Gestational dyslipidaemia and adverse birthweight outcomes: a systematic review and meta-analysis

Wang, Jingya; Moore, David; Subramanian, Anuradhaa; Cheng, Kar; Toulis, Konstantinos; Qiu, Xiu; Saravanan, Ponnusamy; Price, Malcolm; Nirantharakumar, Krishnarajah

DOI:
10.1111/obr.12693

References

1. Buhling KJ, Henrich W, Starr E, et al. Risk for gestational diabetes and hypertension for women with twin pregnancy compared to singleton pregnancy. Archives of gynecology and obstetrics. 2003;**269(1):**33-6.
2. Jiang S, Jiang J, Xu H, et al. Maternal dyslipidemia during pregnancy may increase the risk of preterm birth: A meta-analysis. Taiwanese Journal of Obstetrics and Gynecology. 2017;**56(1):**9-15.
3. Laleh E, Soheila A, Vajihe M, Ashraf J. Effect of different maternal metabolic characteristics on fetal growth in women with gestational diabetes mellitus. Iranian Journal of Reproductive Medicine. 2013;**11(4):**325-34.

4. Schaefer-Graf UM, Graf K, Kulbacka I, et al. Maternal lipids as strong determinants of fetal environment and growth in pregnancies with gestational diabetes mellitus. Diabetes Care. 2008;**31(9):**1858-63.
5. Son GH, Kwon JY, Kim YH, Park YW. Maternal serum triglycerides as predictive factors for large-for- gestational age newborns in women with gestational diabetes mellitus. Acta Obstetricia et Gynecologica Scandinavica. 2010;**89(5):**700-4.
6. Couch SC, Philipson EH, Bendel RB, Wijendran V, Lammi-Keefe CJ. Maternal and cord plasma lipid and lipoprotein concentrations in women with and without gestational diabetes mellitus: Predictors of birth weight? Journal of Reproductive Medicine for the Obstetrician and Gynecologist. 1998;**43(9):**816-22.
7. Olmos PR, Rigotti A, Busso D, et al. Maternal hypertriglyceridemia: A link between maternal overweight-obesity and macrosomia in gestational diabetes. Obesity. 2014;**22(10):**2156-63.
8. Vinod KM, Sheri T, Uma P. Maternal serum lipids during pregnancy and infant birth weight: the influence of prepregnancy BMI. Obesity. 2011;**19(7):**1476-81.
9. McIntire DD, Bloom SL, Casey BM, Leveno KJ. Birth weight in relation to morbidity and mortality among newborn infants. New England journal of medicine. 1999;**340(16):**1234-8.
10. Jarvie E, Hauguel-de-Mouzon S, Nelson SM, et al. Lipotoxicity in obese pregnancy and its potential role in adverse pregnancy outcome and obesity in the offspring. Clinical Science. 2010;**119(3):**123-9.
11. Ehrenberg HM, Huston-Presley L, Catalano PM. The influence of obesity and gestational diabetes mellitus on accretion and the distribution of adipose tissue in pregnancy. American journal of obstetrics and gynecology. 2003;**189(4):**944-8.
12. Ramsay JE, Ferrell WR, Crawford L, et al. Maternal obesity is associated with dysregulation of metabolic, vascular, and inflammatory pathways. The Journal of Clinical Endocrinology & Metabolism. 2002;**87(9):**4231-7.
13. Ryan E. Diagnosing gestational diabetes. Diabetologia. 2011;**54(3):**480-6.
14. Barrett HL, Nitert MD, Jones L, et al. Determinants of maternal triglycerides in women with gestational diabetes mellitus in the Metformin in Gestational Diabetes (MiG) study. Diabetes Care. 2013;**36(7):**1941-6.

Title Page

Gestational Dyslipidaemia and the Risk of Extreme Birth Weight: A Systematic Review and Meta-analysis

Jingya Wang, MPH[1,2], David Moore, PhD[2], Anuradhaa Subramanian, MPH[2], Kar Keung Cheng, PhD[2], Konstantinos A. Toulis, MD[2], Xiu Qiu, MD[1], Ponnusamy Saravanan, PhD[4], Malcolm James Price, PhD[2], Dr. Krishnarajah Nirantharakumar, MD[2]

1. Division of Birth Cohort Study, Guangzhou Women and Children's Medical Centre, Guangzhou Medical University, Guangzhou, China, 510500.
2. Institute of Applied Health Research, University of Birmingham, Birmingham, United Kingdom, B15 2TT.
3. Division of Health Sciences, Warwick Medical School, University of Warwick, Coventry, United Kingdom, CV4 7AJ.

Joint corresponding authors:

Krishnarajah Nirantharakumar, MD, Institute of Applied Health Research, Public Health Building, University of Birmingham, Edgbaston, Birmingham, B15 2TT, United Kingdom, k.nirantharan@bham.ac.uk, +44 (0)121 414 8344

Malcolm James Price, PhD, Institute of Applied Health Research, Public Health Building, University of Birmingham, Edgbaston, Birmingham, B15 2TT, United Kingdom, m.price.2@bham.ac.uk, +44 (0)121 414 2530

Abstract

Background

Low and high birthweight is known to increase the risk of acute and longer term adverse outcomes, such as stillbirth, infant mortality, obesity, type 2 diabetes, and cardiovascular diseases. Gestational dyslipidaemia is associated with a numbers of adverse birth outcomes, but evidence regarding on birth weight is still inconsistent to reliably inform clinical practice and treatment recommendations.

Objective

To explore the relationship between maternal gestational dyslipidaemia and neonatal health outcomes namely, birth weight, metabolic factors, and inflammatory parameters.

Methods

We searched systematically Embase, MEDLINE, PubMed, CINAHL Plus, and Cochrane Library up to 1st August 2016 (with an updated search in MEDLINE at the end of July 2017), for longitudinal studies that assessed the association of maternal lipid levels during pregnancy with neonatal birth weight, or metabolic and inflammatory parameters up to 3 years old.

Results

Data from 46 publications including 31,402 pregnancies suggests that maternal high triglycerides and low high-density-lipoprotein cholesterol levels throughout pregnancy are associated with increased birth weight, higher risk of large-for-gestational age and macrosomia; and lower risk of small-for-gestational age. The findings were consistent across the studied populations, but stronger associations were observed in women who were overweight or obese prior to pregnancy.

Conclusions

This meta-analysis suggested that the potential under-recognised adverse effects of intrauterine exposure to maternal dyslipidaemia may warrant further investigation into the relationship between maternal dyslipidaemia and birth weight in large prospective cohorts or in randomised trials.

Abbreviations:

LBW: low birth weight

SGA: small for gestational age

LGA: large for gestational age

GDM: gestational diabetes mellitus

RCT: Randomised Controlled Trial

TC: total cholesterol

HDL: high-density lipoprotein

LDL: low-density lipoprotein

VLDL: very low-density lipoprotein

TG: triglycerides

FFAs: total free fatty acids

BMI: Body Mass Index

MCP-1: Monocyte Chemoattractant Protein-1

IL-6: interleukin 6

TNF-α: Tumour Necrosis Factor alpha

11β HSD1: 11-beta-Hydroxysteroid Dehydrogenase Type 1

CRP: C-reactive protein

T1: the first trimester

T2: the second trimester

T3: the third trimester

mg/dL: milligrams per decilitre

mmol/L: millimoles per litre

RC: regression coefficients

OR: odds ratio

MD: mean difference

GWAS: genome-wide association study

Introduction

Low and high birth weight has been linked to the risk of stillbirth and infant mortality.[1] In a longer life course, both low birth weight(LBW) or small for gestational age(SGA), and large for gestational age(LGA) or macrosomia are known to increase the future risk of obesity, type 2 diabetes, and cardiovascular disease.[2, 3] The estimated prevalence of macrosomia in developed countries varies from 5% to 20%, and a parallel increase in macrosomic births was observed in both developed and developing countries over the last two to three decades.[4] These life course associations have often been attributed to the impact of an adverse intrauterine environment, particularly, fuels (glucose, lipids, and amino acids) transported from the maternal end.[5] Previous reviews have shown that maternal obesity and gestational diabetes mellitus(GDM) are two identified risk factors of low and high birthweight.[6-8] However, as one of common metabolic disorders, the adverse effects of gestational dyslipidaemia on neonates birth weight/birth weight centiles are not widely recognized in clinical practice.

Dyslipidaemia has been considered a risk factor for a number of adverse health outcomes, in particular cardiovascular disease and type 2 diabetes.[9, 10] Previous reviews have shown that dyslipidaemia during pregnancy are associated with increased risk of GDM, preeclampsia, and pre-term delivery[11-13], but epidemiological evidence on birthweight is conflicting[14-16]. Furthermore, previous evidence indicates that excessive maternal intrauterine lipid exposures may program the development of foetus organs from early life, resulting in metabolic dysfunction.[17, 18] If maternal dyslipidaemia is a significant contributor to birth weight and implicated in neonatal metabolic dysfunction, then interventions before and during pregnancy to mitigate dyslipidaemia might improve offspring's adverse birth and metabolic health outcomes.

We performed a comprehensive systematic review and meta-analysis to explore the association, and quantify the magnitude of effect between maternal dyslipidaemia and neonatal outcomes namely, birthweight, metabolic factors, and inflammatory parameters.

Methods

Search strategy and selection criteria

The protocol for this review was registered on PROSPERO (CRD42016048568) and the review is reported in accordance with the PRISMA[19] and MOOSE[20] guidelines. We searched systematically Embase, MEDLINE, PubMed, Scopus, CINAHL Plus, and Cochrane library (CENTRAL) up to August 1, 2016, without language or year restrictions. An updated search was made in MEDLINE before manuscript submission until the end of July 2017. The search of bibliographic databases combined index and free text terms relating to lipids (e.g. "lipids", "lipoproteins", "fatty acids", "triglycerides", "cholesterol") with those relating to pregnancy (e.g. "pregnan*", "gestation*", "gravidity", "mothers") and birthweight (e.g. "birth weight", "small for gestational age", "large for gestational age", "macrosomia"). The full strategies are provided in S1 Appendix. Cohort and Randomised Controlled Trial (RCT) filters were used to target longitudinal observational studies and the secondary analysis of RCT studies.[21] Additional searches were conducted in Grey Literature Report and Open Grey. Reference lists of included studies were screened and checked for relevance.

Search results, after removal of duplicates, were screened for relevance using title and abstract information. Fully texts of relevant articles were assessed for eligibility against the selection criteria. Screening and selection were undertaken by two reviewers independently in consultation with a third reviewer when required.

This review included studies of healthy pregnant women and pregnant women with GDM or obesity, which investigated the association between maternal lipid levels during pregnancy

(total cholesterol (TC), high-density lipoprotein cholesterol (HDL-C), low-density lipoprotein cholesterol (LDL-C), very-low-density lipoprotein cholesterol (VLDL-C), triglycerides (TG), and total free fatty acids (FFAs)) and neonatal anthropometric, metabolic, and inflammatory parameters.

Studies of pregnant women with conditions that could influence maternal metabolic status before pregnancy (hepatitis, polycystic ovary syndrome, familial hyperlipidaemia, acquired immunodeficiency syndrome, type I & type 2 diabetes, hypertension, thrombophilia, history of thromboembolism, rheumatologic disorders, cardiac dysfunction, or history of taking relevant lipid-lowering medications) were excluded.

The primary outcome was birthweight measured within the first week after delivery. Neonatal anthropometric parameters, including LBW, SGA, LGA, and macrosomia, were considered as different indexes of birthweight. Secondary outcomes included: anthropometric parameters in children less than three years old (e.g. weight gain after delivery, Body Mass Index (BMI) and skinfold thickness); biological indicators (glucose, TC, HDL-C, LDL-C, VLDL-C, TG, FFAs and insulin levels; and insulin resistance) and neonatal inflammatory factors (Monocyte Chemoattractant Protein-1 (MCP-1), interleukin 6 (IL-6), Tumour Necrosis Factor (TNF-α) and 11-beta-Hydroxysteroid Dehydrogenase Type 1 (11β HSD1) and C-reactive protein(CRP), as well as leptin levels) measured in cord blood or blood samples taken from neonates(<3 years old). Due to the diverse definition of GDM, obesity, SGA, LGA, and macrosomia in different populations, we accepted the definition specified by authors.

Data extraction and quality assessment

A STROBE-based pre-designed form[22] was used for data extraction, including the following information: study characteristics(study name, design, language, and location),

participants(setting, eligibility/exclude criteria, and sample size) , maternal characteristics (age, parity, pre-pregnancy BMI, and gestational length), follow-up (enrolment time, length of follow-up, data collection methods, and loss to follow-up rate), exposures (definition, fasting status, measured gestational weeks, and measurement methods) and outcomes (definition and measurement time point)(S2 Appendix).

The Newcastle-Ottawa Scale was used to characterise and stratify the methodological quality of included studies (S3 Appendix).[23] Studies quality was classified as 'low' (≤5), 'medium'(6 & 7), or 'high'(8 & 9) quality. In addition, domains relating to sample selection, comparability between groups, and method of outcome assessment were considered separately.

Data extraction and quality assessment were conducted by two reviewers independently in consultation with a third reviewer when required (S4 Appendix). Missing information was requested from authors by email (S5 Appendix).

Data synthesis

Included studies were categorised by trimester based on the mean/median gestational age for the lipid measurement (first trimester (T1): 1-13, second trimester (T2): 14-27, and third trimester (T3): ≥28 gestation weeks). For studies reporting lipid levels multiple times within one trimester, data from the trimester with the largest sample size was adopted. Studies with different types of population (example GDM or obesity) were divided into two or three subsets to enable us to assess and report separately. Lipid measurements reported in milligrams per decilitre (mg/dL) were converted to millimoles per litre (mmol/L) using a standard unit conversion factors.[24]

Results of birthweight were reported in various ways, for instance, regression coefficients and correlation coefficients. Findings were summarised in tables and visually represented as horizontal histogram, displaying the direction as well as statistical significance of results comprehensively (post analysis).

Summary estimates were pooled using random effects meta-analysis, according to assessment of outcomes (birthweight, LGA, SGA, and macrosomia), timing of lipids measurement(T1/T2/T3) and statistic reported in the primary study (regression coefficients, odds ratio (OR), or mean difference (MD)). Unadjusted and adjusted estimates reported in the articles were entered into random-effects models separately. Confounding factors that were adjusted (maternal age, pre-pregnancy BMI, gestational weight gain, gestational glucose level, pre-term birth, gestational lipid levels, gestational age, and neonatal gender) for each result were recorded for further sensitivity analyses. The I^2 statistic was used to quantify the degree of heterogeneity beyond that expected by chance in each analysis.[25] The potential for publication bias could not be assessed via funnel plots as the requirement for ten or more studies per meta-analysis was not met.[26] Due to the heterogeneity in baseline characteristics of included studies, we were not able to compare non-GDM women to GDM women. Sensitivity analysis was performed by choice of co-variates controlled for in the model. All analyses were conducted using Review Manager version 5.3 (Nordic Cochrane Centre, Copenhagen, Denmark) and R 3.3.2(The R Foundation for Statistical Computing).

Results

Study selection

Of the 13,705 unique records identified by the searches, 46 publications[14-16, 27-69] reporting from 42 studies were included in the review (Figure 1). These studies included 31,402 pregnancies. Of the 46 included publications, 16 contributed to the quantitative analysis due

to the diversity of reporting formats (regression coefficients, correlation coefficients, mean differences, trend analyses, or without exact effect estimates) and lack of data required for calculations. No additional eligible studies were found in the updated search till July 2017.

Characteristics of included studies

Table describes the baseline characteristics of the 46 included publications. Most articles were published in English language and as full text articles with only one[44] study written in German, and one[43] published as an abstract. The studies were published between 1985 and 2016. The number of pregnancies ranged from 38 to 5,535. Based on the World Bank Income Classification of countries [70], 25 out of 42 studies were from high income economies[14, 16, 27, 28, 35, 41, 44-49, 51, 53, 55-62, 66-68], 16 from upper middle economies[15, 30-34, 37, 38, 40, 42, 43, 50, 54, 63, 65, 69], and one middle income[39]. Forty studies were prospective cohorts[14, 15, 28-36, 38-50, 52, 54-57, 59-69], three were retrospective cohorts[27, 37, 58], and three were secondary analyses of cohorts in RCTs[16, 51, 53].

Quality of included studies

Forty-five publications (excluding the abstract[43]) were assessed for methodological quality. Ten, 21, and 14 studies were assessed as methodologically high[15, 29, 41, 47-49, 52, 54, 60, 67], moderate[14, 16, 27, 30-32, 37, 38, 40, 44, 46, 50, 51, 55-57, 61, 62, 64, 68, 69] and low quality[28, 33-36, 39, 42, 45, 53, 58, 59, 63, 65, 66] respectively(S6 Appendix). Three (7%) of 45 included studies had low risk for study selection while 40(93%) had medium risk. For comparability bias, 15(33%) had low risk, 13(29%) had medium risk, and 17(38%) had high risk. Sixteen (36%) studies were regarded to have a low risk of outcome assessment bias, with the rest (29 studies) having medium risk.

Maternal lipid levels during pregnancy and birth weight

Figure 2 shows the relationship between maternal lipid levels during pregnancy and birthweight (S7 Appendix). There were strong associations noted for HDL-C and TG

throughout pregnancy with birthweight. For HDL-C, both studies[55] reporting in T1, six[15, 16, 31, 37, 49, 55] out of 11[15, 16, 31, 34, 37, 49, 50, 55, 59, 62] studies reporting in T2, and 11[14, 15, 28, 41, 49, 54, 55, 61, 65, 68] out of 18[14-16, 28, 39, 41, 42, 46, 49, 50, 54, 55, 58, 61, 63, 65, 68] studies reporting in T3 showed an inverse association with birthweight, while one[15] in T2 and one[16] in T3 reported a positive association. For TG, four[52, 55, 57] out of five[35, 52, 55, 57] studies reporting in T1, ten[15, 31, 34, 37, 49, 55, 59, 62, 67] out of 12[15, 16, 31, 34, 37, 49, 50, 55, 59, 62, 67] studies reporting in T2, and 20[15, 16, 39, 41, 46, 49, 50, 54-56, 58, 61, 63-65, 67, 69] out of 27[14-16, 28, 36, 39, 41, 42, 46, 49-51, 53-56, 58, 61, 63-65, 67, 69] studies reporting in T3 found a positive association with birthweight, while three[14, 28, 51] studies in T3 reported an inverse association. Of the seven studies reporting the association between maternal FFAs level in T3 and birthweight[36, 46, 49, 53, 56, 61, 68], four reported a positive association[49, 53, 56, 68], while none reported inverse association. For TC, seven[15, 16, 27, 37, 48, 49, 55] out of 12[15, 16, 27, 31, 48-50, 55, 59, 62] studies in T2, and eight[15, 16, 48, 54-56, 65, 69] out of 22[14-16, 28, 36, 39, 41, 42, 45, 46, 48-50, 53-56, 58, 61, 63, 65, 69] studies in T3 reported a positive association, while one[55] in T2 and three[28, 41, 55] in T3 found an inverse association. There was no evident association between maternal LDL-C level and birthweight[14, 16, 28, 31, 37, 39, 41, 42, 46, 50, 54, 55, 58, 59, 62, 63, 65, 68] or between maternal VLDL-C level and birthweight[46, 68].

Figure 3 shows the pooled estimates for the effect of maternal lipids throughout pregnancy on birthweight using all available data (S7 Appendix). In general, the results of meta-analyses are consistent with the overall results summary (Figure 2). Maternal HDL-C was inversely associated with birthweight, particularly in T3 (adjusted RC, -70.17g per mmol/L, $p<0.001$). Increased maternal TG levels were significantly associated with birthweight for T1 (adjusted RC, 86.72g per mmol/L, $p<0.001$) and T3 (adjusted RC, 89.58g per mmol/L, $p=0.01$). Positive associations between TC and birthweight were observed in T1(adjusted RC, 22.67g of birthweight per mmol/L maternal lipid, $p=0.02$), T2 (adjusted RC, 24.74g per mmol/L, $p=0.01$), and T3(adjusted RC, 9.14g per mmol/L, $p=0.13$).

Stronger associations were observed among pregnant women with pre-pregnancy overweight or obesity in the two relevant studies (S5 Appendix).[50, 55] The degree of heterogeneity within all meta-analyses in T3 was detected with I^2 values ranging from 0 to 93%. The heterogeneity decreased markedly when studies controlled for pre-pregnancy BMI, gestational weight gain, glucose level, and gestational age (S7 Appendix).

Maternal lipid levels during pregnancy and LGA, SGA, and macrosomia

Figure 4 shows the pooled adjusted OR for LGA as well as SGA, according to each type of maternal lipids in T3 (S8 & S9 Appendix). Pooled estimates for rising maternal HDL-C level revealed potentially decreased odds of LGA (OR, 0.77; 95% CI, 0.59 to 1.01; p=0.06), and significantly increased odds of SGA (OR, 1.96; 95% CI, 1.04 to 3.71; p=0.04). In contrast, increased maternal TG levels were associated with increased odds of LGA (OR, 1.08; 95% CI, 1.01 to 1.15; p=0.02), and decreased odds of SGA (OR, 0.66; 95% CI, 0.49 to 0.90; p=0.007). In addition, ten[30, 38-40, 53, 54, 56, 58, 65, 69] out of 11[14, 30, 38-40, 53, 54, 56, 58, 65, 69] studies reporting the association between maternal TG and LGA in T3 reported positive statistically significant associations. Of six studies investigating the relationship between maternal HDL-C and macrosomia[30, 33, 34, 38, 47, 65], four studies reported decreased risk of macrosomia (three statistically significant)[30, 33, 34, 47], especially for T2 with higher HDL-C(S10 Appendix). For the relationship of TG with macrosomia, five[33, 38, 43, 47, 64] out of six[30, 33, 38, 43, 47, 64] studies reported statistically significant positive OR values across three trimesters. No association was observed between maternal TC as well as LDL-C levels and LGA, SGA, and macrosomia.

Maternal lipid levels during pregnancy and other outcomes of interest

For secondary outcomes, positive correlations were found by all six publications investigating the association between different maternal lipids and different cord blood lipids, but results are inconsistent with each other[36, 44-46, 53, 66]. No association was observed between

maternal lipids and infant postnatal weight, weight gain, or sum of skinfolds thickness up to 2 years old[16, 29, 51, 52]. No study investigated the relationship of maternal lipid levels during pregnancy with neonatal glucose, insulin, inflammatory factors and leptin levels in our searches.

Discussion

Summary of the findings

This is the first systematic review pooling data from 40 longitudinal observational studies and two RCT secondary analysis studies providing quantitative estimates of the magnitude of association between maternal lipid levels at various stages of pregnancy and neonatal health outcomes. Throughout pregnancy, low maternal HDL-C and high TG levels are associated with increased birthweight. Low HDL-C and high TG increased the risk of LGA/macrosomia and lowered the risk of SGA babies. Maternal TC level throughout pregnancy and FFAs level in the third trimester are positively associated with a small increase in birthweight. Associations are stronger among populations with pre-pregnancy obesity. The findings provide evidence for the critical role of dyslipidaemia in gestational metabolism and neonatal health, and will contribute to future research and management of gestational dyslipidaemia.

Potential mechanisms

The results are mostly consistent with previous published evidence. Maternal lipid metabolism is mainly in lipogenesis state in the earlier half of pregnancy, but then switches into catabolic state.[71, 72] When the lipid accumulation exceeds the storage capacity of adipose tissue, the buffering function of the adipocytes is decreased, leading to elevated serum FFAs and TG.[73-75] Compared to pregnant women with smaller pre-pregnancy BMI, women who are overweight or obese will not only progress to catabolic state earlier, but also have less capacity to inhibit lipolysis.[18] Women with obesity prior to pregnancy usually present with

more central adipose accumulation and severe dyslipidaemia[76, 77], resulting in steep concentration gradient across the placenta.[78]

Both in vivo and epidemiological evidence suggest that excessive maternal intrauterine lipid exposure could affect the development of foetus organs systematically, which can then alter initial foetus metabolism and feeding behaviours permanently.[18, 79] Previous animal studies observed that foetal metabolic abnormalities mediated by maternal obesity and high-fat diet often manifest as increased body weight, fat mass, blood glucose, cholesterol and blood pressure levels; and decreased insulin sensitivity and ectopic lipid storage in newborns.[18] The latest multi-ancestry genome-wide association study (GWAS) meta-analysis also demonstrated that cholesterol biosynthesis is one of the most important metabolic pathways involved in birthweight.[17] Strengths and weakness

The major strengths of this study are the comprehensive searches, adherence to robust review methodology and thorough analyses. Special care was taken in the handling of missing data, which was addressed by personal contact with the authors in an attempt to minimise reporting bias. The inclusion of longitudinal studies ensured the temporal association between exposures and outcomes, which also permitted a trimester-specific analysis. The major limitation of the study was the substantial heterogeneity, possibly due to the diversity of settings, study populations, lipid measurement methods and diverse gestational age of the studied populations. However, this heterogeneity was addressed by subgroup analysis.

It would be intriguing to explore the effects of maternal dyslipidaemia independent of maternal hyperglycaemia. Unfortunately, this was not feasible due to the nature of data reported in individual study. GDM women are known to have higher TG levels and lower HDL-C levels compared with non-GDM women.[11] However, elevated maternal TG levels and lower HDL-C levels are associated with the risk of LGA and macrosomia in both GDM

women[38, 53, 58] and non-GDM women[30, 39, 40, 52, 54, 69]. For women with type 1 diabetes/GDM, maternal hyperglycaemia is not the sole contributor to increased birth weight since foetuses may develop LGA despite them having optimal glycaemic control.[80] Several other studies found that lipid levels during pregnancy, similar to glucose levels, are also strong metabolic determinants for foetal growth[15, 29, 31, 32, 35, 37, 41, 47, 53, 56, 61, 64]. Our sensitivity analyses result also shown there is little effect on the relationship between gestational HDL-C/TG levels and birth weight when removing those studies controlled for glucose (S7.13 & S7.23). Collectively, this evidence suggests that maternal dyslipidaemia may be an independent, unrecognised risk factor of LGA/macrosomia.

Unfortunately, paucity of the required primary data prevented the pre-specified subgroup analyses on the basis of different definitions used for GDM and obesity across studies. Thus, this should be acknowledged as a source of clinical heterogeneity when interpreting the findings of the present study. Another limitation of this study is that we are unable to control for the effect of GDM treatment on lipid levels. However, it has been noticed that initiation of therapy (diet control, insulin, or metformin) may modestly influence TG levels[81], yet to a direction that would obscure rather than magnify differences between normal and GDM pregnancies. Similarly, our sensitivity analyses shown a moderate decrease on triglycerides effect estimate when removing studies that excluded pre-term births (S7.25).

It should be acknowledged that our primary outcome, birth weight, is a quite inexact measure of foetal growth, although it has been widely measured and utilized in clinical and research areas. We tried to extend our target outcomes from birth weight parameters to other neonatal growth parameters, biological indicators, and inflammatory factors, however, we did not find sufficient studies.

Implications

Our results provides compelling evidence on the role of maternal circulating HDL-C and TG levels on birth outcomes, and suggest that the under-recognised adverse effects of intrauterine exposure to maternal dyslipidaemia may need further investigation in large prospective cohorts or in randomised trials. Although the importance of screening for preconceptional dyslipidaemia has been noted in recent guidelines to alert for risk assessment for GDM[82, 83], its independent adverse effects remain largely underestimated in routine clinical practice and recommendations regarding the management of dyslipidaemia preconceptionally or during pregnancy are still lacking. Our findings do question the current clinical practice and support the monitoring of gestational dyslipidaemia before or during pregnancy. Moreover, our findings may be a call for action regarding the implementation of strategies to address maternal dyslipidaemia (such as carefully planned dietary interventions, increasing physical activity, and/or Omega-3 fatty acids supplementation). Meanwhile, gestational dyslipidaemia, as an important feature of obesity and GDM, might be a potential treatment target for clinical interventions. These steps need to be evaluated by global health policy makers through randomised controlled trials, evidence synthesis and consensus.[84-86]

Conclusion

Our findings demonstrate that maternal low HDL-C and high TG levels are positively associated with neonatal birthweight. No effect was documented for total or LDL cholesterol. Findings are of clinical importance in considering the management of gestational dyslipidaemia, for example using lifestyle interventions and omega-3 fatty acid supplementation to improve maternal and neonatal outcomes.

Acknowledgments: We thank Christine Sommer, H. Hauner, T.G.M. Vrijkotte, Aisling Geraphty, Ewa Wender-Ozegowska for providing us with requested data.

Contributors: KN, QX, KK, and JW conceived the research question. JW defined the question, designed the study, and conducted searches, data extraction, quality assessment, and data analysis. AS and KN contributed as second reviewers for the data extraction and quality assessment. DM, KN, and MJP advised on study design and contributed to data analysis. KK, QX, PS, and KAT also provided input for study design. All authors contributed to the interpretation of the results. JW led the writing of the manuscript with critical input from all other authors. All authors, external and internal, had full access to all data (including statistical reports and tables) in the study and can take responsibility for the integrity of the data and the accuracy of the data analysis. JW is the guarantor.

Funding: JW is supported by the LiSiguang scholarship provided by the University of Birmingham and the China Scholarship Council jointly. The funder had no role in study design, data collection, data analysis, data interpretation, or writing of the report. The corresponding author had full access to all the data in the study and had final responsibility for the decision to submit for publication.

Competing interests: All authors have completed the ICMJE uniform disclosure form at www.icmje.org/coi_disclosure.pdf and declare: no support from any organisation for the submitted work; no financial relationships with any organisations that might have an interest in the submitted work in the previous three years; no other relationships or activities that could appear to have influenced the submitted work.

Ethical Approval: Not required.

Data sharing: No additional data available.

Transparency: The lead author (JW) affirms that this manuscript is an honest, accurate, and transparent account of the study being reported; that no important aspects of the study have been omitted; and that any discrepancies from the study as planned (and, if relevant, registered) have been explained.

References

1. McIntire DD, Bloom SL, Casey BM, Leveno KJ. Birth weight in relation to morbidity and mortality among newborn infants. New England journal of medicine. 1999;**340(16):**1234-8.

2. Yu Z, Han S, Zhu G, et al. Birth weight and subsequent risk of obesity: a systematic review and meta-analysis. Obes Rev. 2011;**12(7):**525-42.

3. Harder T, Rodekamp E, Schellong K, Dudenhausen JW, Plagemann A. Birth weight and subsequent risk of type 2 diabetes: a meta-analysis. American journal of epidemiology. 2007;**165(8):**849-57.

4. Koyanagi A, Zhang J, Dagvadorj A, et al. Macrosomia in 23 developing countries: an analysis of a multicountry, facility-based, cross-sectional survey. The Lancet. 2013;**381(9865):**476-83.

5. Barker D. The developmental origins of adult disease. Journal of the American College of Nutrition. 2004;**23(sup6):**588S-95S.

6. McDonald SD, Han Z, Mulla S, Beyene J. Overweight and obesity in mothers and risk of preterm birth and low birth weight infants: systematic review and meta-analyses. Bmj. 2010;**341:**c3428.

7. Frederick IO, Williams MA, Sales AE, Martin DP, Killien M. Pre-pregnancy body mass index, gestational weight gain, and other maternal characteristics in relation to infant birth weight. Maternal and child health journal. 2008;**12(5):**557-67.

8. Kamana K, Shakya S, Zhang H. Gestational diabetes mellitus and macrosomia: a literature review. Annals of Nutrition and Metabolism. 2015;**66(Suppl. 2):**14-20.

9. Rader DJ. Effect of insulin resistance, dyslipidemia, and intra-abdominal adiposity on the development of cardiovascular disease and diabetes mellitus. The American journal of medicine. 2007;**120(3):**S12-S8.

10. Lakka H-M, Laaksonen DE, Lakka TA, et al. The metabolic syndrome and total and cardiovascular disease mortality in middle-aged men. Jama. 2002;**288(21):**2709-16.

11. Ryckman KK, Spracklen CN, Smith CJ, Robinson JG, Saftlas AF. Maternal lipid levels during pregnancy and gestational diabetes: a systematic review and meta-analysis. BJOG: An International Journal of Obstetrics & Gynaecology. 2015;**122(5):**643-51.

12. Ray J, Diamond P, Singh G, Bell C. Brief overview of maternal triglycerides as a risk factor for pre-eclampsia. BJOG: An International Journal of Obstetrics & Gynaecology. 2006;**113(4):**379-86.

13. Jiang S, Jiang J, Xu H, et al. Maternal dyslipidemia during pregnancy may increase the risk of preterm birth: A meta-analysis. Taiwanese Journal of Obstetrics and Gynecology. 2017;**56(1):**9-15.

14. Retnakaran RY, C. Hanley, A. J. G. Connelly, P. W. Sermer, M. Zinman, B. Hamilton, J. K. Effect of maternal weight, adipokines, glucose intolerance and lipids on infant birth weight among women without gestational diabetes mellitus. Cmaj. 2012;**184(12):**1353-60.

15. Kulkarni SR, Kumaran K, Rao SR, et al. Maternal lipids are as important as glucose for fetal growth: Findings from the pune maternal nutrition study. Diabetes Care. 2013;**36(9):**2706-13.

16. Geraghty AA, Alberdi G, O'Sullivan EJ, et al. Maternal Blood Lipid Profile during Pregnancy and Associations with Child Adiposity: Findings from the ROLO Study. PloS one. 2016;**11(8):**e0161206.

17. Horikoshi M, Beaumont RN, Day FR, et al. Genome-wide associations for birth weight and correlations with adult disease. Nature. 2016;**538(7624):**248-52.

18. Heerwagen MJ, Miller MR, Barbour LA, Friedman JE. Maternal obesity and fetal metabolic programming: a fertile epigenetic soil. Am J Physiol Regul Integr Comp Physiol. 2010;**299(3):**R711-22.

19. Moher D, Liberati A, Tetzlaff J, Altman DG, Group P. Preferred reporting items for systematic reviews and meta-analyses: the PRISMA statement. PLoS med. 2009;**6(7):**e1000097.

20. Stroup DF, Berlin JA, Morton SC, et al. Meta-analysis of observational studies in epidemiology: a proposal for reporting. Jama. 2000;**283(15):**2008-12.

21. Evidence BC. Study design search filters 2012 [updated 20 September 2012. Available from: http://clinicalevidence.bmj.com/x/set/static/ebm/learn/665076.html, Accessed 22nd March 2017.

22. Von Elm E, Altman DG, Egger M, et al. The Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) statement: guidelines for reporting observational studies. International Journal of Surgery. 2007;**12(12):**1495-9.

23. Wells G, Shea B, O'connell D, et al. The Newcastle-Ottawa Scale (NOS) for assessing the quality of nonrandomised studies in meta-analyses. Ottawa, Ontario: The Ottawa Health Research Institute; 2014.

24. ENDMEMO. Medical Unit Conversion [updated 2016. Available from: http://www.endmemo.com/medical/unitconvert/, Accessed 5th December 2016.

25. Higgins J, Thompson SG. Quantifying heterogeneity in a meta-analysis. Statistics in medicine. 2002;**21(11):**1539-58.

26. Higgins J, Green S. Recommendations on testing for funnel plot asymmetry. Cochrane Handbook for Systematic Reviews of Interventions Version. 2011;**5(0)**.

27. Edison RJ, Berg K, Remaley A, et al. Adverse birth outcome among mothers with low serum cholesterol. Pediatrics. 2007;**120(4):**723-33.

28. Savona-Ventura C, Vassallo J, Craus J, et al. Biological and biochemical characteristics of a Mediterranean population with Gestational Diabetes Mellitus. Journal of Perinatal Medicine. 2016;**44(4):**377-82.

29. Kramer CK, Hamilton JK, Ye C, et al. Antepartum determinants of rapid early-life weight gain in term infants born to women with and without gestational diabetes. Clinical Endocrinology. 2014;**81(3):**387-94.

30. Jin W-Y, Lin S-L, Hou R-L, et al. Associations between maternal lipid profile and pregnancy complications and perinatal outcomes: a population-based study from China. BMC pregnancy and childbirth. 2016;**16(1):**60.

31. Wang DX, S. Chen, H. Zhong, L. Wang, Z. The associations between triglyceride to high-density lipoprotein cholesterol ratios and the risks of gestational diabetes mellitus and large-for-gestational-age infant. Clinical Endocrinology. 2015;**83(4):**490-7.

32. Lei Q, Niu J, Lv L, et al. Clustering of metabolic risk factors and adverse pregnancy outcomes: A prospective cohort study. Diabetes/Metabolism Research and Reviews. 2016;**32(8):**835-42.

33. Jianjun Z, Xia Z, Zhiqun W, Yali H. Combination of lipids and uric acid in mid-second trimester can be used to predict adverse pregnancy outcomes. The journal of Maternal-fetal & neonatal medicine. 2012;**25(12):**2633-8.

34. ZAWIEJSKA A, WENDER-OZEGOWSKA E, J.BRAZERT, SODOWSKI K. Components of metabolic syndrome and their impact on fetal growth in women with gestational diabetes mellitus. J Physiol Pharmacol. 2008;**59(Suppl 4):**5-18.

35. Harmon KA, Gerard L, Jensen DR, et al. Continuous glucose profiles in obese and normal-weight pregnant women on a controlled diet: Metabolic determinants of fetal growth. Diabetes Care. 2011;**34(10):**2198-204.

36. Schaefer-Graf UM, Meitzner K, Ortega-Senovilla H, et al. Differences in the implications of maternal lipids on fetal metabolism and growth between gestational diabetes mellitus and control pregnancies. Diabetic Medicine. 2011;**28(9):**1053-9.

37. Liu B, Geng H, Yang J, et al. Early pregnancy fasting plasma glucose and lipid concentrations in pregnancy and association to offspring size: a retrospective cohort study. BMC Pregnancy Childbirth. 2016;**16(1):**56.

