothers is expected to prevent complications in pregnancy and childbirth. Complications of pregnancy and childbirth in obese mothers have an impact on greater care costs. The results showed that in the intervention group the cost of care was lower than in the control group [14]. There are three studies that show that fewer mothers experience Gestational Diabetes Mellitus (GDM) after participating in a nutrition and physical activity program [7], [21], [22]. In addition to DMG, there are studies which state that complications of hypertension, premature birth, and induction of labor are lower in mothers who follow nutrition and physical activity programs [7]. However, there is one study which states that there is no difference in the incidence of preterm birth and pre-eclampsia between the intervention group and the control group [8].

### *4.2 Effect of nutrition program and physical activity on fetal health*

Fetal development in pregnancy is influenced by maternal nutritional intake. Excessive consumption of nutrients can pose a risk of fetal weight exceeding 4000 grams, known as macrosomia. Macrosomic infants are at risk for hypoglycemia at birth, special care in the NICU and obesity in later childhood.

Nutrition and physical activity programs for obese pregnant women are expected to prevent the occurrence

of macrosomia in the fetus. The results showed that fewer babies were born weighing more than 4000 grams in the intervention group than the control group [7], [9], [21], [22]. There is one study which states that fetuses born in the group that underwent a nutrition and physical activity program had a lower BMI in childhood than the control group [14].

The strength of this systematic review article is the selection of the type of article whose research uses RCTs. This risk assessment of bias is carried out to ensure that the intervention carried out is the most influential factor in the measured research results. The limitation of this study is that there are differences in the type and duration of intervention from various research methods. The difference in the type of intervention is due to the fact that each study uses different intervention standards between countries. There are studies that use only one intervention and some use two or more types of interventions.

## 5. Conclusion

Interventions to increase excess weight in obese pregnant women will be more effective if carried out using an individual approach rather than a group approach. This is because every mother has different characteristics in choosing foods that match the recommended calories. Based on the results of the study, it is known that the method used to evaluate maternal compliance in following the recommended nutrition program is through a nutrition diary that is reported either face-to-face or through electronic media.

## 6. Acknowledgment

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## 7. Ethical aspects and conflict of interest

There was no conflict of interest that might influence the results or interpretation.

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