38. Laleh E, Soheila A, Vajihe M, Ashraf J. Effect of different maternal metabolic characteristics on fetal growth in women with gestational diabetes mellitus. Iranian Journal of Reproductive Medicine. 2013;**11(4):**325-34.

39. Slagjana S-K, Brankica K, Valentina V-N, et al. Effect of lipid parameters on foetal growth in gestational diabetes mellitus pregnancies. Prilozi. 2014;**35(2):**131-6.

40. Hou RL, Zhou HH, Chen XY, et al. Effect of maternal lipid profile, C-peptide, insulin, and HBA1c levels during late pregnancy on large-for-gestational age newborns. World Journal of Pediatrics. 2014;**10(2):**175-81.

41. Christine S, Line S, Kjersti M, Anne KJ, Kåre IB. Effects of early pregnancy BMI, mid-gestational weight gain, glucose and lipid levels in pregnancy on offspring's birth weight and subcutaneous fat: a population-based cohort study. BMC Pregnancy Childbirth. 2015;**15.(1):**84.

42. Patrycja S, Marcin K, Marzena W, Marzena D, Katarzyna C. Family, anthropometric and biochemical factors affecting birth weight of infants born to GDM women. Ginekologia i Poloznictwo. 2015;**86(7):**499-503.

43. Lin XH, Tian S, Yang J, et al. High maternal triglyceride levels increase the risk of macrosomia accompanied with childhood obesity and hyper cholesterolemia. Fertility and Sterility. 2013;**100(3):**S339.

44. Brockerhoff PG. Hyperlipoproteinemia in gestation. Changes in the maternal lipid metabolism due to gestation and its nutritional importance for the fetus. Fortschritte der Medizin. 1986;**104(13):**277-9.

45. Ortega RM, Jesús Gaspar M, Cantero M. Influence of maternal serum lipids and maternal diet during the third trimester of pregnancy on umbilical cord blood lipids in two populations of Spanish newborns. International Journal for Vitamin and Nutrition Research. 1996;**66(3):**250-7.

46. Couch SC, Philipson EH, Bendel RB, Wijendran V, Lammi-Keefe CJ. Maternal and cord plasma lipid and lipoprotein concentrations in women with and without gestational diabetes mellitus: Predictors of birth weight? Journal of Reproductive Medicine for the Obstetrician and Gynecologist. 1998;**43(9):**816-22.

47. Clausen TK, Burski N, Øyen K, Godang JB, Henriksen T. Maternal anthropometric and metabolic factors in the first half of pregnancy and risk of neonatal macrosomia in term pregnancies. A prospective study. European Journal of Endocrinology. 2005;**153(6):**887-94.

48. Fiona M, Linda Y, Andrew N. Maternal circulating nutrient concentrations in pregnancy: implications for birth and placental weights of term infants. The American journal of clinical nutrition. 2004;**79(1):**103-10.

49. Crume TL, Shapiro AL, Brinton JT, et al. Maternal fuels and metabolic measures during pregnancy and neonatal body composition: The healthy start study. Journal of Clinical Endocrinology and Metabolism. 2015;**100(4):**1672-80.

50. Olmos PR, Rigotti A, Busso D, et al. Maternal hypertriglyceridemia: A link between maternal overweight-obesity and macrosomia in gestational diabetes. Obesity. 2014;**22(10):**2156-63.

51. Brunner S, Schmid D, Huttinger K, et al. Maternal insulin resistance, triglycerides and cord blood insulin in relation to post-natal weight trajectories and body composition in the offspring up to 2 years. Diabet Med. 2013;**30(12):**1500-7.

52. Vrijkotte TGM, Krukziener N, Hutten BA, et al. Maternal lipid profile during early pregnancy and pregnancy complications and outcomes: The ABCD study. Journal of Clinical Endocrinology and Metabolism. 2012;**97(11):**3917-25.

53. Schaefer-Graf UM, Graf K, Kulbacka I, et al. Maternal lipids as strong determinants of fetal environment and growth in pregnancies with gestational diabetes mellitus. Diabetes Care. 2008;**31(9):**1858-63.

54. Ye K, Bo QL, Du QJ, et al. Maternal serum lipid levels during late pregnancy and neonatal body size. Asia Pacific Journal of Clinical Nutrition. 2015;**24(1):**138-43.

55. Vinod KM, Sheri T, Uma P. Maternal serum lipids during pregnancy and infant birth weight: the influence of prepregnancy BMI. Obesity. 2011;**19(7):**1476-81.

56. Kitajima M, Oka S, Yasuhi I, et al. Maternal serum triglyceride at 24--32 weeks' gestation and newborn weight in nondiabetic women with positive diabetic screens. Obstetrics and Gynecology. 2001;**97(5):**776-80.

57. Nolan CJ, Riley SF, Sheedy MT, Walstab JE, Beischer NA. Maternal serum triglyceride, glucose tolerance, and neonatal birth weight ratio in pregnancy: a study within a racially heterogeneous population. Diabetes Care. 1995;**18(12):**1550-6.

58. Son GH, Kwon JY, Kim YH, Park YW. Maternal serum triglycerides as predictive factors for large-for- gestational age newborns in women with gestational diabetes mellitus. Acta Obstetricia et Gynecologica Scandinavica. 2010;**89(5):**700-4.

59. Di Cianni G, Miccoli R, Volpe L, et al. Maternal triglyceride levels and newborn weight in pregnant women with normal glucose tolerance. Diabetic Medicine. 2005;**22(1):**21-5.

60. G.M.Vrijkotte T, J.Algera S, A.Brouwer I, Eijsden M, B.Twickler M. Maternal triglyceride levels during early pregnancy are associated with birth weight and postnatal growth. The Journal of Pediatrics. 2011;**159(5):**736-42.

61. Friis CM, Paasche Roland MC, Godang K, et al. Newborn fat percentage: Role of maternal metabolic state and placental size. PLoS ONE. 2012;**8(2):**e57467.

62. Kathy W, Hannah K, Vicky OD, et al. Offspring birth weight and maternal fasting lipids in women screened for gestational diabetes mellitus (GDM). European Journal of Obstetrics and Gynecology and Reproductive Biology. 2013;**170(1):**67-70.

63. Emet T, Ustuner I, Guven SG, et al. Plasma lipids and lipoproteins during pregnancy and related pregnancy outcomes. Archives of Gynecology & Obstetrics. 2013;**288(1):**49-55.

64. Knopp RH, Magee MS, Walden CE, Bonet B, Benedetti TJ. Prediction of infant birth weight by GDM screening tests. Importance of plasma triglyceride. Diabetes Care. 1992;**15(11):**1605-13.

65. Elaheh M, Zohreh A, Mojgan R, Fariba A, Ali K. Prediction of neonates' macrosomia with maternal lipid profile of healthy mothers. Pediatr neonatol. 2014;**55(1):**28-34.

66. Alberti-Fidanza A, Parizkova J, Fruttini D. Relationship between mothers' and newborns' nutritional and blood lipid variables. European Journal of Clinical Nutrition. 1995;**49(4):**289-98.

67. Hwang JY, Choi HI, Kim H, et al. Relationship of maternal grain intake and serum triglyceride levels with infant birth weight: Mothers and Children's Environmental Health (MOCEH) study. European Journal of Clinical Nutrition. 2015;**69(6):**676-80.

68. Knopp RH, Bergelin RO, Wahl PW, Walden CE. Relationships of infant birth size to maternal lipoproteins, apoproteins, fuels, hormones, clinical chemistries, and body weight at 36 weeks gestation. Diabetes. 1985;**34 (Suppl 2):**71-7.

69. Ahmad SMS, Hazlina NHN, Che Anuar CY, Faridah AR, Shukri Y. A study on factors affecting newborn weight and large for gestational age (LGA) newborns in non-diabetic mothers: The role of maternal serum triglycerides. International Medical Journal. 2006;**13(1):**53-8.

70. BANK TW. World Bank Country and Lending Groups 2017 [Available from: https://datahelpdesk.worldbank.org/knowledgebase/articles/906519, Accessed 27th March 2017.

71. Herrera E. Metabolic adaptations in pregnancy and their implications for the availability of substrates to the fetus. Eur J Clin Nutr. 2000;**54(S1):**S47-51.

72. Lain KY, Catalano PM. Metabolic changes in pregnancy. Clin Obstet Gynecol. 2007;**50(4):**938-48.

73. Frayn KN. Adipose tissue as a buffer for daily lipid flux. Diabetologia. 2002;**45(9):**1201-10.

74. Virtue S, Vidal-Puig A. Adipose tissue expandability, lipotoxicity and the Metabolic Syndrome--an allostatic perspective. Biochim Biophys Acta. 2010;**1801(3):**338-49.

75. Klop B, Elte JW, Cabezas MC. Dyslipidemia in obesity: mechanisms and potential targets. Nutrients. 2013;**5(4):**1218-40.

76. Jarvie E, Hauguel-de-Mouzon S, Nelson SM, et al. Lipotoxicity in obese pregnancy and its potential role in adverse pregnancy outcome and obesity in the offspring. Clinical Science. 2010;**119(3):**123-9.

77. Ehrenberg HM, Huston-Presley L, Catalano PM. The influence of obesity and gestational diabetes mellitus on accretion and the distribution of adipose tissue in pregnancy. American journal of obstetrics and gynecology. 2003;**189(4):**944-8.

78. Shafrir E, Khassis S. Maternal-fetal fat transport versus new fat synthesis in the pregnant diabetic rat. Diabetologia. 1982;**22(2):**111-7.

79. Brion M-JA, Ness AR, Rogers I, et al. Maternal macronutrient and energy intakes in pregnancy and offspring intake at 10 y: exploring parental comparisons and prenatal effects–. The American journal of clinical nutrition. 2010;**91(3):**748-56.

80. Evers I, De Valk H, Mol B, Ter Braak E, Visser G. Macrosomia despite good glycaemic control in Type I diabetic pregnancy; results of a nationwide study in The Netherlands. Diabetologia. 2002;**45(11):**1484-9.

81. Edward T Carreras, Polk DM. Dyslipidemia: Current Therapies and Guidelines for Treatment. US Cardiology Review. 2017;**11(1):**10-5.

82. Blumer I, Hadar E, Hadden DR, et al. Diabetes and pregnancy: an endocrine society clinical practice guideline. The Journal of Clinical Endocrinology & Metabolism. 2013;**98(11):**4227-49.

83. Practice Bulletin No. 180: Gestational Diabetes Mellitus. Obstetrics & Gynecology. 2017;**130(1):**e17-e37.

84. Barrett HL, Dekker Nitert M, McIntyre HD, Callaway LK. Normalizing metabolism in diabetic pregnancy: is it time to target lipids? Diabetes Care. 2014;**37(5):**1484-93.

85. Hunter PM, Hegele RA. Functional foods and dietary supplements for the management of dyslipidaemia. Nature Reviews Endocrinology. 2017;**13(5):**278-88.

86. Mente A, Dehghan M, Rangarajan S, et al. Association of dietary nutrients with blood lipids and blood pressure in 18 countries: a cross-sectional analysis from the PURE study. Lancet Diabetes Endocrinol. 2017;**5(10):**774-87.

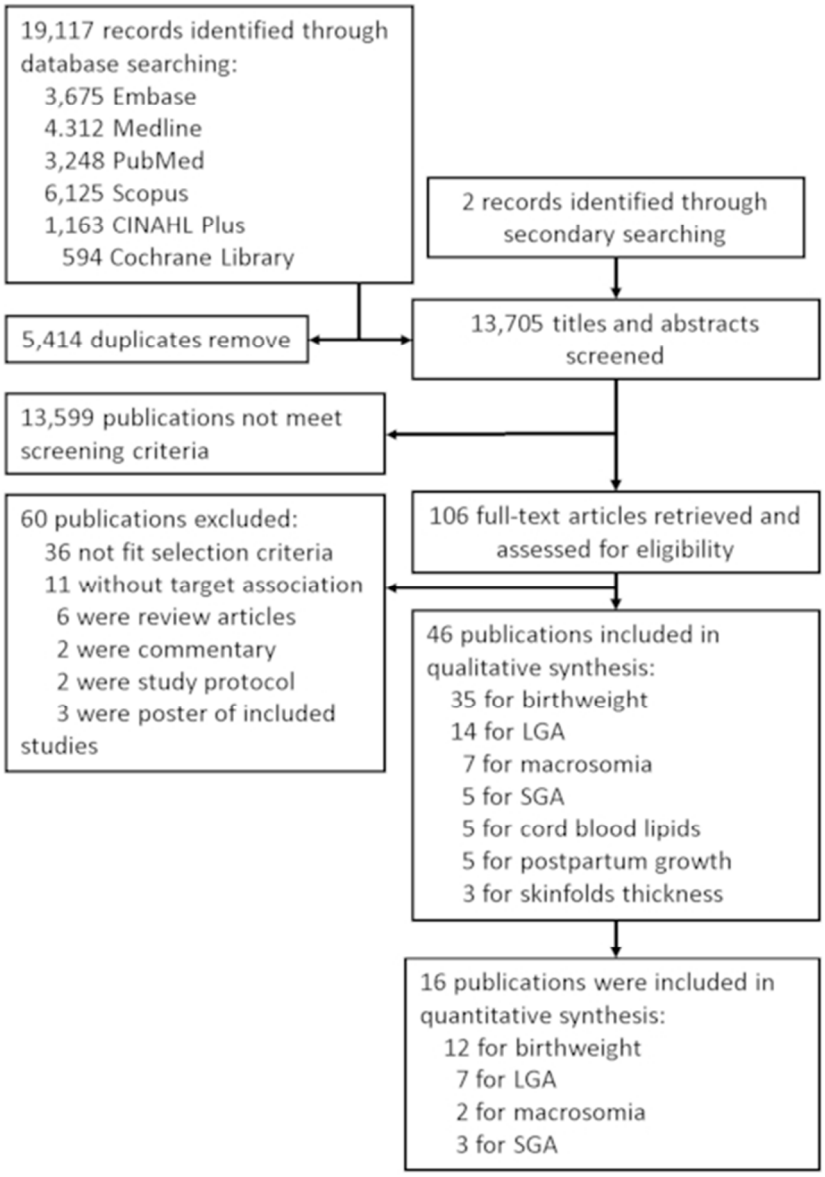
625 **Table Baseline characteristics of included studies**

Study ID	Study design	Locations	Population (N)	TC	HDL	LDL	TG	VLDL	FFAs	Tri.	Outcomes
Ye et al.2015[54]	Prospective observational study	China	non-GDM (n=1,243)	√	√	√	√			3	Birthweight LGA, SGA
Wang et al.2015[31]	Prospective cohort study	China	General (n=636)	√	√	√	√			2	Birthweight
Crume et al.2015[49]	Prospective cohort study	American	General (n=804)	√	√		√		√	2,3	Birthweight
Hwang et al.2015[67]	Prospective cohort study	Korea	non-GDM (n=1,011)				√			2,3	Birthweight
Kulkarni et al.2013[15]	Prospective cohort study	India	non-GDM (n=631)	√	√		√			2,3	Birthweight
Vrijkotte et al.2012[52]	Prospective cohort study	Netherlands	non-GDM (n=4,008)	√			√			1	LGA, SGA
Retnakaran et al.2012[14]	Prospective cohort study	Canada	non-GDM (n=472)	√	√	√	√			3	Birthweight LGA
Hou et al.2014[40]	Prospective observational study	China	non-GDM (n=2,790)	√	√	√	√			3	LGA
Kramer et al.2014[29]	Prospective cohort study	Canada	General (n=340)	√	√		√			3	Infant weight gain at 3 months
Son et al.2010[58]	Retrospective longitudinal observational study	Korea	GDM (n=104)	√	√	√	√			3	Birthweight LGA
Ahmad et al. 2006[69]	Controlled prospective study	Malaysia	non-GDM (n=246)	√			√			3	Birthweight LGA
Di et al. 2005[59]	Prospective observational study	Italy	OGTT+ (n=83)	√	√	√	√			2	Birthweight LGA
Couch et al.1998(1)[46] Couch et al.1998(2)[46]	Prospective observational study	American	GDM (n=20) Non-GDM (n=20)	√	√	√	√	√	√	3	Birthweight Cord vein lipids profile
Ortega et al. 1996[45]	Prospective cohort study	Spain	General (n=292)	√	√	√	√	√	√	3	Birthweight Cord arteriovenous lipids profile
Alberti-Fidanza et al. 1995[66]	Prospective observational study	Italy	General (n=70)	√	√		√			1-3	Mixed venous-arterial cord blood lipids profile
Schaefer-Graf et al. 2008[53]	Secondary analysis of RCT study	German	GDM (n=150)	√			√		√	3	Birthweight, cord blood lipids LGA
Swierzewska et al. 2015[42]	Prospective observational study	Poland	General (n=136)	√	√	√	√			3	Birthweight
Sommer et al. 2015[41]	Prospective cohort study	Norway	General (n=699)	√	√	√	√			3	Birthweight, sum of skinfolds
Slagjana et al. 2014[39]	Prospective cohort study	Yugoslavia	non-GDM (n=200)	√	√	√	√			3	Birthweight LGA, SGA
Laleh et al. 2013[38]	Prospective cohort study	Iran	GDM (n=112)	√	√	√	√			3	LGA, macrosomia
Whyte et al. 2013[62]	Prospective cohort study	Ireland	General (n=189)	√	√	√	√			2	Birthweight
Zhou et al. 2012[33]	Prospective cohort study	China	General (n=1,000)	√	√	√	√			2	Macrosomia
Vrijkotte et al. 2011[60]	Prospective cohort study	Netherlands	General (n=2,052)	√			√			1	Birthweight Postpartum growth
Vinod et al.2011(1)[55] Vinod et al.2011(2)[55]	Prospective cohort study	American	Overweight (n=71) Normal weight (n=72)	√	√	√	√			1-3	Birthweight
Zawiejska et al.	Prospective	Poland	GDM		√		√			2	Birthweight

Study ID	Study design	Locations	Population (N)	TC	HDL	LDL	TG	VLDL	FFAs	Tri.	Outcomes
2008[34]	observational study		(n=357)								Macrosomia
Clausen et al. 2005[47]	Prospective cohort study	Norway	General (n=2,050)	√	√	√	√			2	Macrosomia
Mathews et al. 2003[48]	Prospective cohort study	UK	General (n=798)	√						2,3	Birthweight
Olmos et al.2014(1)[50]	Prospective observational study	Chile	GDM + lean (n=128)	√	√		√			2,3	Birthweight
Olmos et al.2014(2)[50]			GDM + overweight (n=105)								
Olmos et al.2014(3)[50]			GDM + obese (n=46)								
Emet et al.2013[63]	Prospective observational study	Turkey	General (n=801)	√	√	√	√			3	Birthweight, infant weight at 3 months
Liu et al.2016[37]	Retrospective cohort study	China	General (n=1,546)	√	√	√	√			2	Birthweight
Brunner et al. 2013[51]	Secondary analyses of RCT study	German	General (n=208)				√			3	Birthweight, postpartum growth, skinfolds thickness
Knopp et al.1992[64]	Prospective observational study	American	NS- (n=521) PS+ (n=264) GDM (n=96)				√			3	Birthweight
Knopp et al.1985[68]	Prospective observational study	American	General (n=283)		√	√		√	√	3	Birthweight
Schaefer-Graf et al. 2011[36]	Prospective observational study	German	non-GDM (n=190)	√			√		√	3	Birthweight, Cord blood metabolic parameters
Nolan et al.1995[57]	Prospective observational study	Australia	General (n=388)				√			1	Birthweight
Lin et al.2013[43]	Prospective observational study	China	General (ND)				√			ND	Macrosomia
Friis et al.2012[61]	Prospective observational study	Norway	General (n=207)	√	√		√		√	3	Birthweight
Lei et al.2016[32]	Prospective cohort study	China	General (n=5,535)		√		√			2	LGA, SGA
Kitajima et al. 2001[56]	Prospective observational study	Japan	OGTT + (n=146)	√			√		√	3	Birthweight LGA
Mossayebi et al. 2014[65]	Prospective cohort study	Iran	General (n=154)	√	√	√	√			3	Birthweight LGA, macrosomia
Geraghty et al. 2016[16]	Secondary analyses of RCT study	UK	non-GDM (n=331)	√	√	√	√			2,3	Birthweight Postpartum growth, sum of skinfolds
Jin et al. 2016[30]	Prospective cohort study	China	non-GDM (n=934)	√	√	√	√			1-3	LGA, SGA, macrosomia
Brockerhoff 1986[44]	Prospective observational study	German	ND (n=112)		√	√		√		2	Cord blood lipids profile
Harmon et al. 2011[35]	Prospective observational study	American	non-GDM (n=38)				√		√	1	Birthweight
Robin et al. 2007[27]	Retrospective cohort study	American	General (n=957)	√						2	Birthweight
Charles et al. 2016[28]	Perspective observational study	Mediterranean countries	General (n=1062)	√	√	√	√			3	Birthweight

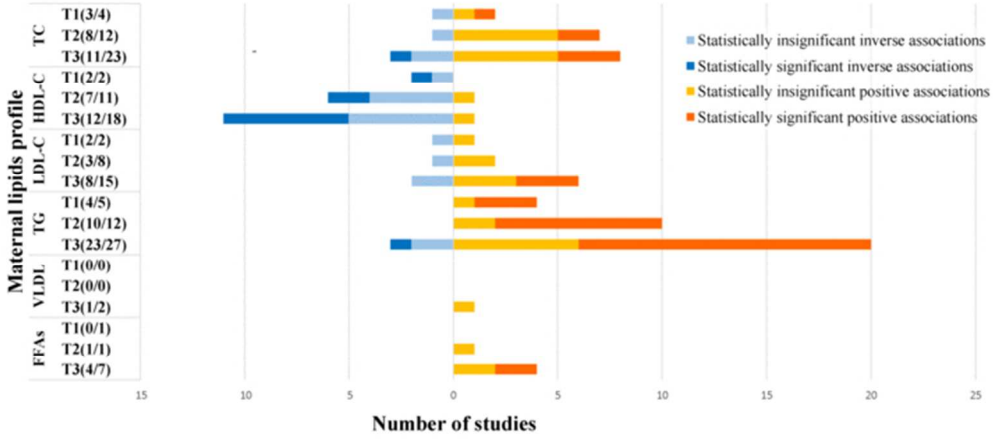
Abbreviation: Trimester(Tri), Total cholesterol (TC), high-density lipoprotein cholesterol (HDL-C), low-density lipoprotein cholesterol (LDL-C), very low-density lipoprotein cholesterol (VLDL-C), triglycerides(TG), free fatty acids(FFAs), large-for-gestational age(LGA), small for gestational age(SGA), randomized controlled trial(RCT), and no documented(ND).

626



Title: Figure 1. Flow-diagram of study selection

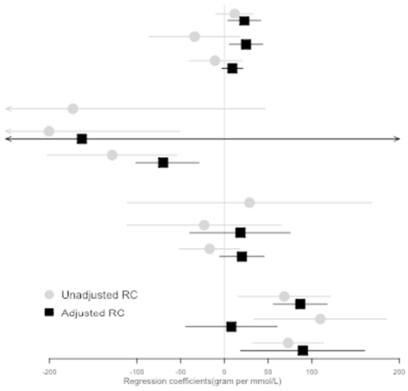
171x244mm (72 x 72 DPI)



Title: Figure 2. Results summary of the association of maternal lipid levels with birth weight throughout pregnancy‼ ┼ Notes: The numbers in parenthesis: The number of studies shown in this figure/the overall number of studies reporting the target associations. Studies reporting statistically insignificant results without its direction or those that did not report their results are not shown in the figure.

253x115mm (72 x 72 DPI)

Lipids	Participants	No. of studies	I-squared	Pooled adjusted RC (95% CI)
TC				
The first trimester	2052/2576	1/4	NA	22.67(4.01, 41.33)
The second trimester	1868/6331	2/12	0%	24.74(5.91, 43.57)
The third trimester	2810/9562	4/23	0%	9.14(-2.63, 20.92)
HDL-C				
The first trimester	0/136	0/2	NA	NA
The second trimester	1135/4998	2/11	23%	-163.11(-928.83, 602.61)
The third trimester	3756/8721	6/18	0%	-70.17(-101.14, -29.20)
LDL-C				
The first trimester	0/136	0/2	NA	NA
The second trimester	331/3206	1/8	NA	18.39(-39.43, 75.21)
The third trimester	2046/6380	3/15	34%	19.98(-5.25, 45.20)
TG				
The first trimester	2052/4666	1/5	NA	86.72(45.14, 117.30)
The second trimester	804/6009	1/12	NA	7.97(-44.18, 60.12)
The third trimester	4118/11363	8/27	93%	89.58(18.52, 160.25)

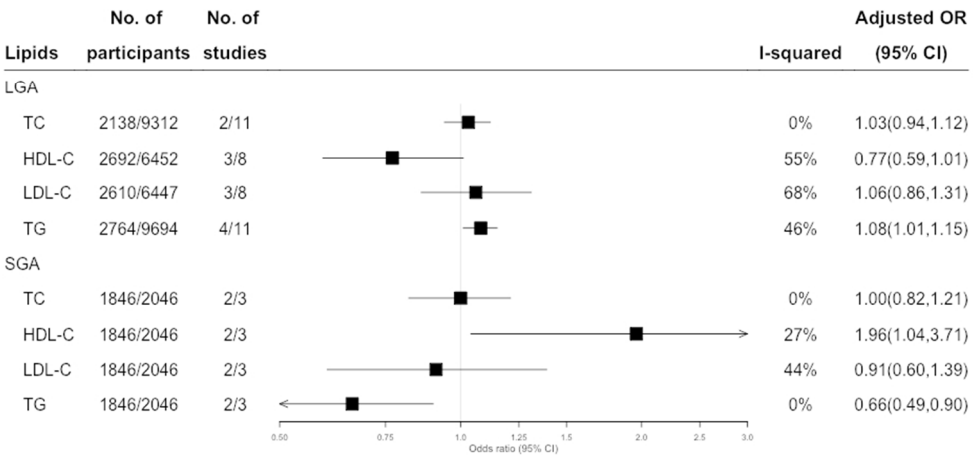


Title: Figure 3 Summary of findings of meta-analysis for the associations between maternal lipids and birth weight throughout pregnancy

Notes: The number of participants (studies) included into quantitative analysis/ overall number of participants (studies) that reported the outcome of interest.

The number of participants (studies) included into quantitative analysis/ overall number of participants (studies) that reported the outcome of interest.

339x166mm (72 x 72 DPI)



Title: Figure 4 Summary of findings of meta-analysis for the associations between maternal lipids and LGA/ SGA in the third trimester

Notes: The number of participants (studies) included into quantitative analysis/ overall number of participants (studies) that reported the outcome of interest.

336x166mm (72 x 72 DPI)

Supplementary material

Context

S1 Appendix Sample search in Medline

1. exp Lipids/ or lipid$.mp.
2. lipoprotein$.mp. or exp Lipoproteins/
3. exp Fatty Acids/ or fat* acids.mp.
4. triglycerides.mp. or exp Triglycerides/
5. exp Lipoproteins, VLDL/ or exp Cholesterol, VLDL/ or VLDL.mp.
6. LDL.mp. or exp Cholesterol, LDL/ or exp Lipoproteins, LDL/
7. IDL.mp. or exp Lipoproteins, IDL/
8. exp Lipoproteins, HDL/ or exp Cholesterol, HDL/ or HDL.mp.
9. exp Cholesterol/ or cholesterol.mp. or exp Cholesterol Esters/
10. hyperlipid?emia$.mp. or exp Hyperlipidemias/
11. dyslipid?emia$.mp. or exp Dyslipidemias/
12. hypertriglycerid?emia$.mp. or exp Hypertriglyceridemia/
13. hypercholesterol?emia.mp. or exp Hypercholesterolemia/
14. metabolic.mp.
15. 1 or 2 or 3 or 4 or 5 or 6 or 7 or 8 or 9 or 10 or 11 or 12 or 13 or 14
16. exp Maternal Health/ or maternal.mp.
17. exp Pregnanes/ or pregnan*.mp.
18. exp Pregnancy/ or gestation*.mp.
19. gravidity.mp. or exp Gravidity/
20. mother$.mp. or exp Mothers/
21. 16 or 17 or 18 or 19 or 20
22. (birth weight or birthweight).mp. or exp Birth Weight/ or exp Infant, Low Birth Weight/
23. overweight.mp. or exp Obesity/ or exp Overweight/ or exp Body Weight/
24. (SGA or Small for gestational age).mp. or exp Infant, Small for Gestational Age/
25. (LGA or Large for gestational age).mp.
26. exp Fetal Macrosomia/ or macrosomia.mp.
27. exp "Growth and Development"/ or exp Growth/ or (growth or development).mp. or exp Fetal Growth Retardation/ or exp Fetal Development/ or exp Child Development/
28. weight gain.mp. or exp Weight Gain/
29. (hyperglyc?emia or hypoglyc?emia).mp. or exp Hyperglycemia/ or exp Hypoglycemia/
30. (insulin* or hyperinsulinism or IR).mp. or exp Insulin/ or exp Insulin Resistance/ or exp Hyperinsulinism/
31. exp Glucose Intolerance/ or glucose.mp. or exp Glucose/ or exp Glucose Metabolism Disorders/
32. skinfold thickness.mp. or exp Skinfold Thickness/
33. (monocyte chemoattractant protein-1 or MCP-1).mp.
34. (interleukin 6 or IL-6).mp.
35. exp Tumor Necrosis Factor-alpha/ or tumour necrosis factor-alpha.mp.
36. exp 11-beta-Hydroxysteroid Dehydrogenase Type 1/ or HSD1.mp.
37. exp Leptin/ or leptin.mp.
38. exp Inflammation/ or inflammat*.mp.
39. 1 or 2 or 3 or 4 or 5 or 6 or 7 or 8 or 9 or 10 or 11 or 12 or 13 or 14 or 22 or 23 or 24 or 25 or 26 or 27 or 28 or 29 or 30 or 31 or 32 or 33 or 34 or 35 or 36 or 37 or 38
40. (neonatal or fetal or foetal or fetus or foetus or infant or offspring or new born).mp. or exp Infant/
41. 15 and 21 and (39 and 40)
42. (animal or mouse or mice or rodent or sheep or mutton or pig or hoggory or hog or swine or rabbit$).mp.
43. 41 not 42
44. cohort studies/ or longitudinal studies/ or follow-up studies/ or prospective studies/ or retrospective studies/ or cohort.ti,ab. or longitudinal.ti,ab. or prospective.ti,ab. or retrospective.ti,ab.
45. "randomized controlled trial".pt.
46. (random$ or placebo$ or single blind$ or double blind$ or triple blind$).ti,ab.
47. (retraction of publication or retracted publication).pt.
48. or/44-47
49. (animals not humans).sh.
50. ((comment or editorial or meta-analysis or practice-guideline or review or letter or journal correspondence) not "randomized controlled trial").pt.
51. (random sampl$ or random digit$ or random effect$ or random survey or random regression).ti,ab. not "randomized controlled trial".pt.
52. or/49-51
53. 48 not 52
54. 43 and 53

S2 Appendix Data extraction form

A. Reference information

1. ID number
2. Title
3. Author
4. Journal
5. Publication Year
6. Language
7. Sponsor

B. Study design

1. Study design
2. Setting
3. Locations
4. Data collection

C. Participants

1. Eligibility criteria (source and methods of selection of participants)
2. Matching criteria (if applicable)
    a. Matching criteria
    b. Attempts were made within the design or analysis to balance the comparison groups for potential confounders (YES/NO).
    c. The groups are comparable at baseline, including all major confounding and prognostic factors (YES/NO).
3. Sample Size
    a. Number of both exposed and unexposed groups
    b. Report numbers of individuals at each stage of study
    c. Give reasons for non-participation at each stage (YES/NO)
    d. Does the size of samples have enough power to detect the difference of primary outcomes? (YES/NO)
4. Demographic, clinical and social characteristics
    a. Age
    b. Ethnicity
    c. Pre-pregnant BMI/weight
    d. Marital status
    e. Education
    f. Other potential confounders information

D. Follow-up

1. Enrolment time
2. Length of follow-up
    a. Length of follow-up (average and total amount)
    b. All groups were followed up for an equal length of time (or analysis was adjusted to allow for differences in length of follow-up)
3. Methods of follow-up
4. Lost to follow-up
    a. Attrition rate in each group
    b. How many participants in each group were no outcome data available? (number & proportion)
    c. Does it comparable? (YES/NO)

E. Exposure

1. Definition of exposures
2. When did they take samples
3. Exposure measurement

F. Outcomes

1. Primary outcomes (definition and measurement)
2. Secondary outcomes (definition and measurement)

G. Statistical methods

1. Statistical methods, including those used to control for confounding
2. Describe any methods used to examine subgroups and interactions
3. How missing data were addressed
4. Explain how lost to follow-up was addressed
5. Describe any sensitivity analysis

H. Results

1. Number of outcomes events or summary measures over time

2. Give unadjusted estimates and, if applicable, confound der-adjusted estimates and their precision (e.g. 95% confidence interval). Make clear which confounders were adjusted for and why they were included

3. Report category boundaries when continuous variables were categorized

4. Alpha value and beta value

I. Limitations

1. Interpretation

Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence.

2. Generalizability (external validity)

J. Other notes

S3 Appendix Newcastle-Ottawa Scale

Selection

1. Representativeness of exposed cohort population
    1) Truly representative of the average, community-dwelling target pregnant women ★
    2) Somewhat representative of the average, community-dwelling target pregnant women★
    3) Selected group of pregnant women, e.g. only certain socio-economic groups/areas
    4) No description of the derivation of the cohort

2. Selection of the unexposed cohort
    1) Drawn from the same source as the exposed cohort★
    2) Drawn from a different source
    3) No description of the derivation of the unexposed cohort

3. Ascertainment of exposures
    1) Laboratory diagnosed ★
    2) Secure record (e.g. health care/clinical record) ★
    3) Written self-report
    4) Other/ no description

4. Demonstration that outcome of interest was not present at start of study
    1) Yes★
    2) No

Comparability

1. Comparability of cohort based on the design or analysis
    1) Study controls for
        ① Outcomes measured at delivery: gestational age ★
        ② Outcomes measured over 1 month after delivery: neonatal age ★
    2) Study controls for any two of additional factors (e.g. neonatal gender, maternal age, parity, socio-economic level, cigarette exposures, delivery mode and so on) ★

Outcome

1. Assessment of outcomes
    1) Independent blind assessment★
    2) Record linkage★
    3) Self-report
    4) Other/ no description

2. Was follow up long enough for outcomes to occur
    1) Yes, if the study follow their subjects until outcomes occur★
    2) No, if the study follow their subjects until outcomes occur

3. Adequacy of follow up of cohorts
    1) Complete follow up : all subjects accounted for★
    2) Subjects lost to follow up unlikely to introduce bias: number lost <= 20%, or description of those lost suggesting no different from those followed★
    3) Follow up rate <80% and no description of those lost
    4) No statement

S4 Appendix Basic characteristics extraction form

Study ID	Basic information	Participants	Maternal characteristics	Follow-up	Exposures	Outcomes	Quality score
Ye et al. 2015	*Study design:* Prospective observational study *Language:* English *Location:* China	*Setting:* Maternal and Child Health centres (MCH) of Hefei. *Eligibility criteria:* Women (≥18 years) who given birth in MCH centres of Hefei around 36^{th} – 41^{st} gestation week. *Exclude criteria:* 1) Gestational diabetes, overt diabetes, hypertension and heart disease. 2) Preterm births (before 37 weeks) or multiple pregnancies. 3) No information on birth weight. *Sample size : n=1,243*	**$\bar{x}$ ± SD or n (%)** *Age (year)* 27.9 ± 4.3 *Primiparous* 1012 (81.4) *Pre-pregnancy BMI (kg/m^2)* 20.5 ± 2.5 *Gestational length* 39.6 ± 1.0 *Fasting blood* No Statement	*Enrolment time* Gestational age at entry (36^{th} – 41^{st} gestation week) (1^{st} Jan 2011 – 31^{st} July 2012) *Length* Follow up until birth *Methods* Clinical follow-up *Data collection* Questionnaire, clinical medical records *Loss to follow-up* 0	Maternal serum TG, TC, HDL, LDL were measured close to delivery (36-41 weeks, in most case 1 week to delivery)	*Birth weight* was retrieved from medical records after delivery. *LGA:* infants with birth weight > 90^{th} percentile for local population after adjusting for gestational age and sex. *SGA:* birth weight <10^{th} *AGA:* 10^{th} ≤birth weight ≤ 90^{th}	8
Wang et al. 2015	*Study design:* Cohort *Language:* English *Location:* China	*Setting:* No statement *Eligibility criteria:* 1) Chinese women with a singleton pregnancy and a live delivery; 2) have GDM screening at 24-28 weeks of gestation; 3) presented for booking at or before 16 weeks and gave birth at or after 36 weeks; 4) compete antenatal and birth data. *Exclude criteria:* Type 1 or type 2 diabetes; hyperlipidaemia, hypertension, cardiovascular diseases or metabolic syndrome before pregnancy; a history of severe systemic disease (liver cirrhosis, chronic renal failure, severe anaemia or immune disorders); and untreated endocrinopathies (hyperadrenalism, hypoadrenalism, hyperthyroidism or hypothyroidism) *Sample size: n= 636*	**Median (25^{th}-75^{th})** *Age (year)* Non-GDM: 29 (27-31) GDM: 31 (29-34) *Parity* No statement *Pre-pregnancy BMI (kg/m^2)* Non-GDM: 20.03 (18.59-21.55) GDM: 21.02 (19.24-22.56) *Gestational length* Non-GDM: 39 (39-40) GDM: 39 (38-40) *Fasting blood* Yes.	*Enrolment time:* Gestational age at entry (at or before 16^{th} gestation week) (1^{st} Jan 2013 – 31^{st} Dec 2013) *Length:* At least follow up until birth *Methods:* No statement *Data collection:* laboratory diagnosis *Loss to follow-up:* 0	Maternal overnight fasting blood was taken at the time of OGTT (24^{th} -28^{th} weeks) for TC, HDL, LDL and TGs laboratory analyses (standard enzymatic procedures on automatic chemistry analyser).	*Birthweight.*	6

Study ID	Basic information	Participants	Maternal characteristics	Follow-up	Exposures	Outcomes	Quality score
		(110 GDM and 526 non-GDM)					
Crume et al.2015	*Study design:* Prospective birth cohort study *Language:* English *Location:* American	*Setting:* Healthy Start Study (n=1,063) conducted in the prenatal obstetrics clinics at University of Colorado Hospital in Aurora, Colorado. *Eligibility criteria:* Women (≥16 years) expecting a singleton birth, living in Colorado, and planning to deliver at University of Colorado Hospital. *Exclude criteria:* Women with serious chronic diseases (cancer, psychiatric diseases, steroid-dependent asthma, pre-existent diabetes), as well as those who subsequently experienced a foetal death or delivered a severely premature infant (<32 week gestation) were excluded. *Sample size : n=804*	**$\bar{x}$ ± SD or n (%)** *Age (year)* 27.7 ± 6.1 *Primiparous* 287 (35.8) *Pre-pregnancy BMI (kg/m^2)* 25.7 ± 6.3 *Gestational length* 39.4 ± 1.3 *Fasting blood* Yes	*Enrolment time* Gestational age at entry (≤24 gestation week) (All women were enrolled and delivered as of Nov 1, 2013) *Length* Follow up at least until birth *Methods* In-person research visits and hospital preconception visit *Data collection* Questionnaires, clinical diagnoses and medical records *Loss to follow-up* 0	Maternal fasting venous blood samples were taken at both two research visits (first, median 17 week, range 11-20 week; second, median 27 week, range 20-34 week) for TGs, TC, HDL-c and FFA laboratory analyses using manufacturer pre-packaged enzymatic kits and the AU400e Chemistry Analyser.	*Birth weight* was measured using a calibrated scale.	8
Hwang et al.2014	*Study design:* Prospective cohort study *Language:* English *Location:* Korea	*Setting:* The MOCEH study, a multicentre prospective hospital- and community-based cohort study in South Korea (n=1,751) *Eligibility criteria:* Pregnant women at mid-stage (15-28 gestation weeks) of a normal (not at risk) pregnancy who were willing to participate the MOCEH study. *Exclude criteria:* Twins (n=31), spontaneous abortion (n=23), intrauterine growth restriction (n=3), foetus congenital anomaly (n=12). Drop out (n=221), pregnancy complications (hypertension or/and diabetes, n=34). No information on dietary intake data	**$\bar{x}$ ± SD or n (%)** *Age (year)* 30.1 ± 3.6 *Primiparous* No statement *Pre-pregnancy BMI (kg/m^2)* 21.3 ± 3.1 *Gestational length* 38.9 ± 1.4 *Fasting blood* No statement	*Enrolment time* Gestational age at entry (12-28 gestation week) (Aug 2006 to Dec 2010) *Length* Follow up until 5 years after delivery. *Methods* Clinical visits *Data collection* Questionnaires and medical records *Loss to follow-up* 221(17.94%)	Maternal serum *TG* was analysed twice at mid-pregnancy (12-28 gestational weeks) and at late pregnancy (29-42 gestational weeks) by means of an enzymatic method using an autonalyzer.	*Birthweight* was obtained from birth records. .	9

Study ID	Basic information	Participants	Maternal characteristics	Follow-up	Exposures	Outcomes	Quality score
		(n=135), total energy consumption <500 or >4000 kcal/day (n=5), No information on serum TG concentration at mid- or late pregnancy (n=276) *Sample size : n=1,011*					
Kulkarni et al. 2013	*Study design:* Population-based birth cohort study *Language:* English *Location:* India	*Setting:* The Pune Maternal Nutrition Study (PMNS), a prospective birth cohort based on six rural villages in India. *Eligibility criteria:* Women with a singleton pregnancy of <21 weeks' gestation (n=797). *Exclude criteria:* Spontaneous abortions, fetal anomalies, multiple pregnancy, medical terminations late booking, Late abortions (n=12), late terminations (n=14), still birth (n=8), maternal death (n=1), congenital anomalies (n=9), baby not measured (n=51), mother diabetic (n=1), mother hypertensive (n=1), preterm (n=69) *Sample size : n=631*	**$\bar{x}$ ± SD or n (%)** *Age (year)* 21.4 ± 3.6 *Primiparous* 226 (35.8) *Pre-pregnancy BMI (kg/m^2)* 18.0 ± 1.9 *Gestational length* 39.4 ± 1.7 *Fasting blood* Yes	*Enrolment time* Gestational age at entry (<21 gestation week) (June 1994 to April 1996) *Length* Follow up until birth. *Methods* No statement *Data collection* Questionnaires and clinical measurement *Loss to follow-up* 131 (16.44%)	Maternal fasting venous blood samples was collected at 18 and 28 weeks for total cholesterol HDL-C and triglycerides using standard enzymatic kits.	Measured by one of five trained fieldworkers within 72h of birth. *Birthweight:* measured by a Salter spring balance.	8
Vrijkotte et al.2012	*Study design:* Prospective cohort study *Language:* English *Location:* Netherlands	*Setting:* The Amsterdam Born Children and Their Development (ABCD) cohort study *Eligibility criteria:* Pregnant women visit to the obstetric care provider around the 12th week of gestation agree to participant the ABCD biomarker study (n=4389) *Exclude criteria:* Women who had multiple gestation or who had no data on the gestational age at blood sampling, women with diabetes (pre-existent as well as pregnancy induced), and	**$\bar{x}$ ± SD or n (%)** *Age (year)* 30.9 ± 4.9 *Primiparous* 2314 (57.7) *Pre-pregnancy overweight or obese* 830 (20.7) *Gestational length* No statement *Fasting blood* No.	*Enrolment time* Gestational age at entry (around 12th gestation week) (Jan 2003 to Mar 2004) *Length* Follow up at least until birth. *Methods* Obstetric care provider visit and the Youth Health Care Registration and the Dutch Perinatal Registration (PRN).	Maternal additional non-fasting blood samples were taken during routine blood collection for laboratory TC and TG levels assessment during their first prenatal visit to the obstetric care provider at around the 12th week of gestation.	Information on pregnancy outcomes was obtained from the Youth Health Care Registration and the Dutch Perinatal Registration (PRN). *SGA:* birth weight below the 10th percentile for gestational age based on gender- and parity-specific standards from the PRN. *LGA:* birth weight above	8

Study ID	Basic information	Participants	Maternal characteristics	Follow-up	Exposures	Outcomes	Quality score
		those using lipid-altering medication (e.g. antiepileptic drugs, steroids, insulin, antidepressants, thyroid hormones, or sleep medication) were excluded. *Sample size : n=4,008*		*Data collection* Questionnaires and Health care registration system. *Loss to follow-up* 381 (8.68%)		the 90th percentile for gestational age based on the same gender0and parity-specific standards from the PRN.	
Retnakaran et al. 2012	*Study design:* Prospective cohort study *Language:* English *Location:* Canada	*Setting:* Ongoing prospective observational cohort study *Eligibility criteria:* White, Asian and South Asian pregnant women with term (37-41 weeks' gestation inclusive) singleton pregnancies were recruited at the second or early in the third trimester. *Exclude criteria:* Women with gestational diabetes. *Sample size: n=472*	**$\bar{x}$ ± SD or Median(IQR)** *Age (year)* Lowest tertile birthweight: 33.6±4.0 Middle tertile birthweight: 34.5±4.3 Highest tertile birthweight: 33.6±4.0 *Primiparous* 251 (53.18) *Pre-pregnancy BMI (kg/m^2)* Lowest: 22.6(20.7-25.4) Middle: 22.6(20.8-25.8) Highest: 23.6(22.3-27.4) *Gestational length* Lowest: 38.6±1.1 Middle: 39.2±1.0 Highest: 39.6±1.1 *Fasting blood* Yes.	*Enrolment time* Gestational age at entry (around 24th-28th gestation week) (No statement about recruitment time) *Length* Follow up until 3 months postpartum period *Methods* No statement *Data collection* No statement *Loss to follow-up* 0	Maternal fasting serum samples were obtained at the time of the oral glucose tolerance test (late second to early third trimester, median 30 week) for laboratory total cholesterol, HDL-c, LDL-c and triglycerides levels measurements.	*Birthweight* was measured at delivery. *LGA:* sex-specific birth weight for gestational age was above the 90th percentile of Canadian foetal growth curves for the relevant ethnic group (white, Asian or South Asian) *Macrosomia:* birthweight over 4,000 g	7
Hou et al.2014	*Study design:* Prospective observational	*Setting:* Hospital-based study *Eligibility criteria:*	**Median (25th-75th)** *Age (year)* 26 (24-29)	*Enrolment time* Gestational age at entry (around 28th – 37th gestation	Maternal fasting venous blood was collected at the	LGA: birth weight were above the 90th percentile for gestational age in	7

Study ID	Basic information	Participants	Maternal characteristics	Follow-up	Exposures	Outcomes	Quality score
	study *Language:* English *Location:* China	Pregnant women with naturally conceive, singleton pregnancy during 28-37 week gestation were enrolled into this study *Exclude criteria:* Diabetes, abnormal glucose tolerance, chromosomal abnormality, inherited metabolic diseases thyroid disease, and risk for foetal chromosomal abnormality New-borns with preterm birth, inherited metabolic diseases, congenital abnormalities and congenital heart diseases. *Sample size : n=2,790*	*Primiparous* No statement *Pre-pregnancy BMI (kg/m^2)* 19.93 (18.55-21.63) *Gestational length* 39 (38-40) *Fasting blood* Yes.	week) (No statement about recruitment time) *Length* Follow up until delivery *Methods* Clinical visit *Data collection* Questionnaire, clinical measurement and diagnosis *Loss to follow-up* 0	enrolment time for laboratory TC, HDL-C,LDL-C and TG assay.	accordance with *Neonatal Birth Weight for Gestational Age and Percentile in 15 cities in China*.	
Kramer et al. 2014	*Study design:* Prospective cohort study *Language:* English *Location:* Canada	*Setting:* Ongoing prospective observational cohort study *Eligibility criteria:* Women with singleton delivery between April 2005 and January 2011, at term (≥37 weeks gestation, with infant birthweight >2500 g) *Exclude criteria:* No *Sample size : n=340* (GDM, n=90; non-GDM, n=250)	**$\bar{x}$ ± SD or n (%)** *Age (year)* No statement *Primiparous* 340 (100) *Pre-pregnancy BMI (kg/m^2)* No statement *Gestational length* No statement *Fasting blood* Yes.	*Enrolment time* Gestational age at entry (around 24th-28th gestation week) (Apr 2005 - Jan 2011) *Length* Follow up until 3-month postpartum period *Methods* Clinical investigation unit *Data collection* Questionnaire, clinical measurement *Loss to follow-up* 0	Maternal fasting serum samples were obtained at the time of the oral glucose tolerance test (late second to early third trimester, median 30 week) for laboratory total cholesterol, HDL-c and triglycerides levels measurements.	*Infant weight gain at 3 months:* the difference between weight at 3 months and birthweight. SD scores for weight gain at 3 months were determined for the study population, which was then stratified into two groups: infants weight rapid weight gain in the first 3 months (≥0.5 SD) and those without (<0.5 SD)	7
Harmon et al.2011	*Study design:* Prospective observational study *Language:* English *Location:*	*Setting:* Normal weight (BMI 20-25 kg/m^2) and obese (BMI 30-38 kg/m^2) women with NGT were enrolled at <15 weeks' gestation from the University of Colorado Hospital vicinity *Eligibility criteria:* Singleton pregnancies, being aged 18-35 years, being English speaking, and having a fasting blood glucose (FBG) <95 mg/dL.	**$\bar{x}$ ± SEM** *Age (year)* Normal weight: 31.2 ± 2.3 Obese: 26.5 ± 4.2 *Parity* Normal weight: 0.4 ± 0.6 Obese: 1.2 ± 0.9	*Enrolment time* Gestational age at entry (<15th gestation week) *Length* Follow up until birth. *Methods* No statement *Data collection* Questionnaire, clinical	Both early (14-16 weeks) and late (26-28 weeks) in gestation, all women had non-esterified free fatty acids (FFAs) measured. Triglycerides were	Birthweight.	6

Study ID	Basic information	Participants	Maternal characteristics	Follow-up	Exposures	Outcomes	Quality score
	American	birthweight >2500 g) *Exclude criteria:* Having a history of diabetes, hypertension, triglycerides>300 mg/dL, chronic diseases; tobacco or alcohol use; or treatment with steroids/β-blockers. Women with positive gestational diabetes diagnosis at baseline or 24-28 weeks' gestation were excluded. *Sample size : n=38*	*Pre-pregnancy BMI (kg/m^2)* Normal weight: 22.4 ± 1.9 Obese: 33.1 ± 3.4 *Gestational length* Normal weight: 39.4 ± 0.3 Obese: 39.6 ± 0.3 *Fasting blood* No statement	measurement *Loss to follow-up* 4 (8.20%)	measured in early gestation only.		
Son et al.2010	*Study design:* Retrospective longitude observational study *Language:* English *Location:* Korea	*Setting:* No statement. *Eligibility criteria:* Pregnant women diagnosed with GDM by the OGTT with complete maternal overnight fasting blood samples within 2 weeks of GDM diagnosis. *Exclude criteria:* Women having hypertensive disorder (n=9), thyroid disorder (n=4), connective tissue disease (n=3). Patients who delivered before 35 weeks of gestation (n=14) and cases of foetal congenital malformation (n=10) or multifetal gestations (n=6) were also excluded. *Sample size : n=104*	**$\bar{x}$ ± SD** *Age (year)* 32.7 ± 4.1 *Parity* 0.7 ± 0.8 *Pre-pregnancy BMI (kg/m^2)* 23.2 ± 4.1 *Gestational length* 38.3 ± 1.2 *Fasting blood* Yes	*Enrolment time* Gestational age at entry (24th -30th gestation week) *Length* Follow up until birth. *Methods* No statement *Data collection* clinical measurement *Loss to follow-up* 0	Maternal fasting serum TG, total cholesterol, low-density lipoprotein (LDL) and high-density lipoprotein (HDL) cholesterol concentrations at 24th -32th gestation week *Hypertriglyceridemia* was defined as a TG level greater than the 75th percentile value (<3.33 mmol/L)	Infants with birthweights above the 90th percentile were classified as LGA, based on gestational age and sex-adjusted birthweights from a Korean national database.	5
Ahmad. 2006	*Study design:* Controlled prospective study *Language:* English	*Setting:* Four antenatal clinics (ANC): Hospital Universiti Sains Malaysia, Kota Bharu Health Cinic, Kubang Kerian Health Clinic and Kedai Lalat Health Clinic. *Eligibility criteria:* Pregnant women attending the antenatal clinics at gestation between 24 to 32 weeks	**$\bar{x}$ ± SD** *Age (year)* 30.87 ± 6.70 *Gravidity* 3.76 ± 2.69 *BMI (kg/m^2)* 23.36 ± 4.04 *Gestational length*	*Enrolment time* Gestational age at entry (24th -32th gestation week) *Length* Follow up until delivery. *Methods* Antenatal clinics visit and appointment	Maternal fasting lipid profile was taken at between 24 to 32 weeks gestation for laboratory analyses. (total cholesterol and	At delivery, weight of the newborn were noted. LGA: Neonatal birth weight above the 90th percentile of gender specific birth weight curve of Malaysia.	7

Study ID	Basic information	Participants	Maternal characteristics	Follow-up	Exposures	Outcomes	Quality score
	Location: Malaysia	gestation. *Exclude criteria:* Diabetic (diagnosed diabetic prior to conception and gestational diabetes requiring insulin); Hypertension or preeclampsia (hypertensive disorder), lupus and antiphospholipid syndrome, fetal anomaly diagnosed through ultrasound during booking or noted abnormal at birth; multiple gestation; pre-term delivery. *Sample size: n=246*	39.00 ± 1.29 *Fasting blood* Yes.	*Data collection* clinical records *Loss to follow-up* 50 (13.9%)	triglycerides)		
Di et al.2005	*Study design:* prospective observational study *Language:* English *Location:* Italy	*Setting:* The diabetes Section of the Department of Endocrinology and Metabolism of the University of Pisa, Italy. *Eligibility criteria:* Pregnant Caucasian women with positive diabetic screening performed at 24 to 30th week of gestation, *Exclude criteria:* Women with hypertensive disorders, thyroid disorder, lupus and anti-phospholipid syndrome. *Sample size: n=180 (NGT=121)* The main analysis of our interest is conducted on NGT women who delivered at term. (n=83)	**$\bar{x}$ ± SD or n (%)** *Age (year)* 33 ± 4 *Primiparous* 106 (59) *Pre-pregnancy BMI (kg/m^2)* 23.6 ± 4 *Gestational length* 39.3(39-40) *Fasting blood* Yes.	*Enrolment time* Gestational age at entry (24th -28th gestation week) *Length* Follow up until delivery. *Methods* Antenatal clinics visit and appointment *Data collection* clinical records *Loss to follow-up* 0	Maternal overnight fasting lipid level (Total cholesterol, LDL-C, HDL-C, Triglycerides) at between 24th and 28th week of gestation.	Birthweight. Macrosomia: neonatal body weight over 4kg or as a neonatal weight greater than 90th percentile for gestational age (LGA), according to the reference table.	5
Schaefer-Graf et al.2008	*Study design:* Secondary analysis of RCT study *Language:* English *Location:*	*Setting:* Two hospital based diabetic prenatal care clinics. *Original study (n=199):* Women diagnosed as GDM based on a 75-g OGTT in capillary blood. (capillary fasting glucose ＜120 mg/dl, postprandial glucose ＜200 mg/dl). *This analysis (n=150):*	**$\bar{x}$ ± SD** *Age (years)* 31.2 ± 4.9 *Parity* 2.05 ± 1.2 *Pre-pregnancy BMI (kg/m^2)* 27.8 ± 6.2 *Gestational length*	*Enrolment time* Gestational age at entry (28.3 ± 2.4 weeks); (Jan 2000 - Jan 2003) *Length* Follow up until day 2 after delivery *Methods* Clinical visits (28, 32, 36,	Maternal serum FFAs, cholesterol and triglycerides were measured every clinical visit (28, 32, 36 and close to delivery) using commercial kits.	Birth weight and length were obtained shortly after delivery, and neonatal skinfold thickness at the flank was measured within 48h. Infants with birth weight <10th percentile were	5

Study ID	Basic information	Participants	Maternal characteristics	Follow-up	Exposures	Outcomes	Quality score
	German	Accepted insulin therapy; availability of complete maternal blood and cord blood samples.	*(weeks)* 39.2 ± 1.4 *Fasting blood* No Statement	39 weeks, labour and day 2 postpartum) *Data collection* No statement *Loss to follow-up* 49/199 (24.6 %)		classified as SGA, and those with birth weight > 90th percentile as LGA based on gestational age and sex-adjusted birth weight percentiles derived from a German national database. Cord blood samples ware taken immediately following delivery and serum was stored at -80℃ for TGs, free fatty acids(FFAs) and cholesterol measurements.	
Swierzewska et al. 2015	*Study design:* Prospective observational study *Language:* English *Location:* Poland	*Setting:* No statement *Eligibility criteria:* 136 Caucasian women were included into this study: 106 diagnosed with GDM and 31 pregnant women with normal glucose tolerance. *Exclude criteria:* No statement *Sample size :136* GDM group: 106 NGT group: 31	**$\bar{x}$ ± SD or n (%)** *Age (year)* GDM: 30.2±0.36 NGT: 28.87±0.6 *Primiparous* No statement. *Pre-pregnancy weight (kg)* GDM:25.29±0.4 NGT: 23.05±0.52 *Gestational length (days)* No statement *Fasting blood* No statement.	*Enrolment time* Gestational age at entry (No statement); (2012 - 2013) *Length* Follow up until birth. *Methods* No statement *Data collection* Survey, interview *Loss to follow-up* 0	Maternal venous blood samples were collected twice (27-32 wks and 34-39 wks of gestation) to assess lipid profile (total cholesterol, HDL and LDL cholesterol, triglycerides).	Macrosomia was diagnosed in newborn with the firth weight of ≥4000 g, and LGA if the birth weight exceeded the 90th percentile.	5
Sommer et al.2015	*Study design:* Population-based, multi-ethnic,	*Setting:* The STORK Groruddalen study (n=823), a population-based cohort study of healthy pregnant women attending Child Health	**$\bar{x}$ ± SD or n (%)** *Age (year)* 29.3 ± 4.8 *Primiparous*	*Enrolment time* Gestational age at entry (<20 gestation week) In practice, the STORK	Maternal fasting total-, HDL- and LDL-cholesterol and triglycerides	Birth weight was measured with calibrated electronic scales immediately after birth.	9

Study ID	Basic information	Participants	Maternal characteristics	Follow-up	Exposures	Outcomes	Quality score
	prospective cohort *Language:* English *Location:* Norway	Clinics for antenatal care in three administrative city districts in Oslo, Norway. *Eligibility criteria for STORK study:* 1. lived in the study districts; 2. Planned to give birth at one of two study hospitals; 3. were<20 weeks pregnant; 4. Could communicate in Norwegain or any of the eight translated languages; 5. Were able to give a written consent to participate. *Exclude criteria for STORK study:* Women with pregestational diabetes or in need of intensive hospital follow-up during pregnancy were excluded *In/Exclusion criteria for this analysis:* Women with singleton pregnancy who completed both two clinic visits are eligible for this analysis. Women who was abortions or stillbirths < GW 28, complications mother/baby, preterm birth, mother included late in pregnancy, south American origin were excluded from this analysis. *Sample size: n=699 (for birthweight); n=512 (for sum of skinfolds)*	319 (45.6) *Pre-pregnancy BMI (kg/m^2)* 24.6 ± 4.8 *Gestational length (days)* 281 ± 9 *Fasting blood* Yes.	study also includes 77 (9.4 %) and 11 (1.3%) women entry into this study at 20-24 gestation week and later than gestational week 24, respectively. (May 2008 to May 2010) *Length* Follow up at least until 3 days after birth. *Methods* Clinic visits *Data collection* Questionnaires, clinical measurement and laboratory diagnosis. *Loss to follow-up* 37(5.29%)	were measured from venous blood with a colorimetric method at the central laboratory at clinic visit 2 (week 28).	To assess neonatal subcutaneous fat, skinfolds were measured to the nearest 0.2mm with a skinfold calliper at subscapular, suprailiac, thigh and triceps sites within 72 hours after birth.	
Slagjana et al.2014	*Study design:* Population-based, multi-ethnic, prospective cohort *Language:* English *Location:* Norway	*Setting:* The Outpatient Department of the University Endocrinology, Diabetes and Metabolic Disorders Clinic *Eligibility criteria:* GDM women with singleton pregnancy, and the neonates were delivered at the University Gynaecology and Obstetrics Clinic. *Exclude criteria:* None *Sample size: n=200*	**$\bar{x}$ ± SD or n (%)** *Age (year)* LGA: 31.4±5.6 AGA: 31.1±5.6 SGA: 32.9±5.1 *Primiparous* No statement *Pre-pregnancy BMI (kg/m^2)* LGA: 28.4±6.1 AGA: 26.5±4.9 SGA: 25.0±4.6	*Enrolment time* No statement on recruitment date and entry gestational age. *Length* Follow up until birth. *Methods* Clinic visits *Data collection* Clinical measurement and laboratory diagnosis. *Loss to follow-up*	Maternal overnight fasting blood samples were collected at the second half of pregnancy(LGA; 28.6±7.7; AGA: 28.0±7.1; SGA: 23.8±7.6) for Total cholesterol, HDL-C,LDL-C and triglycerides	*LGA:* birth weight above the 90th percentile. *SGA:* birth weight below the 10th percentile for gestational age. *AGA:* birthweight between LGA and SGA.	5

Study ID	Basic information	Participants	Maternal characteristics	Follow-up	Exposures	Outcomes	Quality score
			Gestational length (weeks) LGA: 39.3±1.5 AGA: 38.2±1.9 SGA: 36.4±3.7 *Fasting blood* Yes.	0	laboratory assessment.		
Laleh et al.2013	*Study design:* Prospective cohort *Language:* English *Location:* Iran	*Setting:* Shariati Hospital affiliated to Tehran University of Medical Sciences, Tehran, Iran *Eligibility criteria:* Pregnant women were diagnosed with GDM. *Exclude criteria:* Women with a history of systemic underlying diseases (cardiovascular, renal, thyroid, liver, autoimmune and connective tissue disorder), substance abuser, overt diabetes mellitus (except previous history of GDM), multifetal gestations and major fetal malformation. *Sample size: n=112*	**$\bar{x}$ ± SD or n (%)** *Age (year)* 27.23±4.19 *Parity* 2.74 (66.1) *Pre-pregnancy weight (kg^2)* 67.40±10.00 *Gestational length (days)* No statement *Fasting blood* Yes.	*Enrolment time* Gestational age at entry (27.02 ± 0.68 weeks); (Mar 2011 - May 2012) *Length* Follow up until birth. *Methods* Clinic visits *Data collection* A combination of interviews and questionnaires in timing of glycemic screening (24-28 weeks) *Loss to follow-up* 20 (15.15%)	Maternal blood samples were collected at 28-32, 32-36 and 36 weeks of gestational age until delivery time to determine fasting serum levels of lipids (TGs, total cholesterol and HDL-c). LDL-c = TC-HDL-(TG/5), if TG>400mg/dl, it was measured directly in serum.	SGA: birthweight <10th percentile. LGA: birthweight >90th percentile. Macrosomia: >4000 g	7
Whyte et al. 2013	*Study design:* Prospective cohort *Language:* English *Location:* Ireland	*Setting:* The Perinatal day centre of University Maternity practice. *Eligibility criteria:* White European women with an ongoing singleton pregnancy were enrolled when they were referred to the Perinatal day centre for OGTT screening test. *Exclude criteria:* Women who were unable to give informed consent or who were less than 18 years of age were excluded.	**$\bar{x}$ ± SD or n (%)** *Age (year)* 32±5 *Primigravidas* 67(35.4) *Pre-pregnancy BMI (kg/m^2)* No statement *Gestational length (days)* 277±14 *Fasting blood*	*Enrolment time* Gestational age at entry (when women attend OGTT screening test); (Mar 2011) *Length* Follow up until birth. *Methods* Clinic visits *Data collection* Clinical measurements, diagnosis, hospital's	Maternal fasting venous blood sample was obtained to measure the TC, HDL-C, LDL-C and TG when women attend OGTT screening test.	After delivery, birthweight was obtained from the Hospital's computerized database.	5

Study ID	Basic information	Participants	Maternal characteristics	Follow-up	Exposures	Outcomes	Quality score
		Sample size: n=189	Yes.	computerized database. *Loss to follow-up* 0			
Zhou et al.2012	*Study design:* Prospective cohort *Language:* English *Location:* China	*Setting:* Routine obstetric care in the Nanjing drum tower hospital *Eligibility criteria:* Nulliparous pregnant women < 20 weeks gestation visited the antenatal department and had booked to deliver their infants at Nanjing Drum Tower Hospital. *Exclude criteria:* Women with family history of dyslipidemia, chronic diseases that may affect the lipid profile such as hypertension, diabetes mellitus and systemic lupus erythematosus, or used a medication that affected the lipid profile. *Sample size: n=1,000*	**$\bar{x}$ ± SD or n (%)** *Age (year)* 28.6±3.4 *BMI (kg/m^2)* 22.54±2.86 *Gestational length (weeks)* 39.3±1.2 *Fasting blood* Yes.	*Enrolment time* Gestational age at entry (20 gestation week); (Jun 2009 to Jan 2010) *Length* Follow up until birth. *Methods* Clinic visits *Data collection* Clinical measurement and laboratory diagnosis *Loss to follow-up* 15 (1.5%)	Maternal overnight fasting blood at 20 weeks gestation were measured for serum TG, TC, LDL-c and HDL-c. Hypo-HDL-cholesterolemia was defined as fasting serum HDL-C levels below the optimal cut-off value.	Infants with birthweight <10th percentile were classified as SGA based on gestational age and sex adjusted birth weight percentiles, and those with birth weight above 4,000 g were classified as macrosomia.	5
Vrijkotte 2011	*Study design:* Prospective community-based cohort study *Language:* English *Location:* Netherlands	*Setting:* Amsterdam Born Children and their Development (ABCD) study *Eligibility criteria:* All pregnant women living in Amsterdam were invited to enrol in the ABCD study at their first prenatal visit to an obstetric care provider at about the 12th week of gestation. *Exclude criteria:* Women who gave birth to twins, delivered preterm (<37 wks), with known diabetes (pre-existent as well as pregnancy related) , or whose infants had congenital abnormalities were excluded. Women who used lipid-altering medication, such as antiepileptic drugs, steroids, insulin, antidepressants, thyroid hormones, or sleep	**$\bar{x}$ ± SD or n (%)** *Age (year)* 31.0±4.8 *Pre-pregnancy BMI (kg/m^2)* <18.5: 115(4.6%) 18.5-24.9: 1869(74.7%) 25.0-29.9: 388(15.5%) ≥30: 130(5.2%) *Primigravidas* 1412(56.4) *Gestational length (weeks)* 37-40 wks: 1779(71.6%)	*Enrolment time* Gestational age at entry (around 12 gestation week); (Jan 2003 to Mar 2004) *Length* Follow up until 12 months after birth. *Methods* Clinic visits *Data collection* Clinical measurement and laboratory diagnosis *Loss to follow-up* 0	Maternal non-fasting serum samples were taken during routine blood collection for screening purposes after the first prenatal check-up for lipid laboratory measurements (TG and TC).	Birthweight for gestational age SDS was determined based on sex-and partiy-specific standards from the Dutch Perinatal Registry. In the first year, weight and length were measured on average 8 times. Weight, length and BMI were expressed as SDS by using internal sex-specific reference curve from the ABCD study. To further explore postnatal growth, the	7

Study ID	Basic information	Participants	Maternal characteristics	Follow-up	Exposures	Outcomes	Quality score
		medication also were excluded. *Sample size: n=2,502*	41.-43 wks: 707(28.4%) *Fasting blood* No.			amount of accelerated growth was defined as an increase >0.67 SDS between 2 time points (between 1 and 6 months of age)	
Vinod et al. 2011	*Study design:* Ongoing prospective cohort study *Language:* English *Location:* American	*Setting:* University of Michigan Health System *Eligibility criteria:* Eligible participants were 18-45 years of age, between 6 and 10 weeks gestation with a singleton pregnancy, and intended to deliver at the study hospital. *Exclude criteria:* Participants who did not complete the study and delivered a live infant. 1% of women were excluded from any analysis because of missing data. *Sample size: n=143*	**$\bar{x}$ ± SD or n (%)** *Age (year)* ≤30: 79(55.2) >30: 64(44.8) *Pre-pregnancy BMI (kg/m^2)* Normal weight: 72 (50.4) Overweight/Obese: 71 (49.6) *Primigravidas* 54 (37.8) *Gestational length (days)* 274.0 ± 13.2 *Fasting blood* No.	*Enrolment time* Gestational age at entry (6-10 gestation week); (No statement on entry date) *Length* Follow up until birth. *Methods* Clinic visits *Data collection* Interview, Questionnaire, Medical records, Clinical measurement and laboratory diagnosis *Loss to follow-up* (1%)	Maternal non-fasting venous blood were collected at five time points during pregnancy: 6-10, 10-14, 16-20, 22-26 and 32-36 weeks gestation for laboratory lipid measurements (TC, HDL-C, LDL-C and TG)	Infant birthweight was collected at delivery. The residual values from each fit were used to represent the gestational age-adjusted birthweight (aBW).	6
Zawiejska et al. 2008	*Study design:* prospective observational study *Language:* English *Location:* Poland	*Setting:* Department of Obstetrics and Women Diseases for a tertiary-level, specialistic antenatal care. *Eligibility criteria:* GDM diagnosed following WHO criteria, singleton pregnancy, live birth and no fetal malformation suspected during gestation or detected postpartum. *Exclude criteria:* None. *Sample size: n=357*	**Median (min-max)** *Age (year)* 29 (17-48) *Pre-pregnancy BMI (kg/m^2)* 24.2 (16.7-46.1) *Primigravidas* No statement *Gestational length (weeks)* 38 (32-42) *Fasting blood*	*Enrolment time* Gestational age at entry (GDM diagnosis week); (1993 to 2005) *Length* Follow up until birth. *Methods* Clinic visits *Data collection* Clinical measurement and laboratory diagnosis *Loss to follow-up* 0	Maternal overnight fasting blood sample were taken for laboratory lipid assessment (TC, HDL and triglycerides) at their first booking weeks (GDM diagnosis week)	Birth weight and the proportion of LGA (defined as a birth weight >90th percentile for local population after adjusting for gestational age and sex) was studied at the end-point.	5

Study ID	Basic information	Participants	Maternal characteristics	Follow-up	Exposures	Outcomes	Quality score
			Yes.				
Clausen et al.2005	*Study design:* Prospective cohort study *Language:* English *Location:* Norway	*Setting:* Aker Hospital in the Oslo city area *Eligibility criteria:* All pregnant women living in Oslo area were offered an ultrasound investigation at 17-19 weeks of gestation *Exclude criteria:* Pre-gestational diabetes, multiple pregnancies, preterm births, missing medical records, no information on birth weight, lost for follow-up *Sample size: n=2,050*	**$\bar{x}$ ± SD or n (%)** *Age (year)* 29.9±4.4 *The 1st trimester BMI (kg/m²)* 23.0±3.7 *Primigravidas* 1030(50.3) *Gestational length (weeks)* 39.7±1.3 *Fasting blood* Yes	*Enrolment time* Gestational age at entry (17-19th gestation week); (1995-1996) *Length* Follow up until birth. *Methods* Clinic visits *Data collection* Clinical measurement and laboratory diagnosis *Loss to follow-up* 244(10.6%)	Maternal fasting blood samples were drawn at 17-19th gestation weeks for laboratory lipid measurements (TGs, TC, HDL-C, non-HDL-cholesterol).	Macrosomia: birth weight above 4,500 g or a z-score above the 95 percentiles.	7
Mathews et al.2003	*Study design:* Prospective cohort study *Language:* English *Location:* United Kingdom	*Setting:* The geographic catchment area of St Mary's Hospital, Portsmouth, United Kingdom *Eligibility criteria:* White nulliparous women attending their first hospital antenatal clinic were stratified by self-reported smoking status. Simple random selection was carried out within each stratum. *Exclude criteria:* Preterm birth, insufficient blood for assays and still birth *Sample size:* Subjects for birth weight and early pregnancy nutrition analyses: n=798	**$\bar{x}$ ± SD or n (%)** *Age (year)* 25.4±4.9 *Pre-pregnancy BMI (kg/m²)* 23.1± 3.9 *Gestational length (days)* Boys: 280.3±9.9 Girls: 281.3±9.5 *Fasting blood* NS	*Enrolment time* Gestational age at entry (14-17th gestation week, range: 9-20 wk); (May 1994 – Feb 1996) *Length* Follow up until birth *Methods* Clinical visits *Data collection* Questionnaire, Clinic measurement and laboratory diagonosis *Loss to follow-up* 0	Maternal blood samples were obtained from subjects at two time points (early pregnancy: at around 16 gestation week, later pregnancy: at around 28 gestation week) for total cholesterol laboratory analyses	Infants were weighed at delivery to the nearest 5 g on digital scales.	8
Olmos et al.2014	*Study design:* Prospective observational study *Language:* English	*Setting:* Obstetricians *Eligibility criteria:* Women aged 18-42 years with singleton pregnancy, under the care of an Obstetrician of the University Health Care Network, having GDM confirmed recently (<14 days)	**$\bar{x}$ ± SD or n (%)** *Age (year)* Normal weight: 32.7±5.0 Overweight: 32.7±5.3 Obese:	*Enrolment time* Gestational age at entry (after GDM diagnosis week); (Jan 2009 – Jun 2013) *Length* Follow up until birth	Maternal fasting lipid (triglycerides, total cholesterol, HDL-C) level were measured in the 2nd and 3rd trimesters. All lipid	Birth weight z-scores. Macrosomia: a birth weight above 90th percentile, was used, applying to that effect the tables of the Chilean	6

Study ID	Basic information	Participants	Maternal characteristics	Follow-up	Exposures	Outcomes	Quality score
	Location: Chile	by an oral glucose tolerance test (OGTT) test. *Exclude criteria:* Women unable to give informed consent or who were less than 18 years of age were excluded. *Sample size: n=279* Normal weight group: n=128 Overweight group: n=105 Obese group: n=46	32.3±4.7 *Primiparous* No statement *Pre-pregnancy BMI (kg/m^2)* Normal weight: 22.3±1.5 Overweight: 26.1±3.1 Obese: 33.1±2.7 *Gestational length (weeks)* Normal weight: 38.0±1.3 Overweight: 37.7±1.7 Obese: 37.6±1.7 *Fasting blood* Yes.	*Methods* Clinic visits *Data collection* Clinical measurements and diagnosis, and laboratory diagnosis *Loss to follow-up* 0	parameters were calculated as z-scores based on Alvarez paper.	Ministry of Health, in use since 2004.	
Emet et al.2013	*Study design:* Prospective observational study *Language:* English *Location:* Turkey	*Setting:* Antenatal care, *Eligibility criteria:* 1,000 pregnant patients between 17 and 48 years of age were included in this prospective longitudinal and uni-centre study. *Exclude criteria:* Patients with type I-II diabetes mellitus and hypothyroidism, multiple gestations, dyslipoproteinemia were excluded from the study. Also, patients on special diets because of underlying diseases or personal preferences such as gluten or casein-free diets, vegetarian diet, liver or renal failure diet, etc., or patients using medications that effect lipid metabolism were excluded as well. Patients whose pregnancies were	**$\bar{x}$ ± SD or n (%)** *Age (year)* 28.5±5.5 *Parity* 0.94±0.98 *Pre-pregnancy BMI (kg/m^2)* No statement *Gestational length (weeks)* 38.9±1.8 *Fasting blood* Yes	*Enrolment time* Gestational age at entry (<14 gestation week); (Jan 2010 – Dec 2011) *Length* Follow up until birth *Methods* Clinic visits *Data collection* Questionnaire, interview, clinical and laboratory diagnosis *Loss to follow-up* 76(8.68%)	Maternal lipid profile (TG, TC, HDL, LDL) were tested at the first antenatal visit (<14 weeks) and the last trimester (>28 weeks)	Birthweight was recorded. Third month infant weight was also surveyed.	5

Study ID	Basic information	Participants	Maternal characteristics	Follow-up	Exposures	Outcomes	Quality score
		terminated before 24 gestational week, patients who dropped out of routine antenatal and patients who gave birth outside the hospital were also not included in this analysis *Sample size: n=801*					
Liu et al. 2016	*Study design:* Retrospective cohort study *Language:* English *Location:* China	*Setting:* The first affiliated hospital of Sun Yat-sen University *Eligibility criteria:* Singleton pregnant women who underwent a FPG test at the first prenatal care, and delivered in our centre were recruited for the present study. *Exclude criteria:* Pregnant women with overt DM before, pregnancy or treated with insulin during gestation were excluded in the present study *Sample size: n=1,546*	**$\bar{x}$ ± SD** *Age (year)* GDM: 31.85±4.24 NGT: 29.42±3.82 *Primiparous* GDM: 234 (84.7) NGT: 969 (76.2) *Pre-pregnancy BMI (kg/m^2)* GDM: 21.20±3.00 NGT: 20.47±2.60 *Gestational length (days)* GDM: 271.33±11.70 NGT: 273.94±11.91 *Fasting blood* YES.	*Enrolment time* Gestational age at entry (10^{th} -24^{th} gestation week); (Jan - Dec 2013) *Length* Follow up until birth *Methods* Clinic visit *Data collection* Questionnaire, clinical measurements and diagnosis, laboratory diagnosis. *Loss to follow-up* 0	Maternal fasting venous plasma were obtained at the first prenatal visit (24-28 gestational weeks) for the examination of lipid profiles (triglyceride, cholesterol, LDL, HDL)	Neonatal birth weight was measured with a calibrated electronic scale.	7
Brunner et al. 2013	*Study design:* Secondary analyses of RCT study *Language:* English *Location:* German	*Setting:* The Impact of Nutritional Fatty Acid on Infant Adipose Development (INFAT) study, an open-label randomized controlled trial *Eligibility criteria:* Healthy pregnant women with singleton pregnancies and a pre-pregnancy BMI between 18 and 30 kg/m^2 were enrolled and randomly assigned to either an intervention (n=104) or a control group (n=104) from the	**$\bar{x}$ ± SD or n (%)** *Age (year)* 31.8±4.7 *Primiparous* 122(58.5) *Pre-pregnancy BMI (kg/m^2)* 22.3±3.0 *Gestational length (weeks)* 39.6±1.5	*Enrolment time* Gestational age at entry (before 15^{th} gestation week); (No statement on recruitment date) *Length* Follow up until 2 years old. *Methods* Clinic visits *Data collection* Clinic measurement,	Maternal blood was collected at the 32^{nd} week of gestation in the morning after an overnight fast for serum triglycerides laboratory measurement.	The infants were examined at birth (for skinfolds: 3-5 days post-partum), at 6 weeks, 4months, 1 and 2 years post-partum. Birthweight was retrieved from the medical record. Anthropometric measurements of the	7

Study ID	Basic information	Participants	Maternal characteristics	Follow-up	Exposures	Outcomes	Quality score
		15th week of gestation until 4 months post-partum. *Exclude criteria:* None. *Sample size : n=208*	*Fasting blood* YES	medical records, clinic diagnosis, laboratory analyses *Loss to follow-up* 0		infants were taken by trained investigators according to standardized procedures. Skinfolds were measured in triplicate with a Holtain calliper at the left body axis at four sites (triceps, biceps, subscapular and suprailiac) .	
Knopp et al.1992	*Study design:* Prospective observational study *Language:* English *Location:* American	*Setting:* Obstetrical practices at the two main Group Health hospitals in the King County. Subjects participating in this study were prenatal registrants at Group Health Cooperative of Puget Sound (WA), a prepaid health care program that enrols ~10% of the King County population and corresponds closely to census estimates in King County with respect to age, race, and sex, abased on 1970 and 1980 census data. *Eligibility criteria:* 3517 women between 24 and 32 wk of gestation (average 28 wk), of whom 2019 consented to participate. This analyses groups consist of 521 negative screenees chosen randomly from 1,654 subjects in this group and 365 women with positive glucose screening test. Of these women, 264 had GTT^- and 96 had GTT^+ and were designated as having GDM. *Exclude criteria:* Five other GDM subjects treated with insulin were not included in this analysis. *Sample size: n=881* *Negative screenees(NS-): n=521*	**$\bar{x} \pm SD$** *Age (year)* NS^-: 28±5 PS^+: 30±5 GDM: 31±5 *Multipara (%)* NS^-: 53.0 PS^+: 52.4 GDM: 57.3 *Pre-pregnancy BMI (kg/m^2)* No statement *Gestational length* NS^-: 39.8±1.5 PS^+: 39.6±1.6 GDM:39.4±1.5 *Fasting blood* Yes.	*Enrolment time* Gestational age at entry (24^{th} – 32^{nd} gestation week); (Jan 1985 – May 1986) *Length* Follow up until birth *Methods* Clinic visit *Data collection* Medical records, laboratory measurement. *Loss to follow-up* 0	Maternal overnight fasting blood samples collected at between 24^{th} and 32^{nd} gestation was measured by laboratory for plasma triglycerides.	Birthweight was adjusted for differences in gestational age by dividing the observed birth weight by the 50^{th} percentile birth weight for that gestational age, giving a birth-weight ratio.	6

Study ID	Basic information	Participants	Maternal characteristics	Follow-up	Exposures	Outcomes	Quality score
		Positive screenees(PS+): n=264 *GDM: n=96*					
Knopp et al.1985	*Study design:* Prospective observational study *Language:* English *Location:* American	*Setting:* Group Health Cooperative of Puget Sound, a prepaid health program. *Eligibility criteria:* Subjects were identified at 26-28 wk gestation by a prospective random sampling scheme, were invited to participate, and, after consent was given, had anthropomorphic measurements and blood sampled at home at 36 wk gestation by a visiting research nurse. *Exclude criteria:* Women were excluded if they aborted or delivered before 36 wk or had fasted <12 h. women who were not Caucasian, were under 18 yr of age, or had a twin pregnancy were also excluded. *Sample size: n=283*	**$\bar{x}$ ± SD or n (%)** *Age (year)* 28.0±3.8 *Primiparous* 102 (36) *Pre-pregnancy BMI (kg/m^2)* No statement *Gestational length (days)* 283.4±18.6 *Fasting blood* Yes	*Enrolment time* Gestational age at entry (26-28 gestation week); (No statement on recruitment date) *Length* Follow up until birth. *Methods* Clinic visit, home visit *Data collection* Interview, hospital records, clinical and laboratory measurements. *Loss to follow-up* 10 (3.5%)	Maternal fasting blood sampled at home at 36 wk gestation by a visiting research nurse for laboratory lipid measurements (HDL-C, VLDL-C, LDL-C and FFA)	Birth weight data were extracted from hospital records. Birth weight was adjusted for gestational age and expressed as the birth weight ratio as determined from the expected date of confinement by dividing the observed birth weight by the median expected for gestational age using the University of Oregon (sea level) tables.	7
Schaefer-Graf et al.2011	*Study design:* Prospective observational study *Language:* English *Location:* German	*Setting:* Vivantes Medical Center Department of Obstetrics in Berlin *Eligibility criteria:* 1)documented normal 75-g oral glucose tolerance test according to Carpenter and Coustan criteria (5.0/10.0/8.6 mmol/L) with three glucose values in capillary blood using the hexokinase method; 2) accurate gestational age, confirmed by an ultrasound examination before 20 weeks of gestation; 3) singleton pregnancy; 4) absence of identified fetal anomalies; 5) delivery after 34 weeks; 6) signed informed consent *Exclude criteria:* No statement	**$\bar{x}$ ± SD or n (%)** *Age (year)* 30.0±0.4 *Parity* 2.07±0.09 *Pre-pregnancy BMI (kg/m^2)* 25.7± 0.4 *Gestational length* 38.8±0.1 *Fasting blood* Yes	*Enrolment time* Gestational age at entry (No statement on recruitment gestation week); (Aug 2007 – Aug 2008) *Length* Follow-up until 48h after birth *Methods* Hospital stay *Data collection* Laboratory diagnosis. No statement around how did they get maternal baseline information. *Loss to follow-up*	Maternal overnight fast blood samples were taken from a radial vein either on the morning of admission for surgery in cases of primary Caesarean section or at the last visit o the obstetrical clinic, no longer than 1 week before delivery. Serum triacylglycerols, free fatty acids and	Birth weight was obtained shortly after delivery and neonatal skinfold thickness at the flank was measured within 48 h to calculate fat mass. LGA: birthweight <10th percentile. SGA: birthweight >90th percentile. Cord blood samples from one of the umbilical arteries were taken immediately after delivery.	5

Study ID	Basic information	Participants	Maternal characteristics	Follow-up	Exposures	Outcomes	Quality score
		Sample size: n=190		0	cholesterol were measured in laboratory.	Serum glucose, insulin, triacyglycerols, free fatty acids and cholesterol were measured in cord blood.	
Nolan et al.1995	*Study design:* Prospective observational study *Language:* English *Location:* Australia	*Setting:* Obstetric clinic at the Mercy Hospital for Women *Eligibility criteria:* Women with singleton pregnancies had routine 3rd-trimester oral glucose tolerance tests performed and have been included for analyses in this study. *Exclude criteria:* No statement *Sample size: n=388*	**$\bar{x}$ ± SD or n (%)** *Age (year)* 28.4±5.3 *Primiparous* No statement *BMI at wk 20 (kg/m^2)* 24.7±4.2 *Gestational length* No statement *Fasting blood* No.	*Enrolment time* Gestational age at entry (≤20th gestation week); (1991) *Length* Follow up until birth *Methods* clinic visits *Data collection* Clinic records, clinic visits, laboratory measurements *Loss to follow-up* 0	During the morning of the first clinic visit (average sampling time: 12.2±6.2 weeks), all women had non-fasting serum TG and cholesterol measured within their routine antenatal screening blood analyses. TG and cholesterol were assayed by enzymatic colorimetric methods.	Birth weight was record. Birth weight ratio (BWR) for all infants was calculated by dividing the observed birth weight by the 50th percentile birth weight for gestational age.	6
Friis et al.2012	*Study design:* Prospective observational study *Language:* English *Location:* Norway	*Setting:* A subcohort of the STORK study, *Eligibility criteria:* women of Scandinavian heritage (n= 1031) who registered for obstetric care at Oslo University Hospital - Rikshospitalet *Exclude criteria:* Multiple pregnancies, known pre-gestational diabetes, and severe chronic diseases (lung, cardiac, gastrointestinal or renal). *Sample size: n=207*	**$\bar{x}$ ± SD or n (%)** *Age (year)* 31±3.5 *Primiparous* 91(44) *Pre-pregnancy height(cm)/weight (kg^2)* 168/66 *Gestational length* 40.1±1.4 *Fasting blood* Yes	*Enrolment time* Gestational age at entry (14th -16th gestation week); (2001-2008) *Length* Follow up until 4 days postpartum *Methods* Clinic visits *Data collection* Interview, clinic measurements, hospital records *Loss to follow-up*	Maternal fasting blood samples were collected at 30-32th gestation weeks for total cholesterol, HDL, triglycerides, free fatty acids laboratory measurements.	Birthweight	6

Study ID	Basic information	Participants	Maternal characteristics	Follow-up	Exposures	Outcomes	Quality score
				0			
Lei et al.2016	*Study design:* Prospective cohort study *Language:* English *Location:* China	*Setting:* The Department of Obstetrics of Guangdong Women and Children Hospital, Guangzhou, Guangdong Province *Eligibility criteria:* Pregnant women were recruited before 20 gestation wks *Exclude criteria:* Multiple pregnancy, conception by means of gonadotropin ovulation induction or in vitro fertilization, ischemic heart disease, stroke, peripheral vascular disease, dyslipidaemia, diagnosis of diabetes or/and hypertension before the current to participate in the study. *Sample size: n=5,535*	**$\bar{x}$ ± SD or n (%)** *Age (year)* 29.07±5.04 *Primiparous* 3152 (56.95) *Pre-pregnancy BMI (kg/m^2)* 20.87±2.81 *Gestational length* 38.20±2.81 *Fasting blood* Yes.	*Enrolment time* Gestational age at entry (<20th gestation week); (Jan 2012 – Dec 2014) *Length* Follow up until birth *Methods* Clinic visits *Data collection* Laboratory assessment, medical surveillance. *Loss to follow-up* 485 (8.06%)	Maternal fasting venous blood samples were drawn before 20 weeks to assess metabolic profile (TG and HLD-C). High level of TG was defined as ≥3.49 mmol/L (≥75th percentile). Low level of HDL-C was defined as <1.3 mmol/L (<25th percentile)	A newborn was considered SGA or LGA if birth weight as smaller or greater than the estimated 10th/90th percentile for the baby's gender and gestational age according to the Chinese data published before.	6
Kitajima et al.2001	*Study design:* Prospective observational study *Language:* English *Location:* Japan	*Setting:* Nagasaki University Hospital *Eligibility criteria:* Japanese pregnant women who had positive diabetic screen test results (at least 135mg/dl of plasma glucose level at 1 hour after 50-g oral glucose challenge) and a normal 75-g oral GTT. *Exclude criteria:* Women with pregestational or gestational diabetes mellitus were excluded. We also excluded women with hypertensive disorder, thyroid disorder, lupus, and antiphospholipid syndrome. Subjects who delivered before 37 weeks' gestation and cases of foetal congenital malformation or multifetal gestation were also excluded. *Sample size: n=146*	**$\bar{x}$ ± SD or n (%)** *Age (year)* 32±4 *Primiparous* 65(44%) *Pre-pregnancy BMI (kg/m^2)* 21.2±2.7 *Gestational length* 39.0±1.2 *Fasting blood* Yes.	*Enrolment time* Gestational age at entry (24-32 gestation week); (Nov 1992 and Oct 1999) *Length* Follow up until delivery. *Methods* Clinic visits *Data collection* Self-report, clinic measurements and diagnosis *Loss to follow-up* 0	Maternal fasting blood samples were drawn to measure serum *triglyceride*, *free fatty acids* and *total cholesterol* levels at 24-32 gestation week through laboratory measurements. Maternal *hyperlipidaemia* was defined as a value higher than the 75th percentile value of each lipid concentration.	Neonatal birth weight above the 90th percentile of the gender specific Japanese birth weight curve was defined as *LGA*.	6
Mossaye	*Study design:*	*Setting:*	**$\bar{x}$ ± SD**	*Enrolment time*	Maternal blood	Macrosomia was defined	5

Study ID	Basic information	Participants	Maternal characteristics	Follow-up	Exposures	Outcomes	Quality score
bi et al. 2014	Cohort study *Language:* English *Location:* Iran	The prenatal clinic of the Shahid Akbar Abadi Hospital *Eligibility criteria:* All women were generally healthy pregnant women carrying a single foetus, between 25 weeks and 32 weeks of their gestational age, BMI between 17.5 kg/m2 and 29 kg/m,2 without a history of diabetes prior to or during previous pregnancies and with a negative result from the diabetes screening test in the current pregnancy, hypertensive disease and preeclampsia, thyroid diseases, lupus, antiphospholipid antibody syndrome, and other collagen vascular diseases. *Exclude criteria:* Exclusion criteria were preterm labour prior to 37 weeks of gestational age and any abnormality or disorder in the foetus or neonate. *Sample size: n=154*	*Age (year)* 26.6±5.17 *Parity* 1.7±0.79 *Pre-pregnancy BMI (kg/m^2)* 22.6±2.3 *Gestational length* No statement *Fasting blood* Yes.	Gestational age at entry (25-32th gestation week); (2010-2011) *Length* Follow up until birth *Methods* Clinic visits *Data collection* Clinic measurement and diagnosis. Laboratory measurements. *Loss to follow-up* 16 (8%)	sample for checking fasting triglyceride (TG), total cholesterol, low-density lipoprotein (LDL), and high-density lipoprotein (HDL) after 10-12 hours of fasting at 25-32th gestation week. (gestational age at the time of blood sampling: 30±2.1)	as neonate birth weight higher than 4000 g. LGA was defined as neonate's birth weight higher than 3412 g for infants at 38 weeks of gestational age, 3622 g for infants at 39 weeks of gestational age, 3798 g for infants at 40 weeks of gestational age, and 3930 g for infants at 41 weeks of gestational age. This definition was according to the neonates' weight higher than 75% of their predicted value according to their gestational age.	
Geraghty et al. 2016	*Study design:* Secondary analyses of RCT study *Language:* English *Location:* Ireland	*Setting:* Randomised cOntrol trial of Low glycaemic index diet vs no dietary intervention in pregnancy to prevent recurrence of a large baby (ROLO) study, which was carried out in The National Maternity Hospital, Dublin, Ireland. *Original study:* Eight hundred secundigravida women who did not have gestational diabetes but had previously given birth to a macrosomic baby (birth weight equal to or above 4.0 kg), and were therefore at increased risk of delivering another macrosomic infant, were randomised to receive low glycaemic index (GI) dietary advice or usual antenatal care,	**$\bar{x}$ ± SD or n (%)** *Age (year)* 33.10±3.90 *BMI at 14 weeks' gestation(kg/m^2)* 26.40±4.60 *Gestational length (days)* 282.80±7.50 *Fasting blood* Yes	*Enrolment time* Gestational age at entry (<14th gestation week); (No statement on recruitment time) *Length* Follow up until 2 years old. *Methods* Clinic visits and follow-up appointments *Data collection* Clinic measurements, laboratory measurements. *Loss to follow-up* 0	Maternal fasting blood samples were taken in early pregnancy (approximately 14th gestation weeks) and late pregnancy (28th gestation weeks) for serum total cholesterol, HDL-C and triglyceride laboratory measurements. LDL-C concentration was	Infants were measured at birth, 6 months and 2 years of age for weight and recumbent length along with abdominal circumference and bicep, tricep, subscapular and thigh skinfold thicknesses.	7

Study ID	Basic information	Participants	Maternal characteristics	Follow-up	Exposures	Outcomes	Quality score
		which did not include dietary advice. *Eligibility criteria:* No statement. *Exclude criteria:* No statement. *Sample size : n=331*			estimated using the Friedewald equation.		
Jin et al.2016	*Study design:* Cohort study *Language:* English *Location:* China	*Setting:* Women's Hospital, Zhejiang University School of Medicine *Eligibility criteria:* 1) pregnant at 28–37 gestational weeks; 2) had integrated medical records and clear gestational age; 3) singleton pregnancy; and 4) naturally conceived. Inclusion criteria for newborns were singleton and 5-min-postpartum Apgar scores ≥ 7. *Exclude criteria:* 1) multiple pregnancy; 2) had diabetes mellitus, chromosomal abnormalities, inherited metabolic diseases or thyroid diseases before pregnancy; 3) experienced serious infection during early pregnancy; and 4) conceived with assisted reproductive techniques. Exclusion criteria for newborns were chromosomal abnormalities, inherited metabolic diseases and congenital abnormalities. *Sample size: n=934*	**$\bar{x}$ ± SD or n (%)** *Age (year)* 29.21±3.76 *Primiparous* 778(83.3%) *Pre-pregnancy BMI (kg/m^2)* 20.66±2.70 *Gestational length* 38.84±1.22 *Fasting blood* Yes.	*Enrolment time* Gestational age at entry (7-10th gestation week); (30 Jun 2010 - 30 Jun 2011) *Length* Follow up until birth. *Methods* Clinic visits *Data collection* Questionnaire, medical records, laboratory measurements and diagnosis *Loss to follow-up* 0	Maternal venous blood samples were taken after overnight fasting from all the participants at the first (7–10 gestational weeks), second (21–24 gestational weeks) and third (33–37 gestational weeks) trimester of pregnancy. Every sample was assayed for TC, TG, HDL-C and LDL-C concentrations through laboratory.	Newborns were classified into appropriate for gestational age (AGA), SGA and LGA based on Neonatal Birth Weight for Gestational Age and Percentile in 15 Cities of China. *LGA:* birth weight above the 90th percentile. *SGA:* birth weight below the 10th percentile for gestational age. *AGA:* birthweight between LGA and SGA. According to the birth weight, neonates could be stratified into low birth weight (<2500 g), normal birth weight (2500–4000 g) and macrosomia (>4000 g) groups.	7
Tian et al. 2013	*Study design:* Prospective observational study	*Setting:* No statement *Eligibility criteria:* Maternal and neonatal characteristics were investigated between 2581 newborns with	No statement	No statement	Hypertriglyceridemia and hypercholesterolemia was diagnosed according to the	Macrosomia	Not applicable

Study ID	Basic information	Participants	Maternal characteristics	Follow-up	Exposures	Outcomes	Quality score
	Language: English *Location:* China	normal birth weight (controls,2500-3999g) and 306 macrosomia (birth weight over 4000g). *Exclude criteria:* Pregnancy with twins, premature labour and other complications were all excluded. *Sample size: No statement*			criteria of Hyperlipidaemia of National Cholesterol Education Program.		
Couch et al.1998	*Study design:* Perspective observational study *Language:* English *Location:* American	*Setting:* The Department of Obstetrics and Gynaecology, Hartford Hospital, Hartford, Connecticut, and private physicians' offices affiliated with Hartford Hospital *Eligibility criteria:* Women with GDM and healthy pregnant women with a negative diabetes screening test were recruited. *Exclude criteria:* Women with hypertension, hyperlipidaemia, renal or liver disease, heart disease, thyroid disorder, multiple gestations or parity >5 were excluded from the study. *Sample size: n=40*	**$\bar{x}$ ± SD or n (%)** *Age (year)* GDM: 31.6±2.7 Controls:30.6±3.2 *Primiparous* GDM: 8 (40%) Controls: 8 (40%) *Maternal BMI (kg/m^2)* GDM:25.4±4.6 Controls:23.7±3.8 *Gestational length* GDM:38.3±1.7 Controls:37.6±2.2 *Fasting blood* Yes.	*Enrolment time* Gestational age at entry (26-30th gestation week); (No statement on recruited time) *Length* Follow up until delivery *Methods* No statement *Data collection* Clinic diagnosis, clinic records. *Loss to follow-up* 0(0%)	Maternal plasma samples were collected between 37-38 gestation weeks and analysed for TC, HDL, LDL, VLDL and FFA	Cord vein samples were analysed for TC, HDL, LDL, VLDL and TG.	6
Ortega et al.1996	*Study design:* Cohort study *Language:* English *Location:* Spain	*Setting:* The INSALUD hospitals *Eligibility criteria:* Pregnant women carrying only a single child with no congenital malformations at 37 or more weeks of gestation. Participants without registered maternal disease (either before or during pregnancy), vaginal bleeding, blood pressure over 140/90 mm Hg, protein or glucose in the urine, pregnancy-related immunization and drug or alcohol abuse. *Exclude criteria:*	**$\bar{x}$ ± SD or n (%)** *Age (year)* 28.6±5.4 *Primiparous* NS *Pre-pregnancy BMI (kg/m^2)* NS *Gestational length* 39.6±1.3 *Fasting blood* Yes.	*Enrolment time* Gestational age at entry (32-35th gestation week); (October – December 1988) *Length* Follow up until delivery *Methods* Clinic visit *Data collection* Clinic diagnosis, obstetric case notes *Loss to follow-up* 0(0%)	Venous blood was collected at 32-35 gestation weeks after overnight fasting. TC, HDL-C, LDL-C, VLDL-C and triglycerides were measured by laboratory.	Birthweight was measured using a Marsden spring balance. Cord arteriovenous blood was obtained immediately after clamping and before delivery of the placenta. Blood samples were analysed for a series of lipid parameters (TC, HDL-C, LDL-C VLDL-C and triglycerides).	6

Study ID	Basic information	Participants	Maternal characteristics	Follow-up	Exposures	Outcomes	Quality score
		None. *Sample size: n=292*					
Alberti-Fidanza, et al.1995	*Study design:* Perspective observational study *Language:* English *Location:* Italy	*Setting:* Three towns in the Perugia area (Gubbio, Perugia and Umbertide) *Eligibility criteria:* Volunteer pregnant women attending the Maternity Advisory Service were recruited at the 1st trimester. *Exclude criteria:* Women and newborns in pathological conditions were not included. *Sample size: n=70* For our interested association, the number of participants is 21.	No statement	*Enrolment time* Gestational age at entry (1st trimester); (No statement on recruited time) *Length* Follow up until 6 months post-partum *Methods* Clinic visits *Data collection* Laboratory measurements, clinic records, *Loss to follow-up* 49(70%)	At the 1st, 2nd and 3rd trimester of pregnancy and at delivery, maternal venous blood was obtained for lipids assessments (TC, TG, HDL-C)	Mixed venous-arterial cord blood was obtained at delivery for TC, TG HDL-C measurements.	5
Brockerhoff. 1986	*Study design:* Perspective observational study *Language:* Germany *Location:* German	*Setting:* Obstetrics *Eligibility criteria:* No statement *Exclude criteria:* No statement *Sample size: n=112*	No statement	No statement	Maternal blood was taken at 16th gestation week for VLDL-C, LDL-C and HDL-C assessments.	Cord blood was obtained at delivery for TC and TG assessments.	
Robin et al. 2007	*Study design:* Retrospective cohort study *Language:* English *Location:* American	*Setting:* Hospital closest to the Greenwood Genetic Centre(GGC) in Greenwood, South Carolina *Eligibility criteria:* All women who were consecutively screened between 13 and 23 weeks' gestation during 1996-2001. Women who delivered at the hospital closest to GGC	**$\bar{x}$ ± SD or n (%)** *Age (year)* NS *Primiparous* NS *Pre-pregnancy BMI (kg/m^2)* NS *Gestational length*	*Enrolment time* Gestational age at entry (No statement); (1996-2001) *Length* Follow up until delivery *Methods* Clinic visits *Data collection*	Maternal serum was taken between 13 and 23 weeks' gestation (mean:17.5 weeks, SD: 1.5 weeks) during 1996-2001. Frozen sera(-80˚C)	Birthweight.	7

Study ID	Basic information	Participants	Maternal characteristics	Follow-up	Exposures	Outcomes	Quality score
		Exclude criteria: 1) Age<21 or >34 years old; 2) positive smoking history; 3) not dated by ultrasound 4) pregestational diabetes 5) twin gestation 6) race/ethnicity Hispanic, Asian, or Other 7) preeclamptic pregnancies 8) cardiac malformation 9) missing or conflicting data 10) foetal death 11) >1 eligible pregnancy to same mother 12) delivery before 37 gestation week *Sample size:* Low-TC group:100 Mid-TC group: 757 High-TC group:100	NS *Fasting blood* NS	Laboratory measurements, NIH clinical records, *Loss to follow-up* 47(9.9%) for low-TC group; 233(7.4%) for higher-TC group	were shipped on dry ice from GGC to the NIH. TC in serum was analysed in laboratory.		
Charles et al. 2016	*Study design:* Perspective longitudinal study *Language:* English *Location:* Tunisia, Spain, Serbia, Malta, Italy and Greece	*Setting:* Some centres (e.g. Malta) recruiting from a general population and others (eg. Greece and Italy) recruiting from an obstetric referral centre. *Eligibility criteria:* Pregnant Mediterranean women recruited in centres in Tunisia(n=112), Spain(n=187), Serbia(n=126), Malta(n=309), Italy(n=140), and Greece(n=178) who were not known to suffer from any form of carbohydrate metabolism problems outside their pregnancy (type 1 diabetes(T1DM), type 2 diabetes(T2DM), LADA, or MODY). *Exclude criteria:* None. *Sample size: n=1062*	**$\bar{x}$ ± SD or n (%)** *Age (year)* 31.3±5.4 *Primiparous* NS *Maternal prepregnancy BMI (kg/m^2)* 24.9±5.3 *Gestational length* 38.4±2.8 *Fasting blood* Yes.	*Enrolment time* Gestational age at entry (27.9±2.3); (No statement on recruited time) *Length* Follow up until delivery *Methods* No statement *Data collection* Laboratory measurements, clinic records *Loss to follow-up* 0	Maternal fasting lipid profile levels were assayed at the time of the OGTT. Cholesterol, HDL-C, LDL-C and triglycerides were measured.	Birthweight.	5

S5 Appendix Results extraction form

Study ID		Maternal lipids					Statistical Methods
		TC	HDL-C	LDL-C	TG	FFAs	
Ye et al. 2015	$\bar{x}$ ± SD (mmol/L)	6.6 ± 1.4	2.4 ± 0.5	3.3 ± 0.8	2.9 ± 1.2	—	Statistical software: SPSS 16.0 Two tailed statistical tests and a significant p value ＜ 0.05.
	Birth weight (g) (β, 95% CI)	9.1 (-6.4, 24.6)	-69.5 (-110, -28.2)	35.4 (10.1, 60.8)	25.2 (7.9, 42.6)	—	Multiple linear regression analysis adjusted for maternal glucose, maternal age, pre-pregnancy BMI, gestational weight gain, parity, neonatal sex and gestational age at delivery.
	SGA(n=39) (OR, 95% CI)	0.94 (0.74, 1.20)	1.57 (0.87, 2.83)	0.75 (0.50, 1.14)	0.69 (0.47, 1.03)	—	Logistic regression analysis adjusted for maternal age, pre-pregnancy BMI, gestational weight gain, parity and maternal fasting blood glucose.
	AGA(n=873)	1.00 (ref)	1.00 (ref)	1.00 (ref)	1.00 (ref)	—	
	LGA(n=331) (OR, 95% CI)	1.04 (0.94, 1.15)	0.62 (0.47, 0.82)	1.25 (1.06, 1.47)	1.15 (1.03, 1.27)	—	
Wang et al. 2015	Non-GDM (mmol/L) (Median, 25^{th}-75^{th})	ND	1.88 (1.65 – 2.12)	ND	1.95 (1.59 - 2.42)	—	Statistical software: SPSS 17.0 A significant p value ＜ 0.05.
	GDM (mmol/L) (Median, 25^{th}-75^{th})	ND	1.81 (1.50 – 2.09)	ND	2.18 (1.84 – 2.82)	—	
	Birthweight (r, p)	ND	-0.12, p=0.01	ND	0.19, p＜0.01	—	Partial correlation coefficients analysis adjusted for neonates' sex and gestational age.
Crume et al. 2015	1^{st} visit (11-20 week) ($\bar{x}$ ± SD, mg/dL)	182.3±35.6	61.1±12.6	—	124.3±49.6	373.1±166.0	Statistical software: No statement
	2^{nd} visit(20-34 week) ($\bar{x}$ ± SD, mg/dL)	209.9±40.3	63.1±13.1	—	162.2±62.1	365.1±151.4	
	P value	<0.0001	<0.0001	—	<0.0001	0.3	
	11-20 wk gestation						
	Birth weight (β± SE, g, P) Model 1	0.46±0.39 P=0.2	-0.54±1.17 P=0.6	—	0.09±0.30 P=0.7	0.06±0.09 P=0.5	Regression analyses were performed to determine the association of maternal metabolic fuels and metabolic measures measured at each visit with neonatal outcomes. Model 1 adjusted for the residual value of the predictor from the other visit, infant sex, gestational age at birth, maternal age, race/ethnicity, parity postnatal age at time of PEAPOD (for outcomes other than birth weight). Model 2 is model 1 plus maternal smoking, total energy intake, and maternal physical activity during pregnancy, gestational weight gain. Model 3 is model 2 plus pre-pregnancy BMI
	Birth weight (β± SE, g, P) Model 2	0.42±0.42 P=0.3	-2.67±1.22 P=0.03	—	0.50±0.24 P=0.04	0.05±0.09 P=0.6	
	Birth weight (β± SE, g, P) Model 3	0.44±0.41 P=0.3	-1.71±1.23 P=0.2	—	0.41±0.24 P=0.08	-0.11±0.10 P=0.2	
	20-34 wk gestation						
	Birth weight ($\bar{x}$ ± SE, g, β, P) Model 1	ND	-1.12±1.12 P=0.3	—	0.20±0.24 P=0.4	0.21±0.10 P=0.03	
	Birth weight ($\bar{x}$ ± SE, g, β, P) Model 2	ND	-3.12±1.16 P=0.07	—	0.39±0.24 P=0.1	0.31±0.11 P=0.003	

Study ID		Maternal lipids					Statistical Methods
		TC	HDL-C	LDL-C	TG	FFAs	
	Model 3	ND	-2.20±1.16 P=0.06	—	0.30±0.24 P=0.2	0.24±0.10 P=0.02	
	The modification of effects of maternal cholesterol levels in late pregnancy on all neonatal body composition measures by pre-pregnancy BMI was reported in this study. A positive effect was noted for all neonatal outcomes (Birthweight, Fat mass, Fat free mass, Percent Fat mass) at higher pre-pregnancy BMIs, with a null effect for lean women and an inverse relationship on FM for underweight women. However, no β and P value around those associations was reported. This study also reported that their findings were not influenced by the exclusion of women identified with GDM (n=26), gestational hypertension (n=61), or pre-eclampsia (n=34).						
Hwang et al. 2015	15-28 wks ($\bar{x}$ ± SD, mg/dL)	—	—	—	143.4±68.5	—	Statistical software: SAS 9.3
	29-42 wks ($\bar{x}$ ± SD, mg/dL)	—	—	—	273.4±123.3	—	Statistical significance was defined as P<0.05.
	Birth weight (g), β(s.e.), p, R (%)						Maternal serum TG levels was log-transformed before analyses due to its skewed distribution. Multiple regression analysis adjusted for maternal age, weight gain during pregnancy, log-transformed urinary cotinine, gestational age, gestational age at blood collection, neonatal gender and long-transformed calorie intake.
	15-28 wks	—	—	—	80.446 (31.738) P=0.0015, R=22.4	—	
	29-42 wks	—	—	—	131.067 (31.242) P<0.0001, R=19.8	—	
Kulkarni et al. 2013	18 wks ($\bar{x}$±SD,mmol/L)	4.11 ± 0.85	1.12 ± 0.28	—	1.09 ± 0.36	—	Statistical software: STATA version 11.2
	28 wks ($\bar{x}$±SD,mmol/L)	4.80 ± 0.89	4.80 ± 0.89	—	1.51 ± 0.52	—	
	Birthweight (g): Model 0 (β，95% CI)						Model 0: Multiple regression analyses was performed to explore the association of z-standardized maternal plasma glucose and lipid concentrations with neonatal measurements, adjusting for gestation at the time of measurements, sex, SES, parity, maternal age, maternal BMI before pregnancy and total energy intake at the time of measurements.
	18 wks	39.07 (10.57, 67.58)	17.57 (-11.64, 46.77)	—	14.76 (-13.34 , 42.86)	—	
	28 wks	54.34 (24.85,83.88)	-8.89 (-38.72 ,20.95)	—	36.27 (4.32,68.23)	—	
	Birthweight (g): multivariate analyses (β，95% CI)						Multiple analyses adjusted for gestation, sex of the baby, parity, SES, and maternal age, BMI before pregnancy, total energy intake at the time of measurements and other lipid levels. Model 1 entered with maternal fasting glucose. Model 2 entered with maternal 2-h glucose
	18 wks: model 1	33.42 (0.43,66.41)	6.68 (-24.08, 37.44)	—	4.24 (-26.40, 34.87)	—	
	28 wks: model 1	52.52 (19.11,85.92)	-21.58 (-52.62, 9.46)	—	23.93 (-11.29, 59.15)	—	
	28 wks: model 2	44.42 (8.55,80.29)	-20.29 (-52.73, 12.14)	—	12.90 (-24.25, 50.06)	—	
Vrijkot	SGA (n=364)	4.97 ± 0.86	—	—	1.35 ± 0.61	—	Statistical software: SPSS 16.0 and the statistical package R

Study ID		Maternal lipids					Statistical Methods
		TC	HDL-C	LDL-C	TG	FFAs	
te et al. 2012	($\bar{x}$ ± SD, mmol/L)						2.13.1
	Non-SGA (n=3548) ($\bar{x}$ ± SD, mmol/L)	4.99 ± 0.87	—	—	1.33 ± 0.54	—	A P value <0.05 was considered statistically significant.
	LGA (n=364) ($\bar{x}$ ± SD, mmol/L)	5.06 ± 0.91	—	—	1.44 ± 0.61	—	
	Non-LGA (n=3548) ($\bar{x}$ ± SD, mmol/L)	4.98 ± 0.86	—	—	1.32 ± 0.54	—	
	Crude model						
	SGA (OR, 95% CI)	0.97 (0.85-1.10)	—	—	1.06 (0.87-1.29)	—	Crude model: unadjusted associations between continuous TC and TG and the outcomes.
	LGA (OR, 95% CI)	1.10 (0.97-1.25)	—	—	1.44 (1.20-1.71)	—	
	Model 1						
	SGA (OR, 95% CI)	0.98 (0.86-1.12)	—	—	0.97 (0.79-1.19)	—	Model 1 is multiple logistic regressions adjusted for maternal age, ethnicity, pre-pregnancy BMI, maternal education level, physical activity, smoking during pregnancy, and chronic hypertension.
	LGA (OR, 95% CI)	1.08 (0.95-1.22)	—	—	1.48 (1.23-1.78)	—	
Retnakaran et al. 2012	$\bar{x}$ ± *SD, mmol/L*						
	Lowest tertile birth weight infant [2020-3260 g] (n=156)	6.48 ± 1.25	1.73 ± 0.36	3.72 ± 1.17	2.25 ± 0.72	—	Statistical software: SAS 9.2
	Middle tertile birth weight infant [3260-3670 g] (n=157)	6.55 ± 1.23	1.72 ± 0.37	3.72 ± 1.12	2.46 ± 0.75	—	
	Highest tertile birth weight infant [3670-5700 g] (n=159)	6.39 ± 1.15	1.66 ± 0.34	3.6 ± 1.04	2.49 ± 0.66	—	
	p	0.5	0.2	0.5	0.006		Analysis of variance for continuous variables
	Birth weight (g, β,95 %CI)						Multiple linear regression adjusted for length of gestation, infant sex, maternal demographic factors (age, ethnicity, family history of diabetes), smoking status, anthropometric measure (pre-pregnancy BMI, weight gain during pregnancy up to the time of OGTT), glucose tolerance status, other lipid levels, insulin, adipokines (adiponectin, leptin) and inflammatory proteins (C-reactive protein)
	Crude	ND	-120.54 (-244.42 to 3.35)	-15.22 (-55.49 to 25.05)	61.11 (-1.18 to 123.40)	—	
	Adjusted	ND	-57.16 (-189.42 to 75.09)	-6.79 (-46.98 to 33.39)	-1.59 (-70.67 to 67.49)	—	
	LGA (OR, 95% CI)						

Study ID		Maternal lipids					Statistical Methods
		TC	HDL-C	LDL-C	TG	FFAs	
	Crude	ND	0.89 (0.69 - 1.15)	0.80 (0.61 - 1.05)	1.26 (0.98 - 1.62)	—	Logistic regression analysis adjusted the same covariate as in the multiple linear regression analyses, except for length of gestation and infant sex.
	Adjusted	ND	0.99 (0.70 - 1.39)	0.98 (0.72 - 1.34)	0.98 (0.70 - 1.38)	—	
	White women LGA (OR, 95% CI) (n=388)						
	Crude	ND	0.82 (0.60 - 1.10)	0.85 (0.62 - 1.16)	1.33 (1.00 - 1.77)	—	
	Adjusted	ND	1.03 (0.69 - 1.52)	0.98 (0.69 - 1.38)	1.07 (0.73 – 1.58)	—	Same statistical methods used in the LGA analyses.
Hou et al. 2014	Mmol/L (median, 25th-75th)	6.28 (5.59-7.09)	1.75 (1.51-2.03)	3.06 (2.44-3.72)	3.05 (2.50-3.75)	—	Statistical software: SPSS 16.0 P<0.05 was considered statistically significant.
	AGA(n=2236)	6.30 (5.62-7.10)	1.76 (1.52-2.05)	3.07 (2.47-3.74)	3.02 (2.48-3.69)	—	Mann-whitney U test
	LGA(n=554)	6.18 (5.49-7.04)	1.70 (1.48-1.95)	2.95 (2.30-3.65)	3.19 (2.61-3.97)	—	
	p	0.017	0.000	0.003	0.000	—	
	Outcome: LGA, (OR, 95% CI)						
	Lowest tertile value	Ref	0.202 (0.026-1.562)	Ref	Ref	—	Binary logistic regression analyses adjusted for maternal age, pre-pregnancy BMI, education level, smoking, annual household income, amniotic fluid volume, gestational hypertension, new-born sex, and gestational age at blood collection.
	Middle teritle value	0.967 (0.712-1.313)	Ref	0.785 (0.58-1.063)	3.037 (1.054-8.747)	—	
	Highest tertile value	1.084 (0.754-1.559)	0.812 (0.636-1.036)	0.829 (0.585-1.173)	3.303 (1.177-9.27)	—	The middle teritle value of maternal TC, HDL-C, LDL-C, TG and FFAs are 5.18-6.22, 1.04-1.55, 3.37-4.14 and 1.70-2.25.
Kramer et al. 2014	*Infant weight gain at 3 months (β,p)*						Statistical software: SAS 9.2 The unit of maternal lipid levels: mmol/L
	GDM group	-26.3,0.57	-150.6, 0.40	-11.7, 0.81	-43.3, 0.62	—	Multiple linear regression analyses adjusted for infant age at 3-month visit, sex duration of exclusive breastfeeding, maternal and paternal ethnicity, birthweight and length of gestation.
	Non GDM group	37.0, 0.32	28.6, 0.80	43.5, 0.28	-14.2, 0.82	—	
Harmon et al. 2011	Mean ± SEM				mg/dL	μEq/L	
	Normal weight Early	—	—	—	85 ± 5.6	366 ± 52	
	Normal weight Late	—	—	—	—	326 ± 29	Statistical software: Sigama Stat for Windows version 2.03
	Obese Early	—	—	—	152 ± 14.3	535 ± 55	
	Obese Late	—	—	—	—	547 ± 58	
	None of the metabolic measures correlated with birth weight (data not shown).						A forward stepwise regression was used to generate models between infant adiposity and maternal metabolic parameters.

Study ID		Maternal lipids					Statistical Methods
		TC	HDL-C	LDL-C	TG	FFAs	
Son et al. 2010		Mean ± SD	Mean ± SD		Median (IQR)		Statistical software: SPSS 12.0 (SPSS Inc., Chicago, IL, USA)
	mmol/L	5.7 ± 1.1	1.7 ± 0.4	ND	2.5 (1.8-3.4)	—	p-value < 0.05 was considered significant.
	Non-LGA	5.8 ± 1.1	1.7 ± 0.5	ND	2.3 (1.8-3.1)	—	Differences between non-LGA group and LGA group were analysed using Student's t-test
	LGA	5.5 ± 0.9	1.6 ± 0.3	ND	3.2 (2.4-3.6)	—	
	p	0.352	0.232	ND	0.001	—	
	Birthweight (g, r, p)	p>0.05	p>0.05	ND	r = 0.17 p = 0.07	—	Statistical Method was not stated.
	LGA (OR, 95% CI)	ND	ND	ND	Hypertriglyceridemia (TG≥3.33 mmol/L) 4.43 (1.33-14.82)	—	Logistic regression model with confounding variables, including parity, age, prepregnancy BMI, gestational weight gain.
Ahmad et al. 2006	Birthweight ratio (g, r ,p)	r = 0.147 p = 0.021	—	—	r = 0.122 p = 0.057	—	Birthweight ratio: birthweight adjusted for gestational age. Statistical software: SPSS 11.0. α=0.05, p<0.05 Univariate analysis.
	LGA (crude OR, 95% CI)	ND	—	—	High TG (>2.78 mmol/L) 3.07 (1.33, 7.08)	—	χ^2 test.
	LGA (adjusted OR, 95% CI)	ND	—	—	1.476 (1.15-1.93)	—	Backward wald mode in binary logistic regression. Adjusted for BMI, fasting plasma glucose and 2 hours postprandial plasma glucose.
Di et al. 2005	mmol/L ($\bar{x}$ ± SD)	6.34 ±1.3	1.68 ±0.4	4.01 ±1	1.99 ±0.64	—	Statistical software: SAS
	birthweight (g, r^2, p)	ND	ND	ND	r^2=0.09 p<0.05	—	Univariate regression analyses.
	LGA (crude OR, 95%CI)	ND	ND	ND	Hypertriglyceridemia (TG≥2.3 mmol/L) 5.6(0.93, 33.77)	—	χ^2 test.
Schaefer-Graf et al. 2008		mg/dL			mg/dL	μmol/L	Statistical software: SPSS 12.0 (Chicago, IL)
	$\bar{x}$ ± SD	253.7±55.6	—	—	265.9±87.6	262.6±112.4	All statistical tests were two-tailed and a P value <0.05 was considered significant.
	Week 28,32,36 Outcomes	ND	—	—	ND	ND	
	Close to delivery (r, p)						Bivariate correlation applying Spearman's correlation test

Study ID		Maternal lipids					Statistical Methods
		TC	HDL-C	LDL-C	TG	FFAs	
	birthweight	ND	—	—	p>0.05	0.27, p=0.002	
	TGs in cord blood	ND	—	—	0.19, p=0.003	ND	
	FFAs in cord blood	ND	—	—	ND	0.28, p=0.004	
	After adjustment for maternal pre-pregnancy BMI, weight gain, age parity, fasting and postprandial glucose from the profiles at 36 weeks and close to delivery, only maternal FFAs and TGs remained independently related to LGA (adjusted p= 0.008 and p=0.04, respectively). Maternal FFA levels were significantly higher in mothers with LGA infants than in mothers with AGA infants (362.8 ±101.7 vs. 252.4 ± 10.1 μmol/L, p=0.002)						Logistic regression analysis
Swierzewska et al. 2015	No statistically significant correlation of lipid metabolism parameters with neonatal birth weight in the GDM and NGT group was found (data not shown).						Statistical software: PQStat software. P value <0.5 was considered statistically significant. Multivariate linear regression for numerical factors and multivariate logistic regression were performed to assess the influence of the factors affecting neonatal birth weight.
Sommer et al. 2015	mmol/L($\bar{x}$ ± SD)						Statistical software: IBM SPSS Statistics21， lincom command in Stata IC 12
	Visit 1	5.0 ± 0.9	1.73 ± 0.39	2.71 ± 0.73	1.31 ± 0.55	—	
	Visit 2	6.2 ± 1.1	1.93 ± 0.45	3.44 ± 0.99	1.98 ± 0.69	—	
	Birthweight (g)						Data were provided by authors through email.
	Model 0 (β, 95%CI)	-4.2 (-39.4, 31.0)	-98.9 (-188.1, -9.6)	ND	48.8 (-14.8, 112.4)	—	Model 0 is simple regression analyses.
	Model 1 (β, 95%CI)	-6.1 (-37.5, 25.2)	-105.4 (-183.8, -27.0)	ND	94.4 (37.8, 150.9)	—	Model 1 is a multiple regression of the risk factor variables entered separately, adjusted for gestational week at inclusion, maternal age, parity, smoking status ethnic origin, offspring's sex and gestational age.
	Model 2(β, 95%CI)	-4.8 (-34.0, 24.4)	-118.8 (-190.1, -47.5)	ND	85.4 (37.0, 133.7)	—	
	Model 3(β, 95%CI)	-115.4 (-306.6, 75.8)	47.6 (-160.3, 255.6)	ND	97.4 (-3.8, 198.6)	—	Model 2 = Model 1 + early pregnancy BMI + weight gain.
	Model 4(β, 95%CI)	-74.9 (-260.1, 110.2)	-21.9 (-223.9, 180.2)	ND	83.4 (-14.6, 181.5)	—	
	Sum of skinfolds (mm)						Model 3: (risk variables are entered simultaneously into the regression, and adjusted for fasting glucose and 2-hour glucose, maternal age, gestational week, parity, ethnicity, smoking status, offspring's sex and gestational age)
	Model 0 (β, 95%CI)	0.17 (-0.14, 0.48)	-0.521 (-1.312, 0.270)	ND	0.583 (0.015, 1.151)	—	
	Model 1 (β, 95%CI)	0.10 (-0.21,0.40)	-0.608 (-1.381, 0.164)	ND	0.839 (0.280, 1.397)	—	Model 4 = Model 3 + early pregnancy BMI + weight gain.
	Model 2(β, 95%CI)	0.13 (-0.17,0.42)	-0.611 (-1.321, 0.099)	ND	0.724 (0.245, 1.202)	—	
	Model 3(β, 95%CI)	-0.71 (-2.37, 0.95)	0.433 (-1.412, 2.279)	ND	0.623 (-0.308, 1.553)	—	

Study ID		Maternal lipids					Statistical Methods
		TC	HDL-C	LDL-C	TG	FFAs	
	Model 4(β, 95%CI)	-0.44 (-2.08, 1.20)	-0.022 (-1.851, 1.808)	ND	0.577 (-0.341, 1.494)	—	
Slagjana et al. 2014	mmol/L ($\bar{x}$ ± SD)						Statistical software: SPSS 14.0
	LGA (n=50)	6.0±1.0	1.3±0.4	3.8±1.0	3.8±1.8	—	P<0.05 was considered statistically significant.
	AGA (n=135)	6.5±1.4	1.6±0.4	3.5±1.2	3.1±1.1	—	
	SGA (n=15)	6.3±1.3	1.5±0.5	3.7±1.4	3.8±1.9	—	
	p (LGA vs. AGA)	p>0.05	0.001	p>0.05	0.012	—	Student t test
	p (AGA vs. SGA)	p>0.05	p>0.05	p>0.05	0.012	—	
	Birthweight (g, r, p)	ND	ND	ND	0.16, p=0.077	—	correlation analysis
	LGA (standardized β, p)	-0.230, p=0.164	ND	ND	0.326, p=0.045	—	Multiple linear regression
Laleh et al. 2013	mg/dl ($\bar{x}$ ± SD)						Statistical software: SPSS 16.0
	28-32 wks	218.90±33.82	55.37±4.26	128.84±29.23	175.71±24.23	—	
	32-36 wks	240.99±29.44	59.29±4.61	137.64±29.22	240.46±32.06	—	
	36-40 wks	254.24±34.13	59.35±3.66	147.12±32.59	353.87±39.61	—	
	A significant positive correlation between birth weight (LGA and macrosomia) and TG level in diabetic group after 32 weeks of gestational age (p<0.001) was found. (Bonferroni multiple comparison test) For determination of independent prediction of birth weight in the study group adjustment analyses of covariance (ANCOVA) was performed. After adjustment for maternal pre-pregnancyBMI, age, and parity, only TG level remind independently related to LGA (p=0.04).						
Whyte et al. 2013	mmol/L ($\bar{x}$ ± SD)						Statistical software: SPSS 18.0
	Normal OGTT (n=167)	5.08±0.89	1.54±0.41	2.74±0.78	1.84±0.86	—	A p value <0.05 was considered significant.
	Abnormal OGTT (n=22)	5.31±0.97	1.39±0.35	2.86±0.75	2.33±0.78	—	
	Birthweight (kg) ($\bar{x}$ ± SD)				mmol/L		
	<2.99		—	—	1.58±0.40	—	
	3.09-3.49	—	—	—	1.88±0.93	—	
	3.5-3.99	—	—	—	1.87±0.73	—	
	4.0-4.49	—	—	—	2.23±1.119	—	
	Maternal triglyceride levels increased by 0.248 mmol/L for each 1.0 kg increase in birth weight (p<0.03).						Univariate analysis
	Maternal increased triglyceride levels were independently associated with increased birthweight (p<0.04). No relationship was found between fasting cholesterol and birth weight or other clinical variables						Multivariate regression analysis adjusting for age, BMI and GDM.
Zhou et al.	mmol/L ($\bar{x}$ ± SD)	6.04±1.48	2.19±0.45	2.76±0.71	2.44±1.45	—	Statistical software: SPSS 12.0
	Macrosomia (n=89)	5.91±0.93	2.07±0.43	2.77±0.69	2.47±1.02	—	Non-parametric Mann-Whitney Test was used to compare the

Study ID		Maternal lipids					Statistical Methods
		TC	HDL-C	LDL-C	TG	FFAs	
2012							difference between groups.
	Normal BW (n=890)	6.05±1.53	2.20±0.45	2.76±0.71	2.43±1.48	—	
	p	>0.05	<0.05	>0.05	>0.05	—	
	Hypo-HDL-cholesterolemia						Unconditional logistic regression model.
	Crude OR	ND	1.67	ND	ND	—	
	Adjusted OR (95%CI)	ND	1.63(1.02-2.60)	ND	ND	—	Adjusted for maternal age and BMI.
	p	ND	0.04	ND	ND	—	
	Macrosomia						
	HDL-c (mmol/L)	Case (all, %)	OR (95%CI)	p			HDL-C was categorized in quartiles based on the distribution in all pregnant women, and risk in each quartile was estimated in reference to lowest or highest quartile of metabolic marker level.
	>2.49	14 (234, 6.0%)	1	—			
	2.18-2.49	23 (246, 9.3%)	1.59(0.78-3.27)	0.202			
	1.87-2.16	22(272, 8.1%)	1.47(0.72-2.99)	0.291			
	<1.87	30(238, 12.6%)	2.09(1.04-4.21)	0.039			
Vrijkotte et al. 2011	mmol/L ($\bar{x}$ ± SD)						Statistical software: SPSS 16.0
	Birth weight<2500g	4.63±0.79	—	—	1.21±0.56	—	A P value<0.05 was considered significant.
	2500g-4000g	4.97±0.86	—	—	1.31±0.53	—	
	Birth weight>4000g	5.01±0.89	—	—	1.40±0.62	—	
	Standardised Birthweight, β(SE)						Standardized birthweight (already adjusted for gestational age at birth, parity and sex)
	TC(mmol/L)	Univariate	Model 1	TG (mmol/L)	Univariate	Model 1	Univariate associations between TG and TC levels and BW SDS were explored by using regression analyses.
	Q1 (3.87±0.33)	-0.12±0.07	-0.09±0.06	Q1	-0.03±0.07	-0.06±0.06	Model 1 is multivariate analyses further adjusted for maternal age, maternal height, hypertension, maternal pre-pregnancy BMI, weight gain during early pregnancy, ethnicity, smoking, alcohol use, education level, and cohabitant status
	Q2(4.48±0.13)	0.07±0.07	0.09±0.06	Q2	0.03±0.07	0.00±0.06	
	Q3(4.89±0.12)	Reference	Reference	Q3	Reference	Reference	
	Q4(5.36±0.15)	0.07±0.07	0.08±0.06	Q4	0.04±0.07	0.03±0.06	
	Q5(6.23±0.61)	0.11±0.07	0.11±0.06	Q5	0.17±0.07	0.20±0.06	
	Standardised Birthweight, β(95%CI)	11.82 (-10.00, 33.65)	—	—	47.14 (12.42, 81.87)	—	Data were provided by authors through email. Univariate linear analysis
	β(95%CI)	22.67 (4.00, 41.33)	—	—	86.72 (56.13,117.30)	—	Multivariate results linear analysis adjusted for maternal age, maternal height, hypertension, maternal pre-pregnancy BMI, weight gain during early pregnancy, ethnicity, smoking, alcohol use, education level, and cohabitant status
	SDS weight A significantly different growth patterns over time for SDS of weight (P=0.002). The growth pattern of infants born of women with the lowest TG levels (Q1) deviated more from their individual growth line than the growth patterns of other infants; that is, they started with a relatively low BW, but their weight						Linear regression analyses were used to exploring associations between different TG and TC quintiles and postnatal growth patterns (weight, length, and BMI expressed as SDS).

Study ID	Maternal lipids					Statistical Methods
	TC	HDL-C	LDL-C	TG	FFAs	
	progressively increased during the first year toward levels close to those of the other infants. Post hoc analyses showed that differences in weight among TG quintiles were only significant at 1 month; these differences were 0.140 SDS for Q1 vs Q5, and 0.139 SDS for Q1 vs Q3.					A multivariable model adjusted for maternal age, maternal height, parity, maternal pre-pregnancy BMI, weight gain during early pregnancy, ethnicity, education level, cohabitant status, smoking, alcohol use, pregnancy duration, infants' age and BW.
	SDS length					
	The individual average lines with SDS did not differ significantly among subsequent TG quintiles, although there was a tendency for the Q1 pattern to deviate (p=0.061). Post hoc analyses revealed significant differences at 1 month only for Q1 vs Q5 (0.140).					To compare SDS trajectories between the TG and TC quintiles in more detail, post hoc comparisons were done at multiple time points: 1, 3, 6, 9 and 12 months.
	SDS BMI					
	A similar tendency was observed for Q1, with a relatively low BMI at 1 month and a relatively high BMI at 12 months. Differences were present at the first month after birth only for Q1 vs Q3 (0.129).					The amount of accelerated growth in the different quintiles was determined by using the Pearson χ^2 analysis.
	Accelerated weight gain					
	The percentage of infants in Q1 that showed accelerated growth (24.5%) during the first 6 months of life was significantly higher compared with the other TG quintiles (mean, 19.6%; P=0.027). Although both length and BMI showed a similar tendency with regard to an accelerated growth, no significant differences between Q1 and other TG quintiles were found.					
	No associations were found between TC quintiles and weight, length and BMI trajectories (overall pattern and no post hoc differences).					
	Weight for gestational age according to TG and TC quintiles:					
	Differences between TG quintiles: %SGA (p=0.768), %LGA (p=0.032)					
	Differences between TC quintiles: %SGA (p=0.098), %LGA (p=0.601)					
Vinod et al. 2011	*Gestational age-adjusted birth weight (g) - Normal weight group – β(95%CI)*					Statistical software: SAS 9.1
			mg/dL			A p value of <0.05 was considered significant.
	6-10 wks (n=62)	-0.5 (-3.1, 2.1)	-4.1 (-10.4, 2,2)	-0.2 (-3.4, 3.1)	1.1 (-0.4, 2.6)	— Univariate regression analyses.
	10-14 wks (n=65)	-0.6 (-3.1, 1.8)	-2.1 (-7.7, 3.6)	-0.9 (-4.0, 2.1)	1.5 (0.1, 2.8)	—
	16-20 wks (n=68)	-0.9 (-2.9, 1.2)	-1.0 (-6.4, 4.4)	-1.2 (-3.6, 1.3)	0.7 (-0.8, 2.1)	—
	22-26 wks (n=71)	-1.3 (-2.9, 0.3)	-4.1 (-8.8, 0.6)	-1.5 (-3.4, 0.5)	1.1 (0.0,2.1)	—
	32-36 wks (n=69)	-1.2 (-3.1, 0.6)	-3.6 (-8.6, 1.4)	-1.3 (-3.4, 0.8)	0.9 (-0.1, 1.9)	—
	Gestational age-adjusted birth weight (g) – Obese/Overweight group– β(95%CI)					
	6-10 wks (n=69)	0.3 (-3.5, 4.0)	-7.7 (-16.1, 0.7)	2.5 (-1.9, 7.0)	0.4 (-2.3, 3.0)	—
	10-14 wks (n=71)	1.5 (-1.8, 4.7)	-8.0 (-15.6, -0.4)	2.8 (-1.1,6.7)	1.4 (-0.5, 3.2)	—
	16-20 wks (n=65)	0.1 (-3.3,3.5)	-9.3 (-16.4, -2.1)	2.2 (-1.6, 6.1)	0.7 (-1.2. 2.6)	—
	22-26 wks (n=71)	0.1 (-2.4, 2.5)	-7.4 (-14.1,-0.7)	0.9 (-2.1, 4.0)	1.5 (0.1, 3.0)	—
	32-36 wks (n=70)	0.4 (-2.3,3.1)	-10.0(-17.5, -2.3)	1.0 (-2.0,4.1)	1.9 (0.6, 3.2)	—
	The effect size of maternal HDL-C measured between 32-36 wks gestation on aBW					
	HDL quartile Normal weight	$\bar{x}\pm$ SD (mg/dL)	Mean difference in aBW (g)			

Study ID		Maternal lipids					Statistical Methods
		TC	HDL-C	LDL-C	TG	FFAs	
	1(lowest)	60.3±3.5	Reference				
	2	70.4±3.0	-36.5 (-86.9, 14.1)				
	3	80.5±2.8	72.7 (-173.7, 28.3)				
	4	100.3±11.5	-144 (-344,56)				
	Obese/Overweight						
	1(lowest)	60.0±4.1	Reference				
	2	68.8±1.9	-88 (-154, -20.2)				
	3	79.1±4.3	-191 (-334.3, -43.9)				
	4	94.7±8.2	-347 (607.3, -79.8)				
Zawiejska et al. 2008	mmol/L (Median, 25th -75th)	—	1.87(1.59,2.26)	—	2.45(3.22,4.24)	—	Statistical software: SPSS 12.0 P<0.05 was considered statistically significant.
	Birthweight (g) R^2, F, p	—	ND	—	R^2 = 0.02 F = 9.43 P < 0.01	—	Linear regression analyses.
	Macrosomia (RR,95%CI, p)		0.59(0.32,1.02) P=0.051		ND		Data were provided by the author through email. Population: non-obese GDM women Chi-square statistics.
Clausen et al. 2005	mmol/L (median, 25th -75th)	5.3(4.8,5.9)	1.8 (1.5,2.0)	2.8 (2.3,3.3)	1.5 (1.2,1.9)		Statistical software: SPSS 11.0 P<0.05 was considered statistically significant.
	Macrosomia (OR, 95%CI)						
	Triglycerides (case/all)	*unadjusted OR*	*Model A*	*Model B*	*Model C*	*Model D*	
	Q1 (10/437)	1.0	1.0	1.0	1.0	1.0	
	Q2 (28/668)	1.9 (0.9-3.9)	1.7(0.8-3.6)	1.9(0.9-3.9)	1.6(0.7-3.3)	1.4(0.7-3.1)	
	Q3 (15/394)	1.7(0.8-3.8)	1.4(0.6-3.2)	1.7(0.7-3.8)	1.4(0.6-3.2)	1.3(0.5-2.9)	
	Q4 (35/551)	2.9(1.4-5.9)	2.2(1.1-4.6)	2.9(1.4-5.9)	2.5(1.2-5.2)	1.9(0.9-4.1)	
	P trend	0.004	0.062	0.004	0.016	0.121	
	TC (case/all)	*unadjusted OR*	*Model A*	*Model B*	*Model C*	*Model D*	
	Q1 (20/497)	1.0	1.0	1.0	1.0	1.0	
	Q2 (19/565)	0.8(0.4-1.6)	0.8(0.4-1.5)	0.8(0.4-1.6)	0.7(0.4-1.4)	0.7(0.3-1.3)	
	Q3 (25/448)	1.4(0.8-2.6)	1.4(0.7-2.5)	1.4(0.8-2.5)	1.3(0.7-2.4)	1.4(0.7-2.6)	
	Q4 (24/540)	1.1(0.6-2.0)	1.0(0.5-1.8)	1.1(0.6-2.0)	0.9(0.5-1.7)	0.9(0.5-1.7)	
	P trend	0.397	0.610	0.451	0.751	0.737	
	HDL-C(case/all)	*unadjusted OR*	*Model A*	*Model B*	*Model C*	*Model D*	
	Q1 (38/509)	1.0	1.0	1.0	1.0	1.0	

Q, quartile
Univariate logistic regression was used to calculate unadjusted OR value.
Multiple logistic regression analyses was performed in Model A, B, C and D.
Variables in model A: first trimester BMI;
Model B: age, parity smoking
Model C: age, parity, smoking, weight gain, placental weight, gestational diabetes
Model D: model C+ first trimester BMI

Study ID		Maternal lipids					Statistical Methods
		TC	HDL-C	LDL-C	TG	FFAs	
	Q2 (18/498)	0.5(0.3-0.8)	0.5(0.3-0.9)	0.5(0.3-0.8)	0.3(0.3-0.9)	0.6(0.3-1.0)	
	Q3 (18/527)	0.4(0.2-0.8)	0.5(0.3-1.0)	0.4(0.2-0.7)	0.5(0.2-0.8)	0.3(0.3-1.0)	
	Q4 (14/516)	0.3(0.2-0.6)	0.4(0.2-0.8)	0.3(0.2-0.6)	0.4(0.2-0.7)	0.4(0.2-0.8)	
	P trend	<0.001	0.008	<0.001	0.001	0.009	
	Non-HLD-C(case/all)	*unadjusted OR*	*Model A*	*Model B*	*Model C*	*Model D*	
	Q1 (16/519)	1.0	1.0	1.0	1.0	1.0	
	Q2 (19/530)	1.2(0.6-2.3)	1.2(0.6-2.3)	1.2(0.6-2.3)	1.0(0.5-2.0)	1.0(0.5-2.1)	
	Q3 (21/500)	1.4(0.7-2.7)	1.3(0.7-2.5)	1.4(0.7-2.7)	1.2(0.6-2.5)	1.3(0.7-2.7)	
	Q4 (32/499)	2.2(1.2-4.0)	1.9(1.0-3.5)	2.1(1.2-3.9)	1.8(1.0-3.5)	1.9(1.0-3.6)	
	P trend	0.009	0.034	0.011	0.036	0.035	
Mathews et al. 2003	mmol/L (median, 5th -9th)						Statistical software: SPSS 10.0
	Early pregnancy (n=733)	5.59(4.30,7.45)	—	—	—	—	P<0.05 was considered statistically significant. P value cautiously throughout and considered value <0.05 but >0.01 as marginal
	Later pregnancy (n=537)	6.91(5.30,9.14)	—	—	—	—	
	Birthweight (g, β, 95%CI)						
	Early pregnancy (≈16wks, n=733)	30.1(1.21.58,9) P=0.041	—	—	—	—	Multiple linear regression model adjusted for maternal smoking status and height, infant' gender, gestational age.
	Later pregnancy (≈28wks n=537)	11.1(-18.0, 40.3) P= 0.453	—	—	—	—	
Olmos et al. 2014	mmol/L ($\bar{x}$ ± SD)						Statistical software: PASW statistics version 18.00, GraphPad Prism 5.0 for Windows. P<0.05 was considered statistically significant.
	2nd trimester _Normal weight	ND	ND	—	1.99±0.65	—	
	2nd trimester _Overweight	ND	ND	—	2.29±0.75	—	
	2nd trimester _Obese	ND	ND	—	2.35±0.71	—	
	3rd trimester _ Normal weight	ND	ND	—	2.59±0.76	—	
	3rd trimester _ Overweight	ND	ND	—	2.76±0.91	—	
	3rd trimester _ Obese	ND	ND	—	2.88±0.92	—	
	Newborn weight z-score (r, p)						Maternal lipids z score – newborn weight z score Linear regression model.
	Normal weight (n=128)	ND	ND	—	r=0.12,p=0.158	—	
	Overweight (n=105)	ND	ND	—	r=0.42,p<0.001	—	
	Obese (n=46)	ND	ND	—	r=0.47,p<0.001	—	

Study ID		Maternal lipids					Statistical Methods
		TC	HDL-C	LDL-C	TG	FFAs	
Emet et al. 2013	mg/dL($\bar{x}$ ± SD)						Statistical software: SPSS 15.05 P<0.05 was considered statistically significant.
	1st trimester	166.20±28.28	53.37±10.51	93.75±23.22	93.09±45.57	—	
	3rd trimester	271.28±47.81	63.54±21.16	154.58±44.15	274.10±101.89	—	
	Birthweight (p)	0.616	0.754	0.440	0.033	—	Changed maternal lipid levels - birthweight
	Neonatal weight in 3rd postnatal month (p)	0.2678	0.860	0.769	0.138	—	Pearson correlation analyses.
Liu et al. 2016	mmol/L($\bar{x}$ ± SD)						Statistical software: SPSS 17.00 P<0.05 was considered statistically significant.
	GDM	6.09±0.86	1.82±0.35	3.26±0.86	2.31±0.84	—	
	NGT	3.30±0.81	1.85±0.33	3.30±0.81	2.09±0.76	—	
	Birth weight (r, p)	0.018, p=0.518	-0.011, p=0.701	-0.005, p=0.843	0.100, p<0.001	—	Partial correlation adjusted for gestational age and pre-gravid BMI
	Birthweight (β, SE, p)	ND	ND	ND	0.070, SE=13.235 P=0.001	—	Multiple linear regression model including First Visit FPG, OGTT FPG, triglyceride, Apolipoprotein E, pre-gravid BMI, GDM, gestational age.
Brunner et al. 2013	mg/dL ($\bar{x}$ ± SD)	—	—	—	197.0±66.2	—	Statistical software: R version 2.8.1, PASW version 18.0. A tow-sided P-value<0.05 was considered statistically significant.
	Maternal lipid levels at gestation weeks 32 (β,95%CI)						Data were provided by authors through email.
	Birthweight(g)	—	—	—	-0.54 (-1.56, 0.49)	—	
	Ponderal index (kg/m3)	—	—	—	-0.00 (-0.01, 0)	—	Multiple linear regression model, including the covariates maternal pre-pregnancy BMI, gestational weight gain, maternal glucose tolerance status, pregnancy duration, sex and group allocation for the data at birth, and, additionally, poderal index at birth and mode of infant feeding at the later time points, were performed.
	6 weeks postpartum weight (g)	—	—	—	-0.97 (-2.33, 0.4)	—	
	6 weeks postpartum ponderal index (kg/m3)	—	—	—	-0.00 (0, 0)	—	
	4 months postpartum weight (g)	—	—	—	-0.62 (-2.27, 1.03)	—	
	4 months postpartum ponderal index (kg/m3)	—	—	—	0.01 (0, 0.01)	—	
	1 year postpartum weight (g)	—	—	—	-1.46 (-3.83, 0.92)	—	
	1 year postpartum ponderal index (kg/m3)	—	—	—	-0.00 (-0.01, 0)	—	
	1 year postpartum	—	—	—	-0.00	—	

Study ID		Maternal lipids					Statistical Methods
		TC	HDL-C	LDL-C	TG	FFAs	
	BMI (kg/m^2)				(0, 0)		
	No significant relationships were found for maternal triglyceride levels at 32nd gestation week with birthweight and Ponderal index (or BMI) at delivery, 6 weeks, 1 years and 2 years post-partum, and also with weight gain after birth at any time point. The change in maternal serum triglyceride concentration between the 15th and 32nd week of gestation was weakly, but significantly associated with infant ponderal index at 4 months post-partum (b_{adj}: 0.001 (0-0.01) kg/m3, P=0.020), but not with any of the other growth or body composition outcomes up to 2 years post-partum.						
Knopp et al. 1992	mM ($\bar{x}$ ± SD)						Statistical software: No statement.
	NS- (n=521)	—	—	—	1.86±0.68	—	
	PS+ (n=264)	—	—	—	1.92±0.68	—	
	GDM (n=96)	—	—	—	2.29±0.68	—	
	Birthweight ratio						Univariate Spearman's correlation coefficients
	NS-	—	—	—	0.09 (p≤0.05)	—	
	PS+	—	—	—	0.13(p≤0.05)	—	
	GDM	—	—	—	0.11	—	
	PS+ plus GDM	—	—	—	0.16(p≤0.01)	—	
	ALL	—	—	—	0.12(p≤0.01)	—	
Knopp et al. 1985			**HDL-C**	**LDL-C**	**VLDL-C**	**FFAs**	
	Separman pairwise correlation coefficients						Spearman rank correlation coefficients indicate the linear relationship between all pairs of variable.
	Birth weight (n=273)	—	-0.06	0.003	0.05	-0.06	
	Birth weight ratio (n=248)	—	-0.06	0.01	0.03	0.002	
	Standardized regression coefficients						Structured multiple regression analyses. Variables in very unit were entered the regression equation sequentially and in a predefined order. Unit I: VLDL-C, VLDL-TG,LDL-C, HDL-TG Unit II: Glucose, insulin, FFA, HPL, progresterone, estradiol and estriol
	Birth weight (n-272)	—	-0.15	0.04	-0.14	0.05	
	Birth weight ratio (n=247)	—	-0.13	0.01	-0.30, p<0.05	-0.09	
Schaefer-Graf et al. 2011		mmol/L			mmol/L	µmol/L	Statistical software: SPSS 16.0
	$\bar{x}$ ± SD	6.56±0.11	—	—	2.84±0.08	320±14	P<0.05 was considered statistically significant.
	A significant lineal positive correlation between maternal and cord blood serum was found for log transformed FFAs (r=0.1886, p=0.0172). None of the maternal metabolic variables measured correlated to neonatal body weight.						Pearson correlation coefficients were calculated to evaluate the correlations between different variables.
Nolan	***TG (r, p)***	*Asian-born*	*GDM (n=38)*	*Asian & GDM*	*Overall*		Statistical software: SPSS-PC software package

Study ID		Maternal lipids					Statistical Methods
		TC	HDL-C	LDL-C	TG	FFAs	
et al. 1995		*(n=97)*		*(n=18)*	*(n=388)*		
	Birth weight ratio (univariate analyses)	0.23, p=0.02	0.37, p=0.023	0.63, p=0.005	0.12, p=0.02	—	All statistical tests were two-tailed, and a P value of <0.05 was considered significant.
	Birth weight ratio (multiple regression)	ND	P=0.004	ND	ND	—	Within the total GDM subgroup, using multiple regression analyses to control for the maternal factors of BMI and rate of maternal weight gain.
Friis et al. 2012	mmol/L($\bar{x}$ ± SD)	6.96±1.20	1.71±0.37	—	2.01±0.65	0.44±0.13	Statistical software: SPSS 18.0. All p-values ,0.05 were considered statistically significant.
	Birthweight (β,95%CI, p)	p>0.05	-170 (-329, -9) P=0.04	—	94(2,187) P=0.046	p>0.05	Multiple linear regression model adjusted for gestational age at birth.
Lei et al. 2016	mmol/L(median, IQR)	—	1.46 (1.3-1.7)	—	2.71(2.12-3.49)	—	Statistical software: SPSS 22.0.
	OR (95%CI)	***TG (<3.49 mmol/L)***	***TG (≥3.49 mmol/L)***	***HDL-C (≥1.3 mmol/L)***	***HDL-C (<1.3 mmol/L)***		Logistic regression.
	LGA	1 (Ref)	1.6 (1.42-2.01)	1 (Ref)	1.33(1.12-1.58)	—	
	SGA	1 (Ref)	1.51(1.08-2.12)	1 (Ref)	0.88(0.62-1.25)	—	
Kitajima et al. 2001		mg/dL			mg/dL	mEq/dL	Statistical software: SAS 5.0
	$\bar{x}$ ± SD	263.6±46.2	—	—	213.9±77.7	70.3±12.3	P<0.05 was defined as significant
	Birthweight (r, p)	0.01, p=0.99	—	—	0.22, p=0.009	0.03, p=0.73	Univariable linear regression.
	Birthweight (F,p)	ND	—	—	6.3, p=0.014	ND	After controlling for fasting plasma glucose, prepregnant BMI, maternal weight gain during pregnancy, gestational age at delivery, neonatal gender.
		Hypertriglyceridemia	***Normal triglyceride***	***p***	***Crude OR(95%CI)***		χ^2 test
	LGA	4	1	0.012	14.8 (1.59, 137.38)		
	Non-LGA	30	111				
	LGA	***Adjusted OR***	***95%CI***	***p***			Logistic regression model adjusted for fasting plasma glucose levels, prepregnant BMI, and weight gain during pregnancy
	Hypertriglyceridemia	11.6	(1.1 - 122)	0.04			
Mossayebi et al. 2014	mg/dL ($\bar{x}$ ± SD)	201.4±38.4	46.6±4.36	115.3±34.9	197.5±51.9	—	Statistical software: SPSS 20.0
	Birthweight (g)						P<0.05 was defined as significant
	r, p	0.50, p<0.001	-0.47, p<0.001	0.40, p<0.001	0.68, p<0.001	—	Pearson correlation analyses.
	β, SE	ND	ND	ND	5.24, SE=0.54	—	Stepwise linear regression adjusted for male gender of the child
	Standardized β, p	ND	ND	ND	0.59, p<0.001	—	

Study ID		Maternal lipids					Statistical Methods
		TC	HDL-C	LDL-C	TG	FFAs	
	Macrosomia				***TG***	***TG z score***	Forward stepwise logistic regression analyses
	β, SE, p	ND	ND	ND	0.04, SE=0.01 P<0.001	ND	Adjusted for maternal age, weight prior to pregnancy, FBS and cholesterol.
	OR (95% CI)	ND	ND	ND	1.044(1.02-1.07)	9.44(2.86-31.16)	
	LGA						Forward stepwise logistic regression analyses
	β, SE, p	ND	ND	ND	0.03, SE=0.01 P<0.001	ND	Adjusted for maternal age, weight prior to pregnancy, FBS and cholesterol.
	OR (95% CI)	ND	ND	ND	1.035(1.02, 1.05)	5.90 (2.68-13.00)	
	LGA	***all***	***Case(proportion)***	***Crude OR(95%CI)***	***aOR (95%CI)***		
	Total cholesterol:						Logistic regression model
	Q1:<172	39	2 (5.1)	1 (Ref)	1 (Ref)		
	Q2:172.1-199.9	35	6 (17.1)	3.8 (0.7-20.4)	2.3 (0.4-15.2)		
	Q3:200-234.9	37	9 (24.3)	5.9 (1.2-29.7)	1.2 (0.2-8.6)		
	Q4:≥235	43	18 (41.9)	13.3 (2.8-62.5)	1.1 (0.2-8.1)		
	HDL:						
	Q1: ≤43	40	18 (45.0)	16.4 (3.5-77.2)	0.6 (0.07-5.3)		
	Q2:43.1-46	37	10 (27.0)	7.4 (1.5-36.5)	0.08 (0.08-5.6)		
	Q3:46.1-49.9	35	5 (14.3)	3.3 (0.6-18.4)	1.7 (0.2-11.6)		Variables in model: mother's age, weight prior to pregnancy, FBS, triglyceride, cholesterol, and child gender. If the categorical variable was one of these confounders or had colinearity with other variables, we excluded that variable and only the categorical variable was entered.
	Q4: ≥50	42	2 (4.8)	1 (Ref)	1 (Ref)		
	LDL:						
	Q1: <88	38	3 (7.9)	1 (Ref)	1 (Ref)		
	Q2:88.1-113	40	9 (22.5)	3.4 (0.8-13.6)	2.04 (0.4-10.9)		
	Q3:113.1-143.9	37	10 (27)	4.3 (1.1- 17.3)	0.6 (0.1-4.03)		
	Q4: ≥144	39	13 (33.3)	5.8 (1.5-22.6)	0.8 (0.1-4.4)		
	Triglyceride:						
	Q1: <170	37	2 (5.4)	1 (Ref)	1 (Ref)		
	Q2:170-199.9	37	0 (0)	0	0		
	Q3:200-299.9	37	6 (16.2)	3.4 (0.6-18)	3.2 (0.5-20.7)		
	Q4: ≥230	43	27 (62.8)	29.5 (6.2-139.6)	28.2 (3.5-230.3)		
Geraghty et al. 2016	mmol/L (median, IQR)						Statistical software: SPSS 20.0
	Early pregnancy (n=284)	4.58 (3.87-5.39)	0.64(0.46-0.97)	3.31(2.66-3.94)	1.31(0.80-1.35)	—	
	Late pregnancy (n=293)	6.02(5.00-6.87)	0.85(0.54-1.13)	4.15(3.43-5.06)	1.71(1.28-2.19)	—	
	Early pregnancy						×:p>0.1, statistically insignificant;

Study ID		Maternal lipids					Statistical Methods
		TC	HDL-C	LDL-C	TG	FFAs	
	Birth weight	×	×	×	×	—	√:p<0.1, statistically significant
	Sum of skinfold	×	×	×	√	—	Pearson correlation was used, and Spearman's correlation for the nonparametric data to individually measure the correlation between each blood lipid (in early and late pregnancy and cord blood), HOMA, C-peptide and leptin concentration and each of the anthropometric measures of child weight and adiposity (at birth, 6 months and 2 years of age).
	2 year weight centile	√	×	×	×	—	
	2 years old waist: length ratio	×	√	×	×	—	
	2 years old sum of skinfold	×	×	√	×	—	
	Late pregnancy						Bivariate associations at a significance of P < 0.1 were considered significant
	Birth weight	×	×	×	√	—	
	Sum of skinfold	×	√	×	√	—	
	2 year weight centile	√	×	√	√	—	
	2 years old waist: length ratio	×	√	×	×	—	
	2 years old sum of skinfold	×	×	×	×	—	
	Birthweight (g) (β, p, 95%CI)	ND	ND	ND	β=111.17 p=0.034 (8.48, 213.87)	—	Multiple regression model controlling for confounders (at birth: mother's BMI, gestational age, infant gender, mother's education and smoking status, and at 6-month and 2-years: infant gender, age at data collection, mother's education status and breastfeeding), outcomes associated with maternal blood parameters were birth weight, birth weight centile, and weight at 6 months.
	Birthweight centile	×	×	×	√	—	
	2 years old weight	×	×	×	×	—	
	Subgroup analyses_ late pregnancy (r^2, p)						The final multiple linear regression models that were statistically significant (P < 0.05) were reported as the best predictors of infant weight and adiposity.
	Birthweight (BMI< 25kg/m^2)	ND	ND	ND	R^2=0.0003, p=0.92	—	
	Birthweight (BMI≥25kg/m^2)	ND	ND	ND	R^2=0.08, P=0.008	—	
	Birthweight(g) (β,95%CI)						Data were provided by authors through email.
	Early pregnancy	27.87 (-17.89,73.63)	-1236.25 (-3322.95, 850.45)	18.39 (-38.44, 75.21)	ND	—	Multiple regression model (controlling for mother's BMI, gestational age, infant gender, mother's education and smoking status)
	Late pregnancy	24.85 (-9.39, 59.09)	30.00 (-114.85, 174.84)	19.97 (-24.34, 64.27)	111.18 (8.48, 213.87)	—	
	Sum of skinfolds (β,95%CI)						
	Early pregnancy	0.23 (-0.96, 1.41)	-1.59 (-5.68, 2.51)	0.19 (-1.19, 1.56)	ND	—	
	Late pregnancy	0.61 (-0.49, 1.71)	-0.16 (-4.24, 3.92)	0.46 (-0.74, 1.66)	ND	—	
	Weight at 2 years(kg) (β,95%CI)						Multiple regression model (controlling for infant gender, age

Study ID		Maternal lipids					Statistical Methods
		TC	HDL-C	LDL-C	TG	FFAs	
	Early pregnancy	0.15 (-0.14, 0.44)	0.24 (-0.82, 1.29)	0.12 (-0.23, 0.47)	0.71 (-0.06, 1.48)		at data collection, mother's education status and breastfeeding)
	Late pregnancy	0.23 (-0.02, 0.48)	0.16 (-0.77, 1.09)	0.27 (-0.05, 0.58)	0.47 (-0.05, 0.99)		
Jin et al. 2016	mmol/L (median, IQR)						Statistical software: SPSS 19.0
	1st (7-10 weeks)	3.95 (3.66-4.60)	1.66 (1.45-1.77)	2.25 (2.08-2.45)	2.20 (1.77-2.73)	—	P values < 0.05 were defined as statistically significant.
	2nd (21-24 weeks)	4.65 (4.22-5.10)	1.67 (1.47-1.79)	2.46 (2.22-2.77)	2.45 (2.11-2.89)	—	
	3rd (33-37 weeks)	6.27 (5.52-7.03)	1.80 (1.57-2.04)	2.87 (2.32-3.45)	3.06 (2.37-3.98)	—	
	1st trimester (Adjusted OR, 95%CI, p)						
	SGA	ND	1.31 (0.32-5.38) P=0.709	ND	ND	—	Forward stepwise logistic regression analysis. Odds ratios were adjusted for maternal age, prepregnancy BMI, gestational weight gain, parity, maternal education background, family income and cigarette exposure. Values of macrosomia and SGA were additionally corrected for delivery mode and infant sex.
	Macrosomia	ND	0.51 (0.19-1.36) P=0.178	ND	ND	—	
	2nd trimester (Adjusted OR, 95%CI, p)						
	SGA	ND	1.88 (0.47-7.59) P=0.377	ND	ND	—	
	Macrosomia	ND	0.25 (0.09-0.73) P=0.011	ND	ND	—	
	3rd trimester (Adjusted OR, 95%CI, p)						
	SGA	1.12 (0.80-1.56) P=0.520	3.15 (1.15-8.65) P=0.026	1.16 (0.71-1.89) P=0.565	0.63 (0.40-0.99) P=0.046	—	Odds ratios were adjusted for maternal age, prepregnancy BMI, gestational weight gain, parity, maternal education background, family income and cigarette exposure. Values of PTB, SGA, LGA and macrosomia were additionally corrected for delivery mode and infant sex.
	LGA	0.98 (0.86-1.11) P=0.715	0.79 (0.52-1.21) P=0.281	0.93 (0.78-1.11) P=0.418	1.13 (1.02-1.26) P=0.025	—	
	Macrosomia	0.99 (0.81-1.21) P=0.903	0.46 (0.22-0.94) P=0.034	0.93 (0.69-1.25) P=0.621	1.19 (1.02-1.39) P=0.024	—	
Tian et al. 2013	OR (95%CI)				≥2.27mmol/L		No statement on statistic software and method.
	Macrosomia	—	—	—	2.20 (1.54-3.14)	—	
Couch et al. 1998	In control group, maternal plasma TG is positively associated with birthweight (r=0.46,p≤0.05) In control group, maternal HDL-C significantly correlated with cord vein TC (r=0.51,p≤0.05). Maternal TG significantly correlated with cord vein FFAs (r=0.47, p≤0.05). In GDM group, maternal TC significantly correlated with cord vein VLDL+LDL-C (r=0.48, p≤0.05).						Software: Statistical Analysis Systems Program Pearson correlation analyses
Ortega et al. 1996		TC	HDL-C	LDL-C	TG	VLDL-C	Statistical software: No statement
	mmol/L ($\bar{x}$ ± SD)	6.82±1.16	1.62±0.34	4.07±1.07	2.43±0.83	1.11±0.38	P<0.05 were considered to indicate statistical significance.
	Newborn lipids (r, p)						
	TC	0.3298, p<0.05	ND	0.3204, p<0.05	ND	ND	Spearman's rank correlation
	HDL-C	0.2575, p<0.05	ND	ND	ND	ND	

Study ID		Maternal lipids					Statistical Methods
		TC	HDL-C	LDL-C	TG	FFAs	
	LDL-C	0.3053, p<0.05	ND	0.3507, p<0.05	ND	ND	Student t test.
	TG	ND	ND	ND	ND	ND	
	VLDL-C	ND	ND	ND	ND	ND	
	mmol/L	Maternal TC<7.55 mmol/L (n=215)		Maternal TC≥7.55 mmol/L (n=77)		p	
	TC($\bar{x}$ ± SD)	1.65±0.47		2.10±0.54		<0.05	
	HDL-C($\bar{x}$ ± SD)	0.63±0.25		0.75±0.21		<0.05	
	LDL-C($\bar{x}$ ± SD)	0.78±0.36		1.14±0.40		<0.05	
	TG($\bar{x}$ ± SD)	0.48±0.22		0.45±0.20		>0.05	
	VLDL-C($\bar{x}$ ± SD)	0.22±0.10		0.21±0.09		>0.05	
	TC/HDL-C($\bar{x}$ ± SD)	2.62±0.40		2.81±0.35		<0.05	
	Birthweight (g, $\bar{x}$ ± SD)	3301.5±406.6		3234.5±411.5		>0.05	
Alberti-Fidanza, et al. 1995	Maternal HDL-C levels in the 2nd trimester is significantly associated with cord blood triglycerides among all nowborns (r=-0.53, p=0.0131, n=21). For girls (n=7), maternal HDL-C levels in the 1st (r=-0.86, p=0.0138) and 2nd (r=-0.83, p=0.0218) trimester is significant associated with cord blood TG respectively. Maternal triglycerides measured in the 2nd trimester is correlated with cord blood TC level (r=0.80, p=0.0315). No correlation was observed among boys.						Pearson linear correlation.
Brockerhoff 1986	r, p		HDL	LDL	VLDL		No statement on statistic methods.
	Cord blood TC		0.484	0.082	0.828, P<0.01		
	Cord blood TG		0.063	0.246	0.568, P<0.01		
Robin et al. 2007	Birthweight, g	Mean(SD)	Unadjusted mean difference, p	Adjusted mean difference, p			Unadjusted mean difference was assessed using 1-way analysis of variance, comparing low-TC or high-TC group with mid-TC reference group. Adjusted mean difference was assessed using multivariate linear regression; model adjusted for infant gender, fractional week of GA within the term interval, maternal weight in pounds, maternal age group, and race in pooled analyses. Outliers measurement were excluded from the adjusted model.
	Mid-TC group	3484(482)	Ref	Ref			
	Low-TC group	3360(442)	-124, 0.015	-150, 0.001			
	High-TC group	3504(471)	+20, 0.69	+29, 0.47			
Charles et al. 2016	Birthweight (r, p)	-0.103, p<0.0001	-0.139, p<0.0001	0.001, p<0.0001	-0.014, p<0.0001	—	No statement on statistical software as well as statistical significant level. Pearson correlation.

ND: No documented.

S6 Appendix Quality assessment form

Study ID	Selection				Comparability		Outcome			Overall Score
	A1	A2	A3	A4	B1	B2	C1	C2	C3	
Harmon et al.2011	0	1	1	1	0	0	0	1	1	5
Son et al.2010	0	1	1	1	0	0	0	1	1	5
Di et al.2005	0	1	1	1	0	0	0	1	1	5
Schaefer-Graf et al.2008	0	1	1	1	0	0	0	1	1	5
Slagjana et al.2014	0	1	1	1	0	0	0	1	1	5
Zhou et al.2012	0	1	1	1	0	0	0	1	1	5
Zawiejska et al.2008	0	1	1	1	0	0	0	1	1	5
Emet et al.2013	0	1	1	1	0	0	0	1	1	5
Schaefer-Graf et al.2011	0	1	1	1	0	0	0	1	1	5
Mossayebi et al.2014	0	1	1	1	0	0	0	1	1	5
Swierzewska et al.2015	0	1	1	1	0	0	0	1	1	5
Ortega et al.1996	0	1	1	1	0	0	0	1	1	5
Alberti-Fidanza et al.1995	0	1	1	1	0	0	1	1	0	5
Charles et al. 2016	0	1	1	1	0	0	0	1	1	5
Wang et al.2015	0	1	1	1	1	0	0	1	1	6
Ahmad et al.2006	0	1	1	1	1	0	0	1	1	6
Whyte et al. 2013	0	1	1	1	0	0	1	1	1	6
Vinod et al. 2011	0	1	1	1	1	0	0	1	1	6
Olmos et al.2014	0	1	1	1	1	0	0	1	1	6
Knopp et al.1992	0	1	1	1	1	0	0	1	1	6
Nolan et al.1995	0	1	1	1	1	0	0	1	1	6
Friis et al.2012	0	1	1	1	1	0	0	1	1	6
Lei et al.2016	0	1	1	1	1	0	0	1	1	6
Kitajima et al.2001	0	1	1	1	1	0	0	1	1	6
Couch et al.1998	0	1	1	1	0	0	1	1	1	6
Brockerhoff 1986	0	1	1	1	0	0	1	1	1	6
Retnakaran et al.2012	0	1	1	1	1	1	0	1	1	7
Hou et al.2014	0	1	1	1	1	1	0	1	1	7
Laleh et al.2013	0	1	1	1	1	1	0	1	1	7
Liu et al.2016	0	1	1	1	1	0	1	1	1	7
Brunner et al.2013	0	1	1	1	1	0	1	1	1	7
Knopp et al.1985	0	1	1	1	1	0	1	1	1	7
Geraghty et al.2016	0	1	1	1	1	1	0	1	1	7
Jin et al.2016	0	1	1	1	1	1	0	1	1	7
Robin et al. 2007	0	1	1	1	1	1	0	1	1	7
Ye et al.2015	0	1	1	1	1	1	1	1	1	8
Crume et al.2015	0	1	1	1	1	1	1	1	1	8
Hwang et al.2015	0	1	1	1	1	1	1	1	1	8
Kulkarni et al.2013	1	1	1	1	0	1	1	1	1	8
Vrijkotte et al.2012	0	1	1	1	1	1	1	1	1	8
Kramer et al.2014	0	1	1	1	1	1	1	1	1	8
Vrijkotte et al. 2011	0	1	1	1	1	1	1	1	1	8
Clausen et al.2005	1	1	1	1	0	1	1	1	1	8
Mathews et al.2003	0	1	1	1	1	1	1	1	1	8
Sommer et al.2015	1	1	1	1	1	1	1	1	1	9

S7 Appendix Data analysis for birthweight

Data summary

S7.1 Table Results summary of the association of maternal lipid levels with birthweight throughout pregnancy

Maternal lipids	Trimester	Negative associations	No direction	Positive associations	Total
TC	The first trimester	1	1	2(1)	4
	The second trimester	1	4	7(2)	12
	The third trimester	3(1)	12	8(3)	23
HDL-C	The first trimester	2(1)	0	0	2
	The second trimester	6(2)	4	1	11
	The third trimester	11(6)	6	1	18
LDL-C	The first trimester	1	0	1	2
	The second trimester	1	5	2	8
	The third trimester	2	5	7(3)	15
TG	The first trimester	0	1	4(3)	5
	The second trimester	0	2	10(8)	12
	The third trimester	3(1)	4	20(14)	27
VLDL	The first trimester	0	0	0	0
	The second trimester	0	0	0	0
	The third trimester	0	1	1	2
FFAs	The first trimester	0	1	0	1
	The second trimester	0	0	1	1
	The third trimester	0	3	4(2)	7

1. This table summarised the results distribution of studies that reported the association of maternal lipid levels with birthweight throughout pregnancy;
2. Number in this table represent the number of studies;
3. 'No direction' means that the number of studies reported statistically insignificant results without its direction, as well as the number of studies did not report their results;
4. Number in the bracket means the number of studies reported statistically significant results;
5. Abbreviation: Total cholesterol (TC), high-density lipoprotein cholesterol (HDL-C), low-density lipoprotein cholesterol (LDL-C), very low-density lipoprotein cholesterol (VLDL-C), triglycerides (TG) and free fatty acids (FFAs).

Total cholesterol (TC)

S7.2 Table Results summary of the association of maternal TC level with birthweight

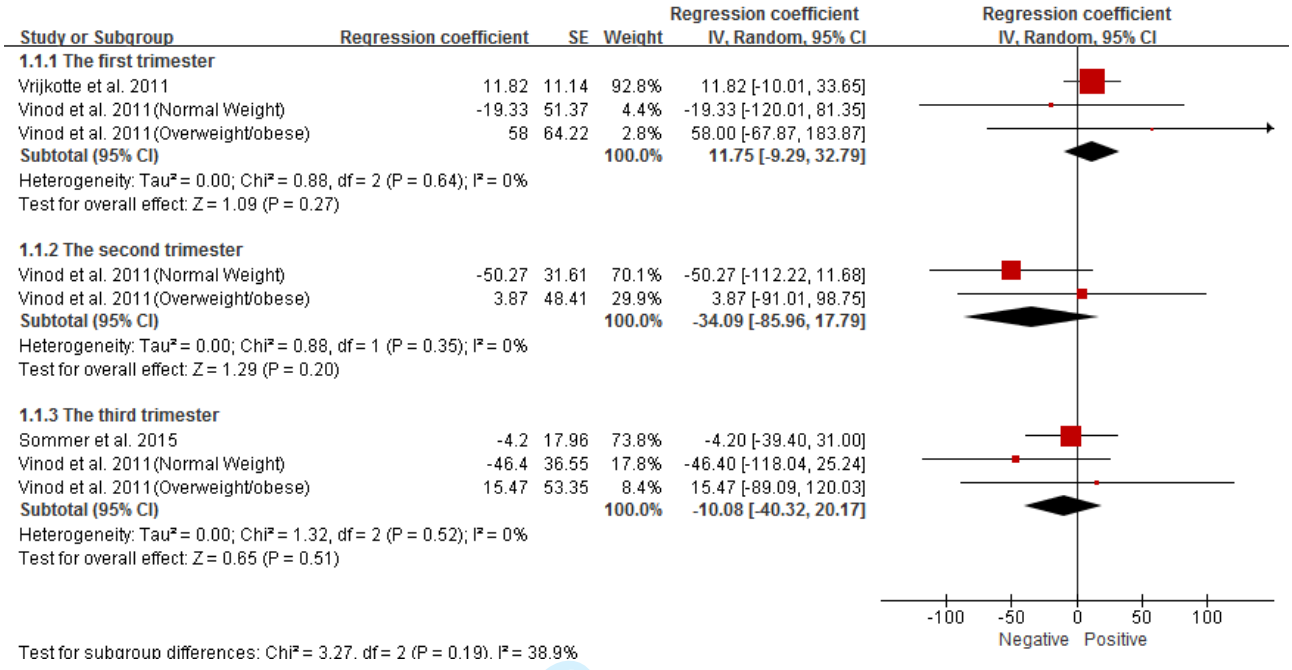
ID	Population	Countries	Sample size	Tri.	Reported measures	Effect size	Lower 95%CI	Upper 95%CI	p	Statistical methods	Quality	The control of confounding factors							
												a	b	c	d	e	f	g	h
Vinod et al.2011(1)	Normal weight	USA	65	1	Crude β	-19.33	-120.03	81.36	ND	SLR	6	×	×	×	×	×	×	×	×
Vinod et al.2011(2)	Overweight/obese	USA	71	1	Crude β	58.00	-67.86	183.87	ND	SLR	6	×	×	×	×	×	×	×	×
Vrijkotte et al.2011	General	Netherlands	2,052	1	Crude β	11.82	-10.00	33.65	ND	Univariate analyses	8	√	√	×	×	×	×	√	×
Vrijkotte et al.2011	General	Netherlands	2,052	1	Adjusted β	**22.67**	**4.00**	**41.33**	ND	MLR	8	√	√	√	√	√	×	√	×
Nolan et al.1995	General	Australia	388	1	ND	ND			ND	ND	6	ND	ND	ND	ND	ND	ND	×	ND
Liu et al.2016	General	China	1,546	2	r	0.02			0.518	Partial correlation	7	×	×	×	×	×	×	×	×
Vinod et al.2011(1)	Normal weight	USA	71	2	Crude β	-50.27	-112.24	11.69	ND	SLR	6	×	×	×	×	×	×	×	×
Vinod et al.2011(2)	Overweight/obese	USA	71	2	Crude β	3.87	-91.02	98.75	ND	SLR	6	×	×	×	×	×	×	×	×
Mathews et al.2003	General	UK	733	2	Adjusted β	**30.10**	**1.21**	**58.90**	ND	MLR	8	√	√	×	×	×	×	√	×
Crume et al.2015	General	USA	804	2	Adjusted β	17.79	-11.82	47.39	0.200	MLR	8	√	√	√	×	×	×	√	×
Kulkarni et al.2013	non-GDM	India	631	2	Adjusted β	**39.07**	**10.57**	**67.58**	ND	MLR	8	×	√	√	√	×	×	√	×
Geraghty et al.2016	non-GDM	UK	331	2	Adjusted β	27.87	-17.89	73.63	ND	MLR	7	√	√	×	√	√	×	×	×
Whyte et al. 2013	General	Ireland	189	2	ND	ND			ND	ND	6	ND	ND	ND	ND	ND	ND	×	ND
Wang et al.2015	General	China	636	2	ND	ND			ND	Partial correlation	6	√	√	×	×	×	×	×	×
Di et al.2005	OGTT+	Italy	83	2	ND	ND			ND	ND	5	ND	ND	ND	ND	ND	ND	×	ND
Olmos et al.2014	GDM	Chile	279	2	ND	ND			ND	ND	6	ND	ND	ND	ND	ND	ND	×	ND
Mossayebi et al.2014	General	Iran	154	3	r	**0.50**			**<0.001**	Pearson correlation	5	×	×	×	×	×	×	√	×
Charles et al. 2016	General	Multiple	1062	3	r	**-0.103**			**<0.0001**	Pearson correlation	4	×	×	×	×	×	×	×	×
Ahmad et al. 2006	non-GDM	Malaysia	246	3	r	**0.16**			**0.021**	Univariate analyses	6	√	×	×	×	×	×	√	×
Kitajima et al.2001	OGTT +	Japan	146	3	r	0.01			0.990	SLR	6	×	×	×	×	×	×	√	×
Vinod et al.2011(1)	Normal weight	USA	69	3	Crude β	-46.40	-118.05	25.24	ND	SLR	6	×	×	×	×	×	×	×	×
Vinod et al.2011(2)	Overweight/obese	USA	70	3	Crude β	15.47	-89.10	120.03	ND	SLR	6	×	×	×	×	×	×	×	×
Sommer et al.2015	General	Norway	699	3	Crude β	-4.20	-39.40	31.00	ND	SLR	9	×	×	×	×	×	×	√	×
Sommer et al.2015	General	Norway	699	3	Adjusted β	-6.10	-37.50	25.20	ND	MLR	9	√	√	√	×	×	×	√	×
Mathews et al.2003	General	UK	537	3	Adjusted β	11.10	-18.00	40.30	ND	MLR	8	√	√	×	×	×	×	√	×
Ye et al.2015	non-GDM	China	1,243	3	Adjusted β	9.10	-6.40	24.60	ND	MLR	8	√	√	√	√	√	√	√	×

ID	Population	Countries	Sample size	Tri.	Reported measures	Effect size	Lower 95%CI	Upper 95%CI	p	Statistical methods	Quality	The control of confounding factors							
												a	b	c	d	e	f	g	h
Kulkarni et al.2013	non-GDM	India	631	3	Adjusted β	**54.34**	**24.85**	**83.88**	ND	MLR	8	×	√	√	√	×	×	√	×
Geraghty et al.2016	non-GDM	UK	331	3	Adjusted β	24.85	-9.39	59.09	ND	MLR	7	√	√	×	√	√	×	×	×
Couch et al.1998	General	USA	40	3	p	ND			>0.05	Pearson correlation	6	×	×	×	×	×	×	×	×
Ortega et al.1996	General	Spain	292	3	p	ND			>0.05	Student t test	5	×	×	×	×	×	×	√	×
Swierzewska et al.2015	General	Poland	136	3	p	ND			>0.05	MLR	5	ND	ND	ND	ND	ND	ND	×	ND
Emet et al.2013	General	Turkey	801	3	p	ND			0.616	Pearson correlation	5	×	×	×	×	×	×	×	×
Friis et al.2012	General	German	207	3	p	ND			>0.05	MLR	6	√	×	×	×	×	×	×	×
Retnakaran et al.2012	non-GDM	Canada	472	3	p				0.500	Analysis of variance for continuous variables	7	×	×	×	×	×	×	×	×
Schaefer-Graf et al.2011	non-GDM	German	190	3	p	ND			>0.05	Pearson correlation	5	×	×	×	×	×	×	√	×
Son et al.2010	GDM	Korea	104	3	p	ND			>0.05	ND	5	ND	ND	ND	ND	ND	ND	√	ND
Crume et al.2015	General	USA	804	3	ND	ND			ND	MLR	8	√	√	√	×	×	×	√	×
Slagjana et al.2014	non-GDM	Yugoslavia	200	3	ND	ND			ND	ND	5	ND	ND	ND	ND	ND	ND	×	ND
Olmos et al.2014	GDM	Chile	279	3	ND	ND			ND	ND	6	ND	ND	ND	ND	ND	ND	×	ND
Schaefer-Graf et al.2008	GDM	German	150	3	ND	ND			ND	Spearman correlation	5	×	×	×	×	×	×	×	×
Robin et al. 2007	General	American	957	2		Adjusted MD(g)			p	MLR	7	√	√	√	×	×	×	√	×
			High-TC group (n=100)			Ref group			Ref group										
			Mid-TC group(n=757)			29			0.47										
			Low-TC group(n=100)			-150			0.001										

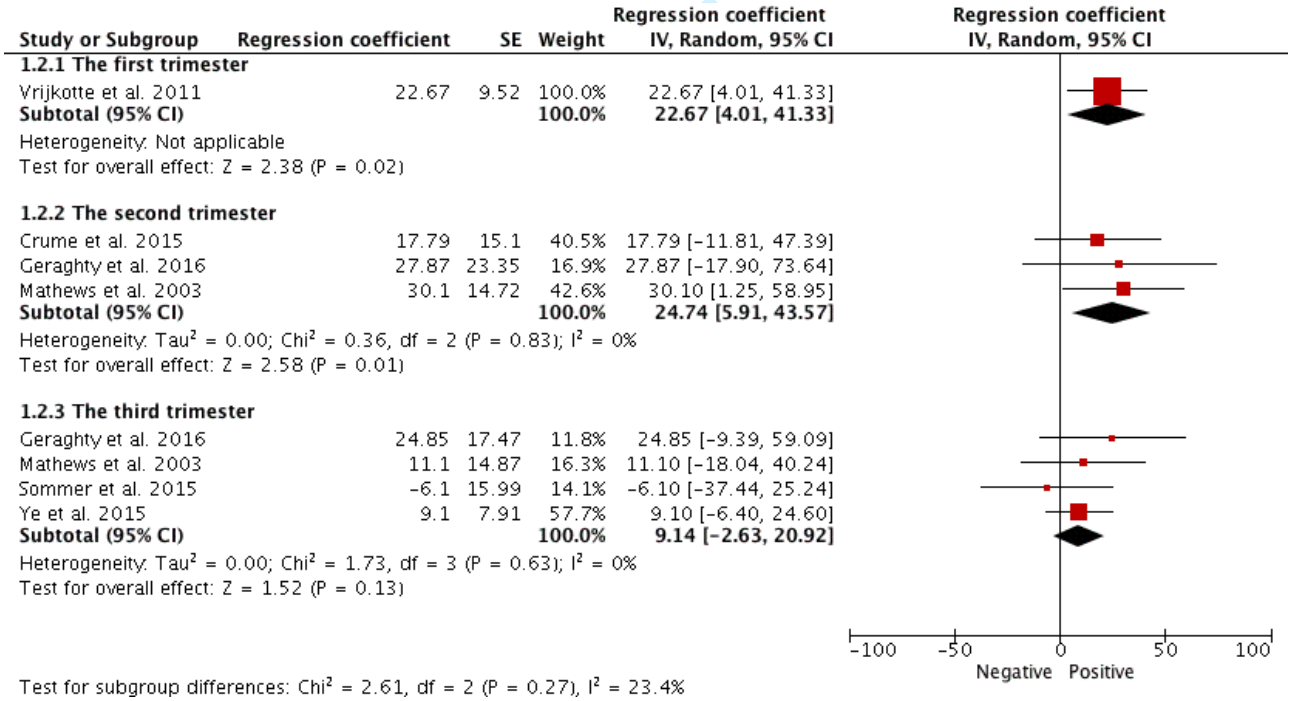
The bold font represents statistically significant results.
r: Correlation coefficients; β: regression coefficients.
Confounding factors: a. Gestational age; b. Neonatal gender; c. Maternal age; d. Pre-pregnancy BMI; e. Gestational weight gain; f. Maternal glucose level; g. pre-term birth; h. Maternal lipid levels.
Abbreviation: Trimesters(Tri.), Gestational diabetes mellitus(GDM), Positive screenes of Oral Glucose Tolerance test(OGTT+), Confidence interval(CI), Not documented(ND), Simple linear regression(SLR), Multiple linear regression(MLR), United Kingdom(UK), Mean difference(MD), Reference(Ref).

Meta-analysis

S7.1 Figure Overall meta-analysis of crude regression coefficients for the association between maternal TC levels and birthweight throughout pregnancy

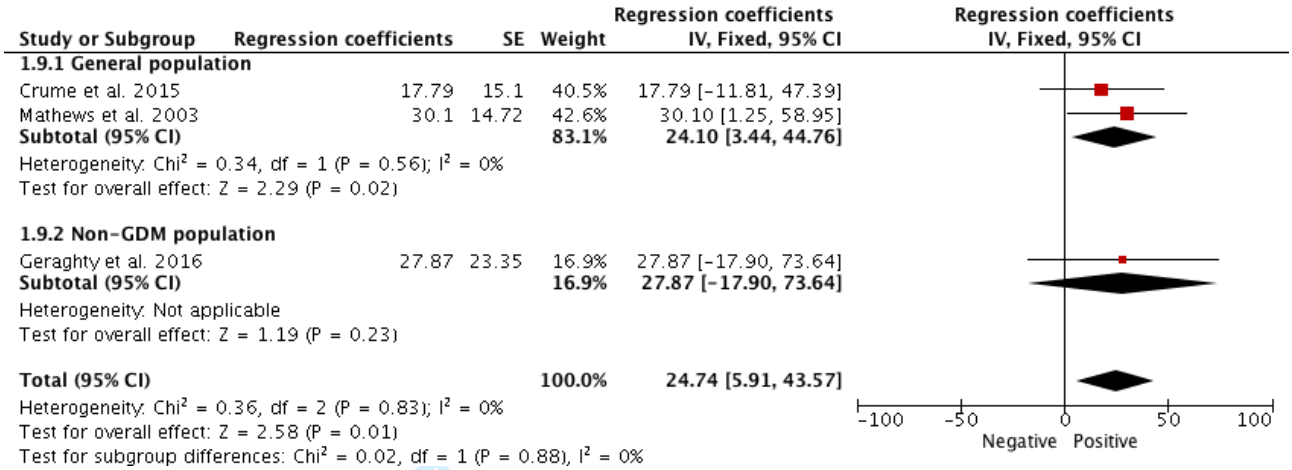


S7.2 Figure Overall meta-analysis of adjusted regression coefficients for the association between maternal TC levels and birthweight throughout pregnancy

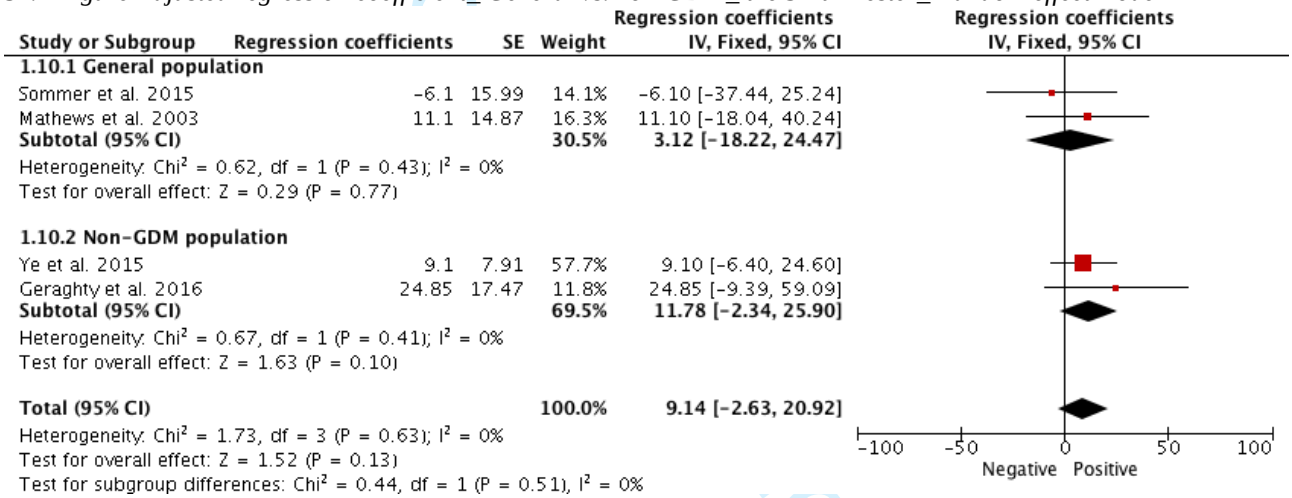


Subgroup analysis

S7.3 Figure Adjusted regression coefficient_ General vs. non-GDM_ the 2nd trimester_ Random effect model

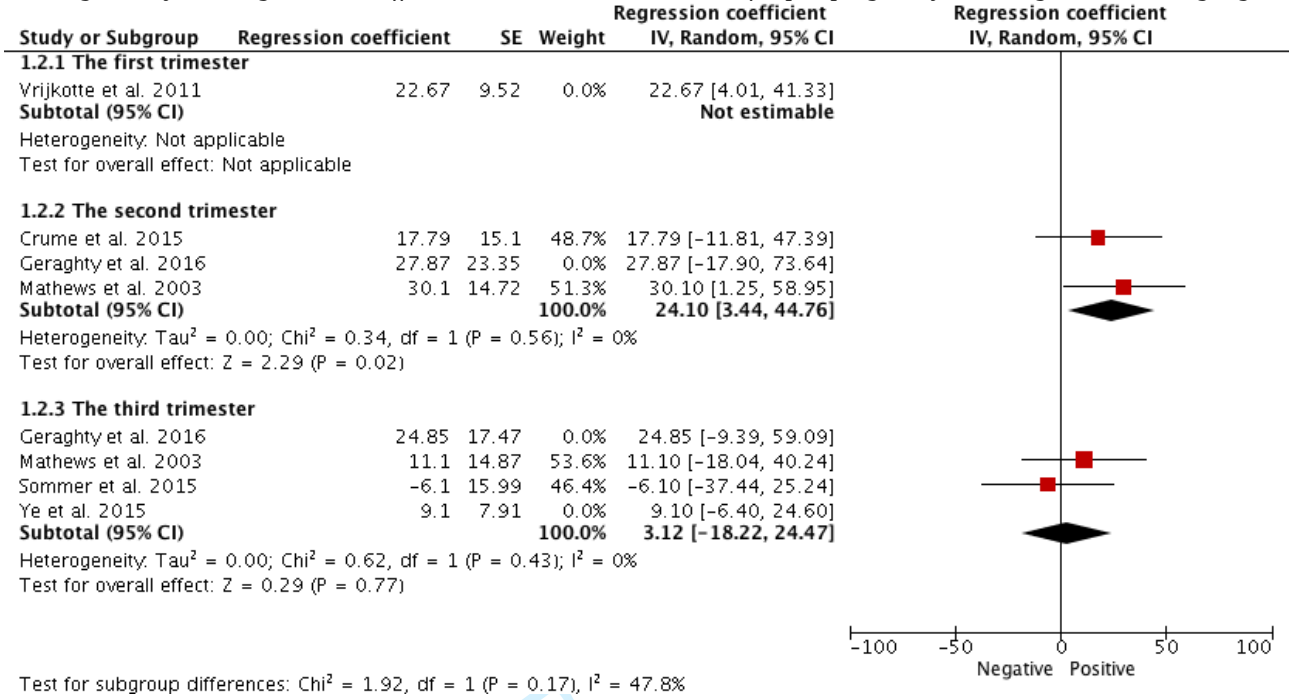


S7.4 Figure Adjusted regression coefficient_ General vs. non-GDM_ the 3rd trimester_ Random effect model

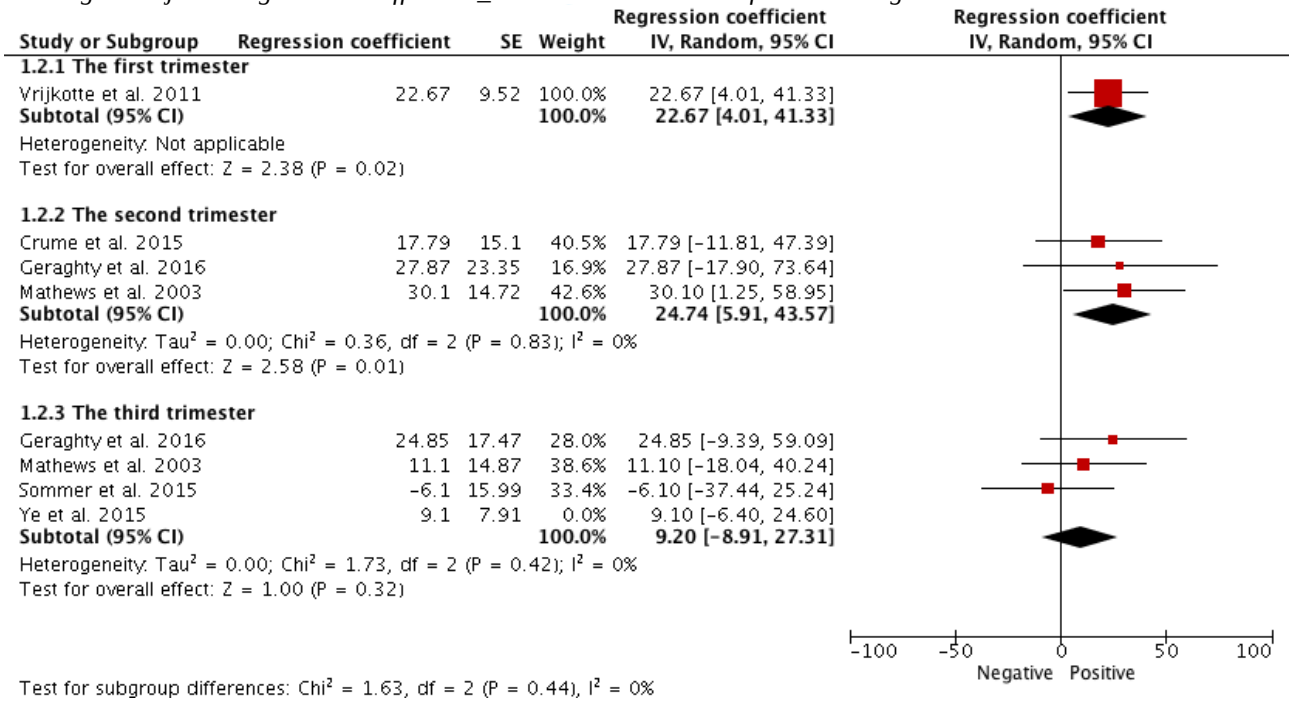


Sensitivity analysis

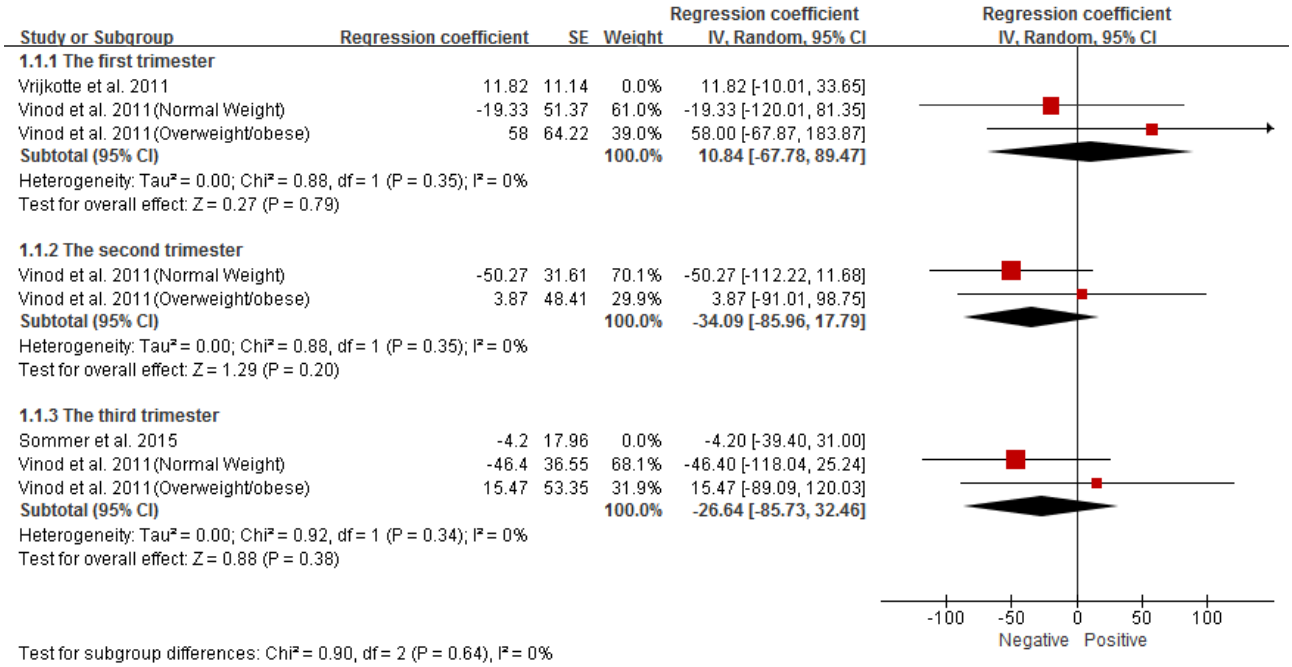
S7.5 Figure Adjusted regression coefficients_ exclude studies control for pre-pregnancy BMI or gestational weight gain



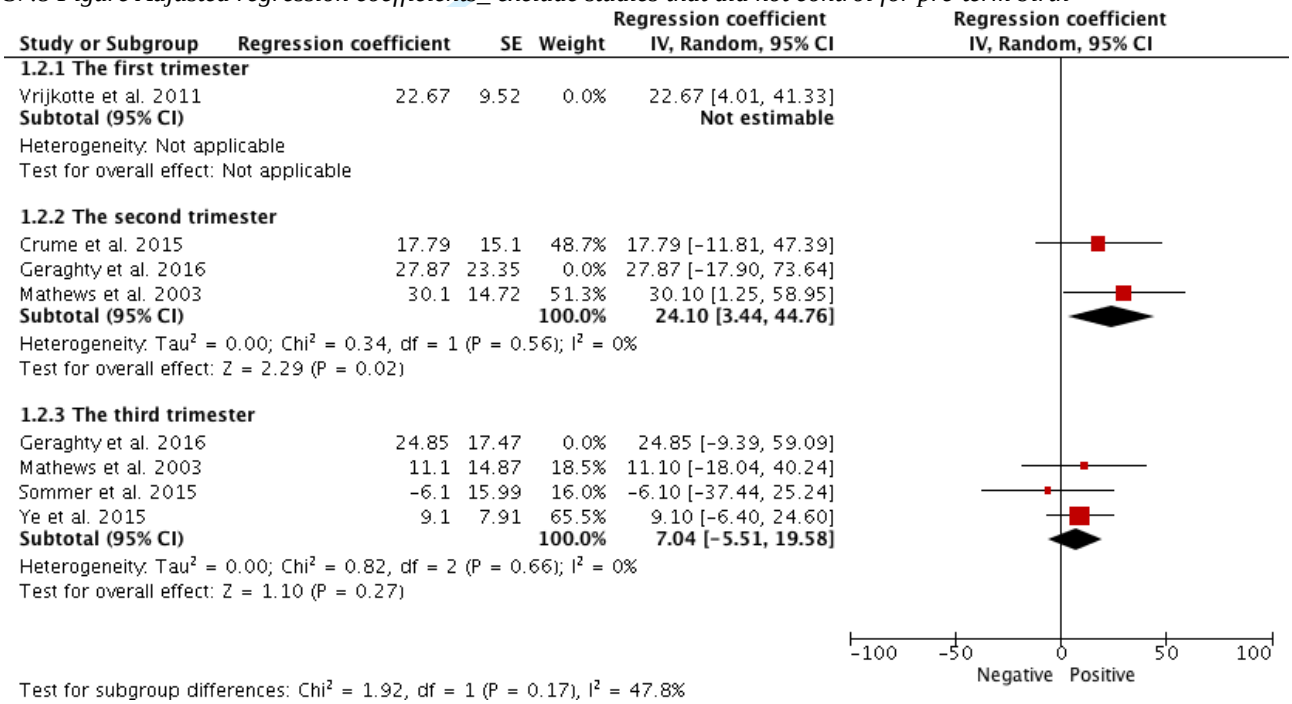
S7.6 Figure Adjusted regression coefficients_ exclude studies control for maternal glucose level



S7.7 Figure Crude regression coefficients_ exclude studies control for pre-term birth



S7.8 Figure Adjusted regression coefficients_ exclude studies that did not control for pre-term birth



High-Density lipoprotein Cholesterol (HDL-C)

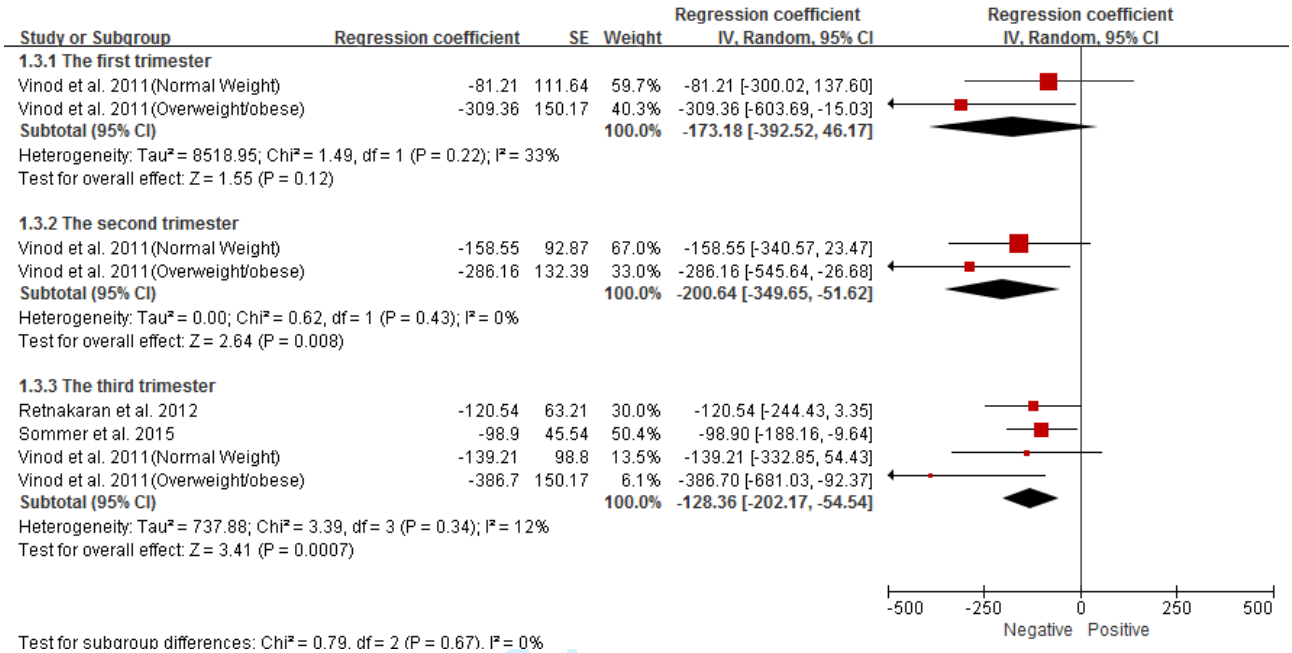
S7.3 Table Results summary of the association of maternal HDL-C level with birthweight

ID	Population	Countries	Sample size	Tri.	Reported measures	Effect size	Lower 95%CI	Upper 95%CI	p	Statistical methods	Quality	The control of confounding factors							
												a	b	C	d	e	f	g	h
Vinod et al.2011(1)	normal weight	USA	65	1	Crude β	-81.21	-300.02	137.61	ND	SLR	6	×	×	×	×	×	×	×	×
Vinod et al.2011(2)	Overweight/obese	USA	71	1	Crude β	**-309.36**	**-603.69**	**-15.03**	ND	SLR	6	×	×	×	×	×	×	×	×
Wang et al.2015	General	China	636	2	r	**-0.12**			**0.010**	Partial correlation	6	√	√	×	×	×	×	×	×
Liu et al.2016	General	China	1,546	2	r	-0.01			0.701	Partial correlation	7	×	×	×	×	×	×	×	×
Vinod et al.2011(1)	Normal weight	USA	71	2	Crude β	-158.55	-340.57	23.48	ND	SLR	6	×	×	×	×	×	×	×	×
Vinod et al.2011(2)	Overweight/obese	USA	71	2	Crude β	**-286.16**	**-545.63**	**-26.68**	ND	SLR	6	×	×	×	×	×	×	×	×
Crume et al.2015	General	USA	804	2	Adjusted β	-20.88	-109.69	67.93	0.600	MLR	8	√	√	√	×	×	×	√	×
Kulkarni et al.2013	non-GDM	India	631	2	Adjusted β	17.57	-11.64	46.77	ND	MLR	8	×	√	√	√	×	×	√	×
Geraghty et al.2016	non-GDM	UK	331	2	Adjusted β	-1236.25	-3322.95	850.45	ND	MLR	7	√	√	×	√	√	×	×	×
Whyte et al. 2013	General	Ireland	189	2	ND	ND			ND	ND	6	ND	ND	ND	ND	ND	ND	×	ND
Di et al.2005	OGTT+	Italy	83	2	ND	ND			ND	ND	5	ND	ND	ND	ND	ND	ND	×	ND
Zawiejska et al. 2008	GDM	Poland	357	2	ND	ND			ND	ND	5	ND	ND	ND	ND	ND	ND	×	ND
Olmos et al.2014	GDM	Chile	279	2	ND	ND			ND	ND	6	ND	ND	ND	ND	ND	ND	×	ND
Knopp et al.1985	General	USA	248	3	r	-0.06			>0.05	Spearman correlation	7	√	√	×	×	×	×	√	×
Mossayebi et al.2014	General	Iran	154	3	r	**-0.47**			**<0.00**	Pearson correlation	5	×	×	×	×	×	×	√	×
Charles et al. 2016	General	Multiple	1062	3	r	**-0.139**			**<0.00**	Pearson correlation	4	×	×	×	×	×	×	×	×
Vinod et al.2011(1)	Normal weight	USA	69	3	Crude β	-139.21	-332.85	54.43	ND	SLR	6	×	×	×	×	×	×	×	×
Vinod et al.2011(2)	Overweight/obese	USA	70	3	Crude β	**-386.70**	**-681.03**	**-92.37**	ND	SLR	6	×	×	×	×	×	×	×	×
Sommer et al.2015	General	Norway	699	3	Crude β	**-98.90**	**-188.10**	**-9.60**	ND	SLR	9	×	×	×	×	×	×	√	×
Retnakaran et al.2012	non-GDM	Canada	472	3	Crude β	-120.54	-244.42	3.35	ND	SLR	7	×	×	×	×	×	×	√	×
Sommer et al.2015	General	Norway	699	3	Adjusted β	**-105.40**	**-183.80**	**-27.00**	ND	MLR	9	√	√	√	×	×	×	√	×
Friis et al.2012	General	German	207	3	Adjusted β	**-170.00**	**-329.00**	**-9.00**	**0.040**	MLR	6	√	×	×	×	×	×	×	×
Crume et al.2015	General	USA	804	3	Adjusted β	-43.31	-128.33	41.71	0.300	MLR	8	√	√	√	×	×	×	√	×
Retnakaran et al.2012	non-GDM	Canada	472	3	Adjusted β	-57.16	-189.42	75.09	ND	MLR	7	√	√	√	√	√	√	√	√
Kulkarni et al.2013	non-GDM	India	631	3	Adjusted β	-8.89	-38.72	20.95	ND	MLR	8	×	√	√	√	×	×	√	×
Ye et al.2015	non-GDM	China	1,243	3	Adjusted β	**-69.50**	**-110.00**	**-28.20**	ND	MLR	8	√	√	√	√	√	√	√	×
Geraghty et al.2016	non-GDM	UK	331	3	Adjusted β	30.00	-114.85	174.84	ND	MLR	7	√	√	×	√	√	×	×	×
Emet et al.2013	General	Turkey	801	3	p	ND			0.754	Pearson correlation	5	×	×	×	×	×	×	×	×
Couch et al.1998	General	USA	40	3	p	ND			>0.05	Pearson correlation	6	×	×	×	×	×	×	×	×
Swierzewska et	General	Poland	136	3	p	ND			>0.05	MLR	5	ND	ND	ND	ND	ND	ND	×	ND
Son et al.2010	GDM	Korea	104	3	p	ND			>0.05	ND	5	ND	ND	ND	ND	ND	ND	√	ND
Slagjana et al.2014	non-GDM	Yugoslavia	200	3	ND	ND			ND	ND	5	ND	ND	ND	ND	ND	ND	×	ND
Olmos et al.2014	GDM	Chile	279	3	ND	ND			ND	ND	6	ND	ND	ND	ND	ND	ND	×	ND

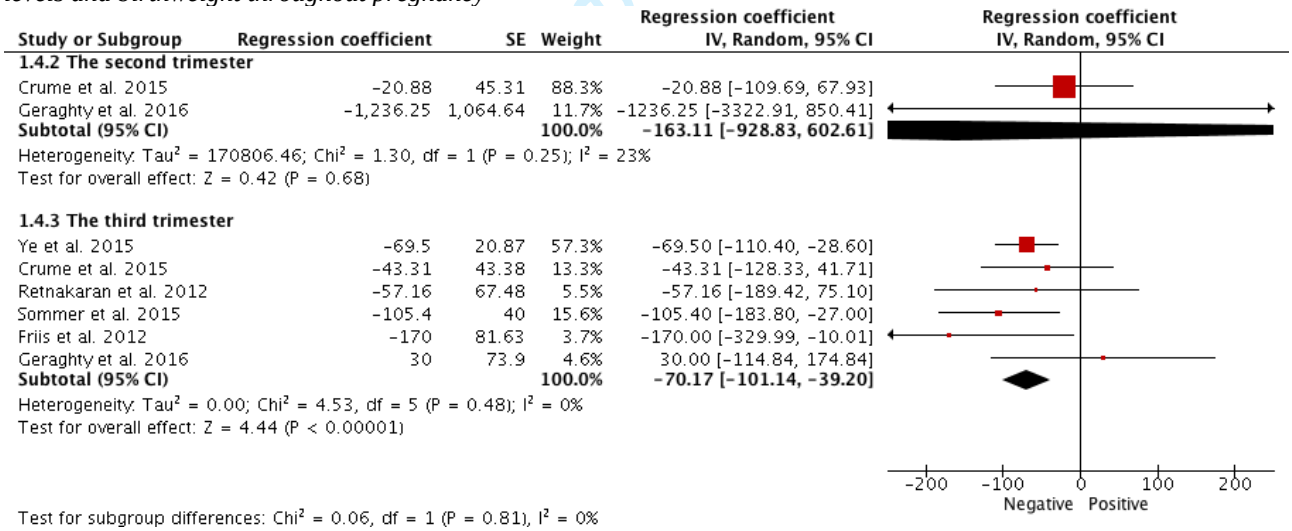
The bold font represents statistically significant results. r: Correlation coefficients; β: regression coefficients.
Confounding factors: a. Gestational age; b. Neonatal gender; c. Maternal age; d. Pre-pregnancy BMI; e. Gestational weight gain; f. Maternal glucose level; g. pre-term birth; h. Maternal lipid levels.
Abbreviation: Trimesters(Tri.), Gestational diabetes mellitus(GDM), Positive screenes of Oral Glucose Tolerance test(OGTT+), Confidence interval(CI), Not documented(ND), Simple linear regression(SLR), Multiple linear regression(MLR), United Kingdom(UK).

Meta-analysis

S7.9 Figure Overall meta-analysis of crude regression coefficients for the association between maternal HDL-C levels and birthweight throughout pregnancy

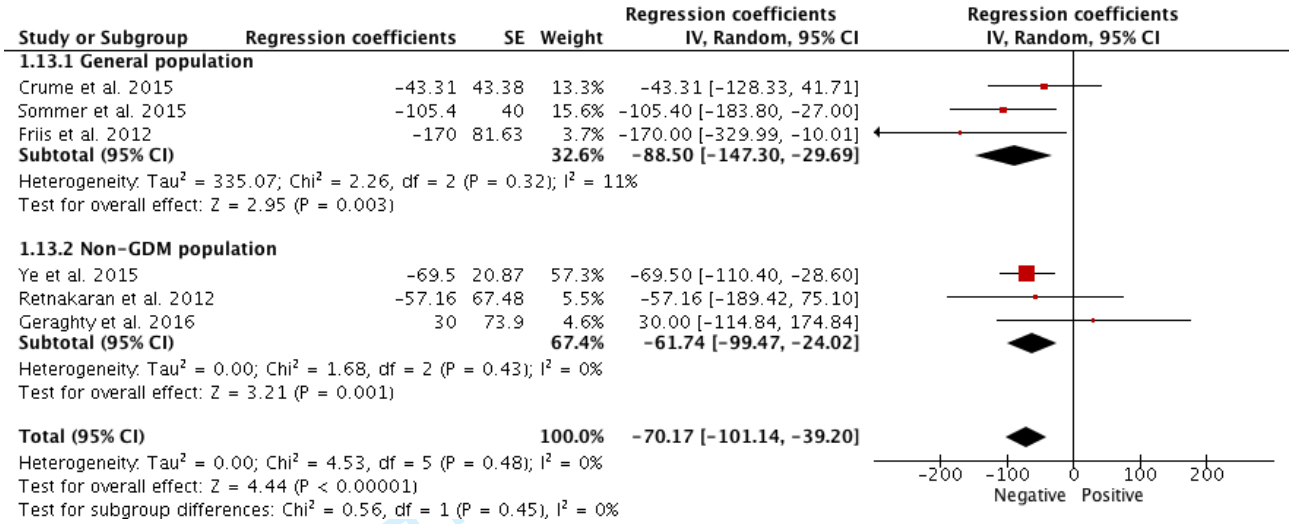


S7.10 Figure Overall meta-analysis of adjusted regression coefficients for the association between maternal HDL-C levels and birthweight throughout pregnancy



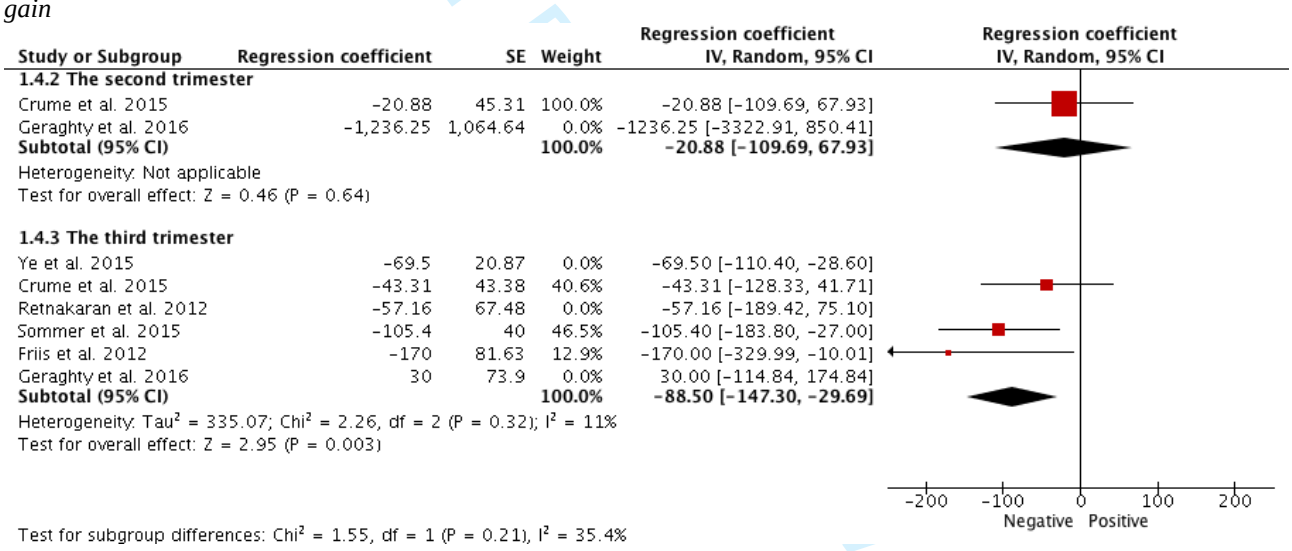
Subgroup analysis

S7.11 Figure Adjusted regression coefficient_ General vs. non-GDM_ the 3rd trimester_ Random effect model

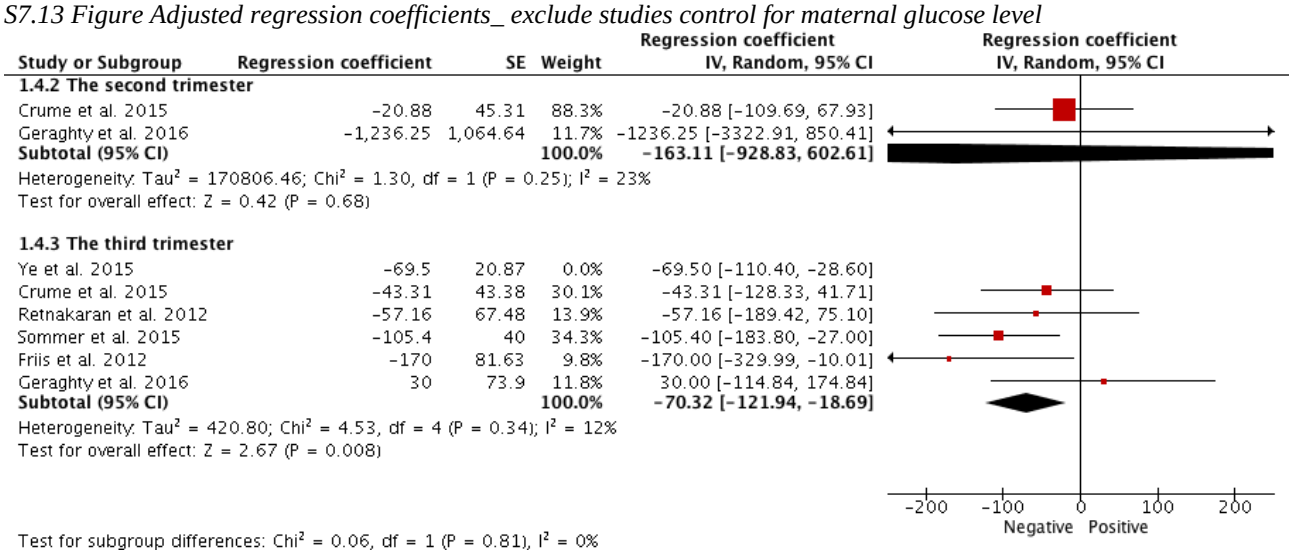


Sensitivity analysis

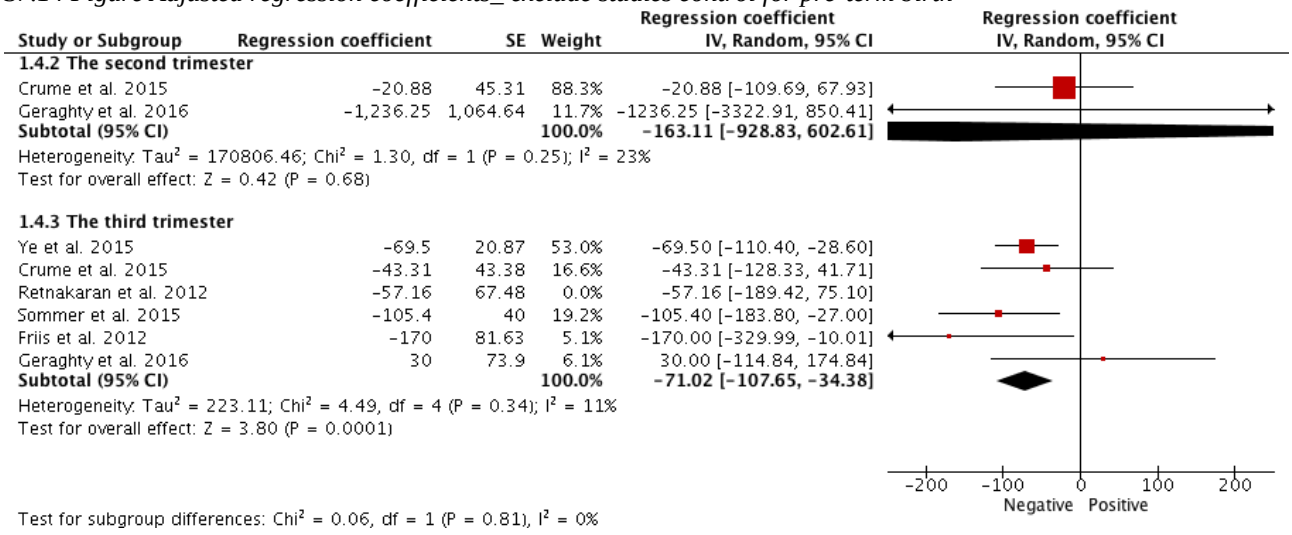
S7.12 Figure Adjusted regression coefficients_ exclude studies control for pre-pregnancy BMI or gestational weight gain



S7.13 Figure Adjusted regression coefficients_ exclude studies control for maternal glucose level



S7.14 Figure Adjusted regression coefficients_ exclude studies control for pre-term birth



Low-Density lipoprotein Cholesterol (LDL-C)

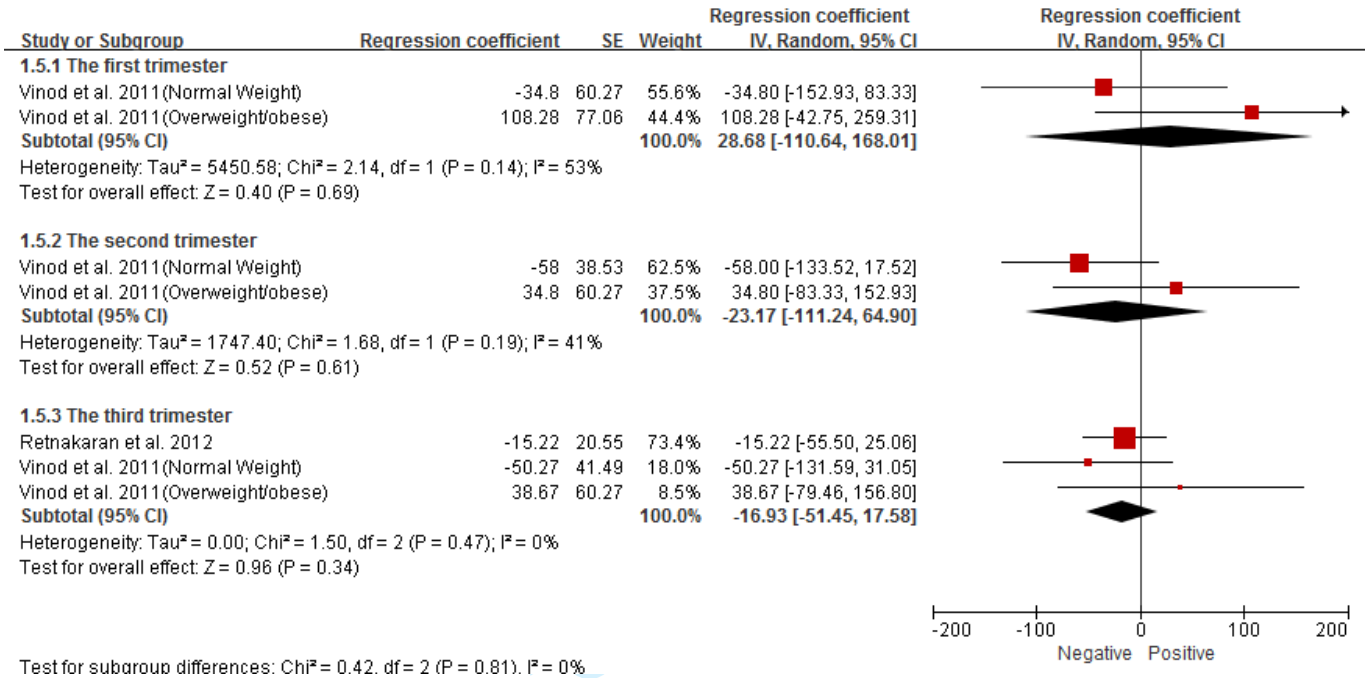
S7.4 Table Results summary of the association of maternal LDL-C level with birthweight

ID	Population	Countries	Sample size	Tri.	Reported measures	Effect size	Lower 95%CI	Upper 95%CI	p	Statistical methods	Quality	The control of confounding factors							
												A	b	c	d	e	f	g	h
Vinod et al.2011(1)	Normal weight	USA	65	1	Crude β	-34.80	-152.92	83.32	ND	SLR	6	×	×	×	×	×	×	×	×
Vinod et al.2011(2)	Overweight/obese	USA	71	1	Crude β	108.28	-42.76	259.31	ND	SLR	6	×	×	×	×	×	×	×	×
Liu et al.2016	General	China	1,546	2	r	-0.01			0.843	Partial correlation	7	×	×	×	×	×	×	×	×
Vinod et al.2011(1)	Normal weight	USA	71	2	Crude β	-58.00	-133.52	17.51	ND	SLR	6	×	×	×	×	×	×	×	×
Vinod et al.2011(2)	Overweight/obese	USA	71	2	Crude β	34.80	-83.32	152.92	ND	SLR	6	×	×	×	×	×	×	×	×
Geraghty et al.2016	non-GDM	UK	331	2	Adjusted β	18.39	-38.44	75.21	ND	MLR	7	√	√	×	√	√	×	×	×
Wang et al.2015	General	China	636	2	ND	ND			ND	Partial correlation	6	√	√	×	×	×	×	×	×
Whyte et al. 2013	General	Ireland	189	2	ND	ND			ND	ND	6	ND	ND	N	ND	ND	ND	×	ND
Di et al.2005	OGTT+	Italy	83	2	ND	ND			ND	ND	5	ND	ND	N	ND	ND	ND	√	ND
Olmos et al.2014	GDM	Chile	279	2	ND	ND			ND	ND	6	ND	ND	N	ND	ND	ND	×	ND
Knopp et al.1985	General	USA	248	3	r	0.01			>0.05	Spearman correlation	7	√	√	×	×	×	×	√	×
Mossayebi et al.2014	General	Iran	154	3	r	0.40			<0.001	Pearson correlation	5	×	×	×	×	×	×	√	×
Charles et al. 2016	General	Multiple	1062	3	r	**0.001**			**<0.0001**	Pearson correlation	4	×	×	×	×	×	×	×	×
Retnakaran et al.2012	non-GDM	Canada	472	3	Crude β	-15.22	-55.49	25.05	ND	SLR	7	×	×	×	×	×	×	√	×
Vinod et al.2011(1)	Normal weight	USA	69	3	Crude β	-50.27	-131.60	31.06	ND	SLR	6	×	×	×	×	×	×	×	×
Vinod et al.2011(2)	Overweight/obese	USA	70	3	Crude β	38.67	-79.45	156.79	ND	SLR	6	×	×	×	×	×	×	×	×
Ye et al.2015	non-GDM	China	1,243	3	Adjusted β	35.40	10.10	60.80	ND	MLR	8	√	√	√	√	√	√	√	×
Retnakaran et al.2012	non-GDM	Canada	472	3	Adjusted β	-6.79	-46.98	33.39	ND	MLR	7	√	√	√	√	√	√	√	√
Geraghty et al.2016	non-GDM	UK	331	3	Adjusted β	19.97	-24.34	64.27	ND	MLR	7	√	√	×	√	√	×	×	×
Emet et al.2013	General	Turkey	801	3	p	ND			0.440	Pearson correlation	5	×	×	×	×	×	×	×	×
Couch et al.1998	General	USA	40	3	p	ND			>0.05	Pearson correlation	6	×	×	×	×	×	×	×	×
Swierzewska et al.2015	General	Poland	136	3	p	ND			>0.05	MLR	5	ND	ND	N	ND	ND	ND	×	ND
Sommer et al.2015	General	Norway	699	3	ND	ND			ND	ND	9	ND	ND	N	ND	ND	ND	×	ND
Slagjana et al.2014	non-GDM	Yugoslavia	200	3	ND	ND			ND	ND	5	ND	ND	N	ND	ND	ND	×	ND
Son et al.2010	GDM	Korea	104	3	ND	ND			ND	ND	5	ND	ND	N	ND	ND	ND	√	ND
Olmos et al.2014	GDM	Chile	279	3	ND	ND			ND	ND	6	ND	ND	N	ND	ND	ND	×	ND

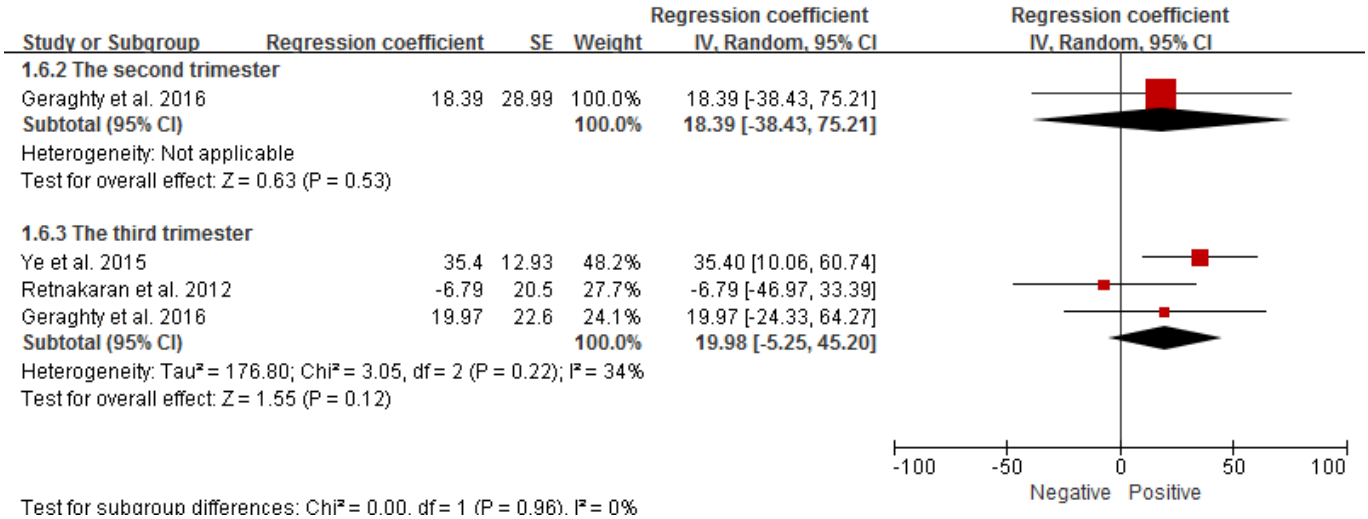
The bold font represents statistically significant results.
r: Correlation coefficients; β: regression coefficients.
Confounding factors: a. Gestational age; b. Neonatal gender; c. Maternal age; d. Pre-pregnancy BMI; e. Gestational weight gain; f. Maternal glucose level; g. pre-term birth; h. Maternal lipid levels.
Abbreviation: Trimesters(Tri.), Gestational diabetes mellitus(GDM), Positive screenes of Oral Glucose Tolerance test(OGTT+), Confidence interval(CI), Not documented(ND), Simple linear regression(SLR), Multiple linear regression(MLR), United Kingdom(UK).

Meta-analysis

S7.15 Figure Overall meta-analysis of crude regression coefficients for the association between maternal LDL-C levels and birthweight throughout pregnancy



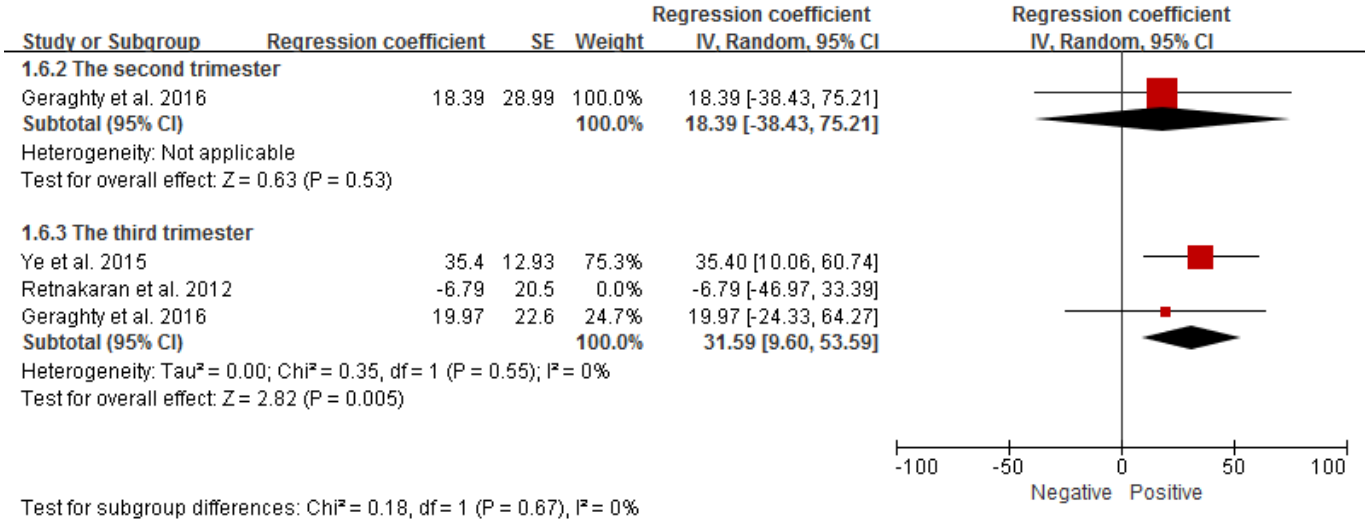
S7.16 Figure Overall meta-analysis of adjusted regression coefficients for the association between maternal LDL-C levels and birthweight throughout pregnancy



Sensitivity analysis

S7.17 Figure Adjusted regression coefficients_ exclude studies that did not control for pre-term birth

S7.18 Figure Adjusted regression coefficients_ exclude studies that did not control for other maternal lipid levels



Triglycerides (TG)

S7.5 Table Results summary of the association of maternal TG level with birthweight

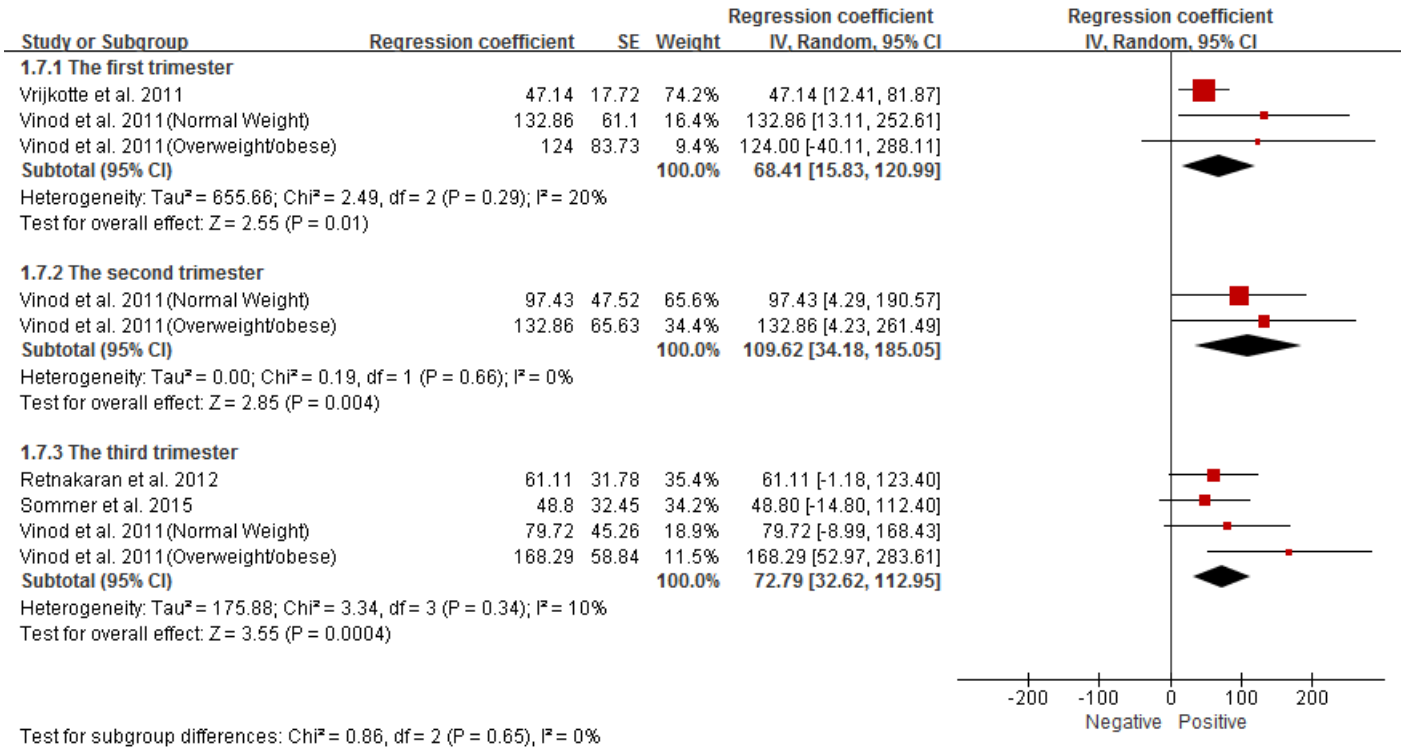
ID	Population	Countries	Sample size	Tri.	Reported measures	Effect size	Lower 95%CI	Upper 95%CI	p	Statistical methods	Quality	The control of confounding factors							
												a	b	c	d	e	f	g	h
Nolan et al.1995	General	Australia	388	1	r	**0.12**			**0.020**	Univariate analyses	6	√	√	×	×	×	×	×	×
Vinod et al.2011(1)	Normal weight	USA	65	1	Crude β	**132.86**	**13.11**	**252.62**	ND	SLR	6	×	×	×	×	×	×	×	×
Vinod et al.2011(2)	Overweight/obese	USA	71	1	Crude β	124.00	-40.10	288.11	ND	SLR	6	×	×	×	×	×	×	×	×
Vrijkotte et al.2011	General	Netherlands	2,052	1	Crude β	**47.14**	**12.42**	**81.87**	ND	Univariate analyses	8	√	√	×	×	×	×	√	×
Vrijkotte et al.2011	General	Netherlands	2,052	1	Adjusted β	**86.72**	**56.13**	**117.30**	ND	MLR	8	√	√	√	√	√	×	√	×
Harmon et al.2011	non-GDM	USA	38	1	p	ND			>0.05	Pearson correlation	5	×	×	×	×	×	×	×	×
Liu et al.2016	General	China	1,546	2	r	**0.10**			**<0.001**	Partial correlation	7	×	×	×	×	×	×	×	×
Wang et al.2015	General	China	636	2	r	**0.19**			**<0.01**	Partial correlation	6	√	√	×	×	×	×	×	×
Di et al.2005	OGTT+	Italy	83	2	r	**0.30**			**<0.05**	SLR	5	×	×	×	×	×	×	×	×
Zawiejska et al. 2008	GDM	Poland	357	2	r	**0.14**			**<0.01**	SLR	5	×	×	×	×	×	×	×	×
Vinod et al.2011(1)	Normal weight	USA	71	2	Crude β	**97.43**	**4.29**	**190.57**	ND	SLR	6	×	×	×	×	×	×	×	×
Vinod et al.2011(2)	Overweight/obese	USA	71	2	Crude β	**132.86**	**4.24**	**261.49**	ND	SLR	6	×	×	×	×	×	×	×	×
Crume et al.2015	General	USA	804	2	Adjusted β	7.97	-44.19	60.13	0.700	MLR	8	√	√	√	×	×	×	√	×
Kulkarni et al.2013	non-GDM	India	631	2	Adjusted β	14.76	-13.34	42.86	ND	MLR	8	×	√	√	√	×	×	√	×
Hwang et al.2015	non-GDM	Korea	1,011	2	Adjusted β^	**7125.42**	**1693.49**	**12557.35**	**0.002**	MLR	8	√	√	√	×	√	×	×	×
Whyte et al. 2013	General	Ireland	189	2	p	+			**<0.05**	SLR	6	×	×	×	×	×	×	×	×
Geraghty et al.2016	non-GDM	UK	331	2	p	ND			>0.1	MLR	7	√	√	×	√	√	×	×	×
Olmos et al.2014	GDM	Chile	279	2	ND	ND			ND	ND	6	ND	ND	ND	ND	ND	ND	×	ND
Mossayebi et al.2014	General	Iran	154	3	r	**0.68**			**<0.001**	Pearson correlation	5	×	×	×	×	×	×	√	×
Charles et al. 2016	General	Multiple	1062	3	r	**-0.014**			**<0.0001**	Pearson correlation	4	×	×	×	×	×	×	×	×
Son et al.2010	GDM	Korea	104	3	r	0.17			0.070	ND	5	×	×	×	×	×	×	√	×
Ahmad et al. 2006	non-GDM	Malaysia	246	3	r	0.12			0.057	Univariate analyses	6	√	×	×	×	×	×	√	×
Couch et al.1998(1)	non-GDM	USA	20	3	r	**0.46**			**<0.05**	Pearson correlation	6	×	×	×	×	×	×	×	×
Slagjana et al.2014	non-GDM	Yugoslavia	200	3	r	0.16			0.077	Correlation analysis	5	×	×	×	×	×	×	×	×
Olmos et al.2014(1)	GDM-normal weight	Chile	128	3	r	0.12			0.158	SLR	6	×	×	×	×	×	×	×	×
Olmos et al.2014(2)	GDM-overweight	Chile	105	3	r	**0.42**			**<0.001**	SLR	6	×	×	×	×	×	×	×	×
Olmos et al.2014(3)	GDM-obese	Chile	46	3	r	**0.47**			**<0.001**	SLR	6	×	×	×	×	×	×	×	×
Kitajima et al.2001	OGTT +	Japan	146	3	r	**0.22**			**0.009**	SLR	6	×	×	×	×	×	×	√	×

ID	Population	Countries	Sample size	Tri.	Reported measures	Effect size	Lower 95%CI	Upper 95%CI	p	Statistical methods	Quality	The control of confounding factors							
												a	b	c	d	e	f	g	h
Knopp et al.1992(1)	OGTT-	USA	521	3	r	**0.09**			**≤0.05**	Spearman correlation	6	×	×	×	×	×	×	×	×
Knopp et al.1992(2)	OGTT+ plus GDM	USA	264	3	r	**0.16**			**≤0.01**	Spearman correlation	6	×	×	×	×	×	×	×	×
Vinod et al.2011(1)	Normal weight	USA	69	3	Crude β	79.72	-8.99	168.42	ND	SLR	6	×	×	×	×	×	×	×	×
Vinod et al.2011(2)	Overweight/obese	USA	70	3	Crude β	**168.29**	**52.97**	**283.61**	ND	SLR	6	×	×	×	×	×	×	×	×
Sommer et al.2015	General	Norway	699	3	Crude β	48.80	-14.80	112.40	ND	SLR	9	×	×	×	×	×	×	√	×
Retnakaran et al.2012	non-GDM	Canada	472	3	Crude β	61.11	-1.18	123.40	ND	SLR	7	×	×	×	×	×	×	√	×
Sommer et al.2015	General	Norway	699	3	Adjusted β	**94.40**	**37.80**	**150.90**	ND	MLR	9	√	√	√	×	×	×	√	×
Retnakaran et al.2012	non-GDM	Canada	472	3	Adjusted β	-1.59	-70.67	67.49	ND	MLR	7	√	√	√	√	√	√	√	√
Brunner et al.2013	General	German	208	3	Adjusted β	-47.83	-138.75	43.09	>0.05	MLR	7	√	√	×	√	√	√	×	×
Friis et al.2012	General	German	207	3	Adjusted β	**94.00**	**2.00**	**187.00**	**0.046**	MLR	6	√	×	×	×	×	×	×	×
Mossayebi et al.2014	General	Iran	154	3	Adjusted β	**464.13**	**370.24**	**558.02**	ND	MLR	5	×	√	×	×	×	×	√	×
Crume et al.2015	General	USA	804	3	Adjusted β	17.71	-24.01	59.44	0.400	MLR	8	√	√	√	×	×	×	√	×
Geraghty et al.2016	non-GDM	UK	331	3	Adjusted β	**111.18**	**8.48**	**213.87**	ND	MLR	7	√	√	×	√	√	×	×	×
Ye et al.2015	non-GDM	China	1,243	3	Adjusted β	**25.20**	**7.90**	**42.60**	ND	MLR	8	√	√	√	√	√	√	√	×
Kulkarni et al.2013	non-GDM	India	631	3	Adjusted β	**36.27**	**4.32**	**68.23**	ND	MLR	8	×	√	√	√	×	×	√	×
Hwang et al.2015	non-GDM	Korea	1,011	3	Adjusted β^	**11609.12**	**6177.20**	**17041.05**	**<0.0001**	MLR	8	√	√	√	×	√	×	×	×
Swierzewska et al.2015	General	Poland	136	3	p	ND			>0.05	MLR	5	ND	ND	ND	ND	ND	ND	×	ND
Emet et al.2013	General	Turkey	801	3	p¶	+			**0.033**	Pearson correlation	5	×	×	×	×	×	×	×	×
Schaefer-Graf et al.2011	non-GDM	German	190	3	p	ND			>0.05	Pearson correlation	5	×	×	×	×	×	×	√	×
Couch et al.1998(2)	GDM	USA	20	3	p	ND			>0.05	Pearson correlation	6	×	×	×	×	×	×	×	×
Schaefer-Graf et al.2008	GDM	German	150	3	p	ND			>0.05	Spearman correlation	5	×	×	×	×	×	×	×	×

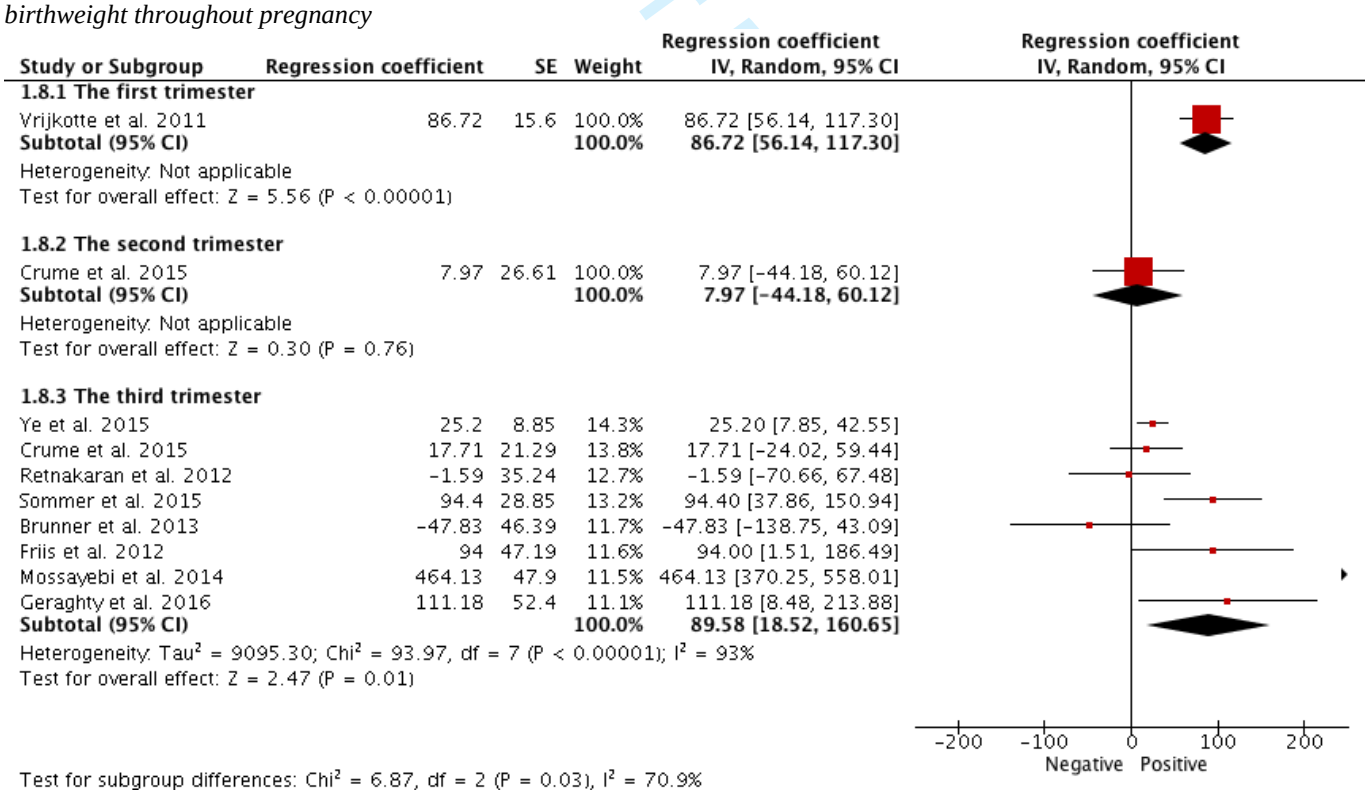
The bold font represents statistically significant results.
^ Maternal TG level was log-transformed
¶ Exposure of this study is change in maternal TG level from the first trimester to the third trimester
r: Correlation coefficients; β: regression coefficients.
Confounding factors: a. Gestational age; b. Neonatal gender; c. Maternal age; d. Pre-pregnancy BMI; e. Gestational weight gain; f. Maternal glucose level; g. pre-term birth; h. Maternal lipid levels.
Abbreviation: Trimesters(Tri.), Gestational diabetes mellitus(GDM), Positive screenes of Oral Glucose Tolerance test(OGTT+), Confidence interval(CI), Not documented(ND), Simple linear regression(SLR), Multiple linear regression(MLR), United Kingdom(UK).

Meta-analysis

S7.19 Figure Overall meta-analysis of crude regression coefficients for the association between maternal TG levels and birthweight throughout pregnancy

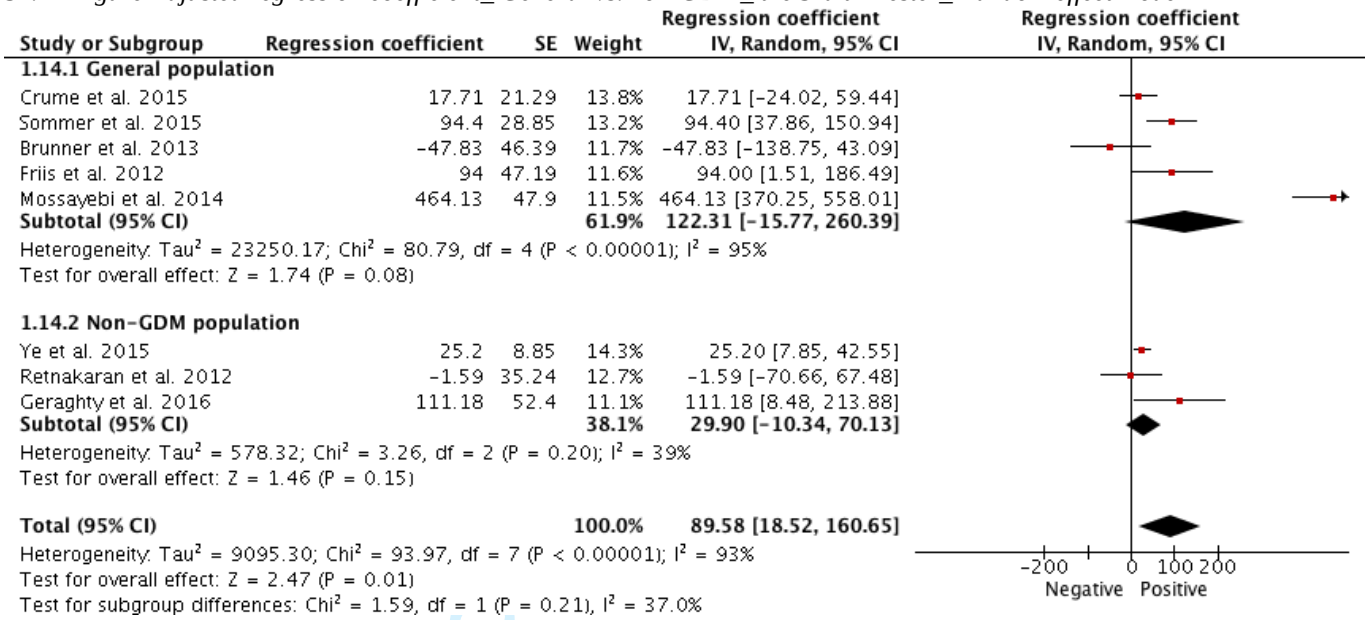


S7.20 Figure Overall meta-analysis of adjusted regression coefficients for the association between maternal TG levels and birthweight throughout pregnancy



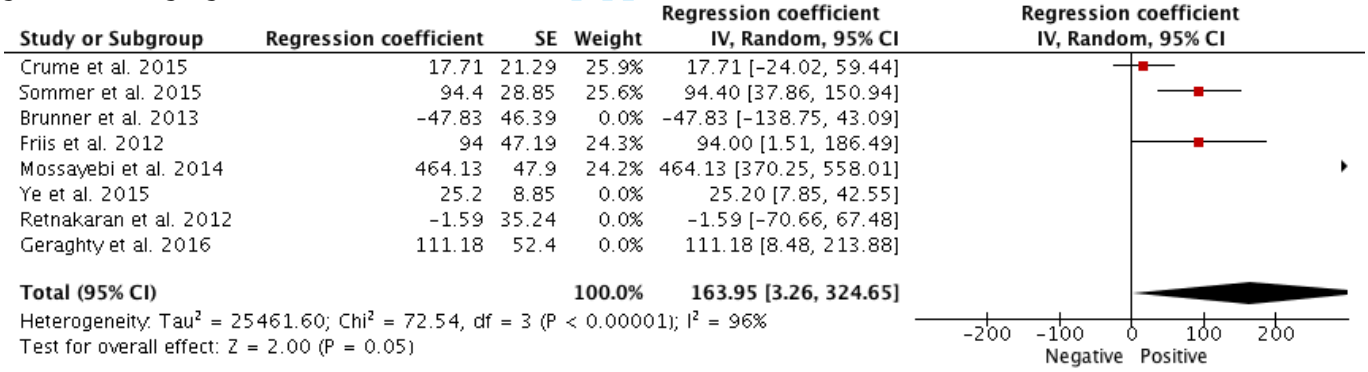
Subgroup analysis

S7.21 Figure Adjusted regression coefficient_ General vs. non-GDM_ the 3rd trimester_ Random effect model

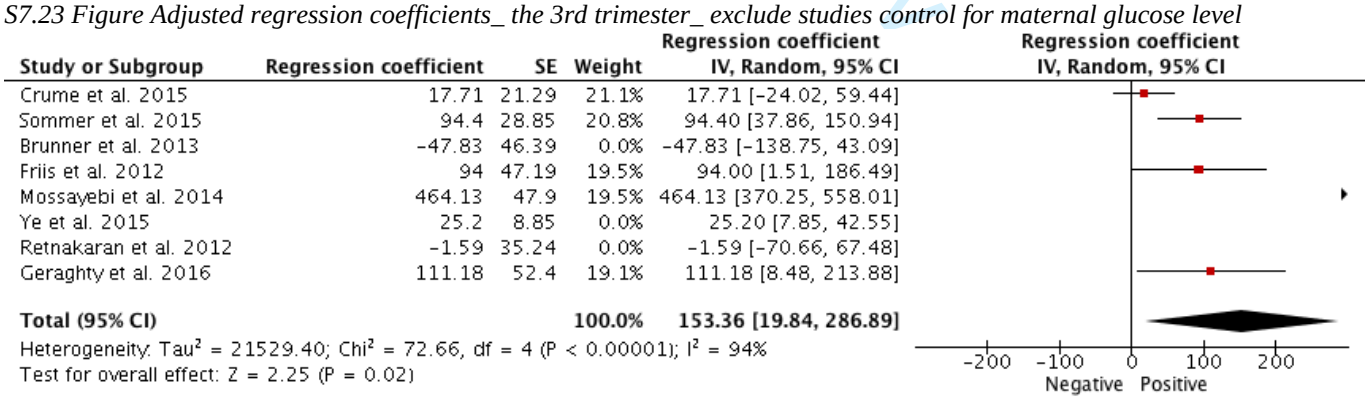


Sensitivity analysis

S7.22 Figure Adjusted regression coefficients_ the 3rd trimester_ exclude studies control for pre-pregnancy BMI or gestational weight gain



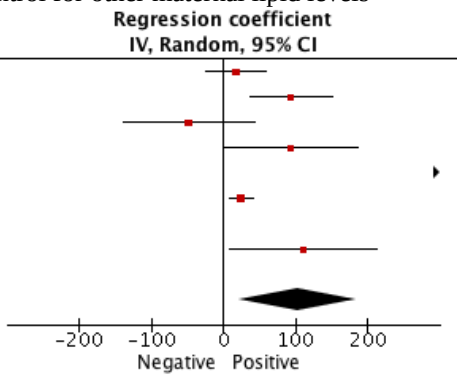
S7.23 Figure Adjusted regression coefficients_ the 3rd trimester_ exclude studies control for maternal glucose level



S7.24 Figure Adjusted regression coefficients_ the 3rd trimester_ exclude studies control for other maternal lipid levels

Study or Subgroup	Regression coefficient	SE	Weight	Regression coefficient IV, Random, 95% CI
Crume et al. 2015	17.71	21.29	15.6%	17.71 [-24.02, 59.44]
Sommer et al. 2015	94.4	28.85	15.1%	94.40 [37.86, 150.94]
Brunner et al. 2013	-47.83	46.39	13.5%	-47.83 [-138.75, 43.09]
Friis et al. 2012	94	47.19	13.4%	94.00 [1.51, 186.49]
Mossayebi et al. 2014	464.13	47.9	13.3%	464.13 [370.25, 558.01]
Ye et al. 2015	25.2	8.85	16.2%	25.20 [7.85, 42.55]
Retnakaran et al. 2012	-1.59	35.24	0.0%	-1.59 [-70.66, 67.48]
Geraghty et al. 2016	111.18	52.4	12.9%	111.18 [8.48, 213.88]
Total (95% CI)			**100.0%**	**103.46 [23.05, 183.88]**

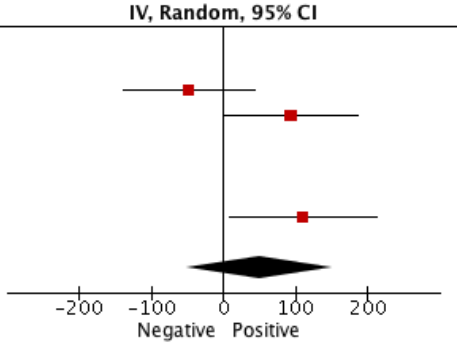
Heterogeneity: Tau² = 10326.69; Chi² = 92.56, df = 6 (P < 0.00001); I² = 94%
Test for overall effect: Z = 2.52 (P = 0.01)



S7.25 Figure Adjusted regression coefficients_ the 3rd trimester_ exclude studies control for pre-term birth

Study or Subgroup	Regression coefficient	SE	Weight	Regression coefficient IV, Random, 95% CI
Crume et al. 2015	17.71	21.29	0.0%	17.71 [-24.02, 59.44]
Sommer et al. 2015	94.4	28.85	0.0%	94.40 [37.86, 150.94]
Brunner et al. 2013	-47.83	46.39	34.3%	-47.83 [-138.75, 43.09]
Friis et al. 2012	94	47.19	33.9%	94.00 [1.51, 186.49]
Mossayebi et al. 2014	464.13	47.9	0.0%	464.13 [370.25, 558.01]
Ye et al. 2015	25.2	8.85	0.0%	25.20 [7.85, 42.55]
Retnakaran et al. 2012	-1.59	35.24	0.0%	-1.59 [-70.66, 67.48]
Geraghty et al. 2016	111.18	52.4	31.8%	111.18 [8.48, 213.88]
Total (95% CI)			**100.0%**	**50.87 [-49.57, 151.30]**

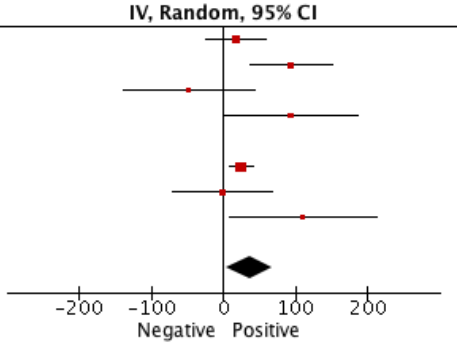
Heterogeneity: Tau² = 5511.94; Chi² = 6.67, df = 2 (P = 0.04); I² = 70%
Test for overall effect: Z = 0.99 (P = 0.32)



S7.26 Figure Adjusted regression coefficients_ the 3rd trimester_ exclude studies that did not control for gestational age

Study or Subgroup	Regression coefficient	SE	Weight	Regression coefficient IV, Random, 95% CI
Crume et al. 2015	17.71	21.29	19.9%	17.71 [-24.02, 59.44]
Sommer et al. 2015	94.4	28.85	15.4%	94.40 [37.86, 150.94]
Brunner et al. 2013	-47.83	46.39	8.6%	-47.83 [-138.75, 43.09]
Friis et al. 2012	94	47.19	8.4%	94.00 [1.51, 186.49]
Mossayebi et al. 2014	464.13	47.9	0.0%	464.13 [370.25, 558.01]
Ye et al. 2015	25.2	8.85	28.1%	25.20 [7.85, 42.55]
Retnakaran et al. 2012	-1.59	35.24	12.4%	-1.59 [-70.66, 67.48]
Geraghty et al. 2016	111.18	52.4	7.2%	111.18 [8.48, 213.88]
Total (95% CI)			**100.0%**	**36.72 [5.29, 68.14]**

Heterogeneity: Tau² = 836.05; Chi² = 13.46, df = 6 (P = 0.04); I² = 55%
Test for overall effect: Z = 2.29 (P = 0.02)



Free Fatty Acids (FFAs)

S7.6 Table Results summary of the association of maternal FFAs levels with birthweight

ID	Population	Countries	Sample size	Tri.	Reported measures	Effect size	Lower 95%CI	Upper 95%CI	p	Statistical methods	Quality	The control of confounding factors								FFAs' unit
												a	b	c	d	e	f	g	h	
Harmon et al.2011	non-GDM	USA	38	1	p	ND			>0.05	Pearson correlation	5	×	×	×	×	×	×	×	×	μEq/L
Crume et al.2015	General	USA	804	2	Adjusted β	0.06	-0.12	0.24	0.500	MLR	8	√	√	√	×	×	×	√	×	mg/dL
Crume et al.2015	General	USA	804	3	Adjusted β	**0.21**	**0.01**	**0.41**	**0.030**	MLR	8	√	√	√	×	×	×	√	×	mg/dL
Knopp et al.1985	General	USA	248	3	r	0.002			>0.05	Spearman correlation	7	√	√	×	×	×	×	√	×	μmol/L
Kitajima et al.2001	OGTT +	Japan	146	3	r	0.03			0.730	SLR	6	×	×	×	×	×	×	√	×	mEq/dL
Schaefer-Graf et al.2008	GDM	German	150	3	r	**0.27**			**0.002**	Spearman correlation	5	×	×	×	×	×	×	×	×	μmol/L
Couch et al.1998	General	USA	40	3	p	ND			>0.05	Pearson correlation	6	×	×	×	×	×	×	×	×	mg/dL
Friis et al.2012	General	German	207	3	p	ND			>0.05	MLR	6	√	×	×	×	×	×	×	×	ND
Schaefer-Graf et al.2011	non-GDM	German	190	3	p	ND			>0.05	Pearson correlation	5	×	×	×	×	×	×	√	×	μmol/L

The bold font represents statistically significant results.
r: Correlation coefficients; β: regression coefficients.
Confounding factors: a. Gestational age; b. Neonatal gender; c. Maternal age; d. Pre-pregnancy BMI; e. Gestational weight gain; f. Maternal glucose level; g. pre-term birth; h. Maternal lipid levels.
Abbreviation: Trimesters(Tri.), Gestational diabetes mellitus(GDM), Positive screenes of Oral Glucose Tolerance test(OGTT+), Confidence interval(CI), Not documented(ND), Simple linear regression(SLR), Multiple linear regression(MLR).

Very Low-density lipoprotein cholesterol (VLDL)

S7.7 Table Results summary of the association of maternal VLDL-C levels with birthweight

ID	Population	Countries	Sample size	Trimester	Reported measures	Effect size	p	Statistical methods	Quality	The control of confounding factors							
										a	b	c	d	e	f	g	h
Couch et al.1998	General	USA	40	3	p	ND	>0.05	Pearson correlation	6	×	×	×	×	×	×	×	×
Knopp et al.1985	General	USA	248	3	r	0.03	>0.05	Spearman correlation	7	√	√	×	×	×	×	√	×

r: Correlation coefficients
Confounding factors: a. Gestational age; b. Neonatal gender; c. Maternal age; d. Pre-pregnancy BMI; e. Gestational weight gain; f. Maternal glucose level; g. pre-term birth; h. Maternal lipid levels.
Abbreviation: Not documented(ND).

Supplementary 8 Data analysis for Large for gestational age

Total cholesterol (TC)

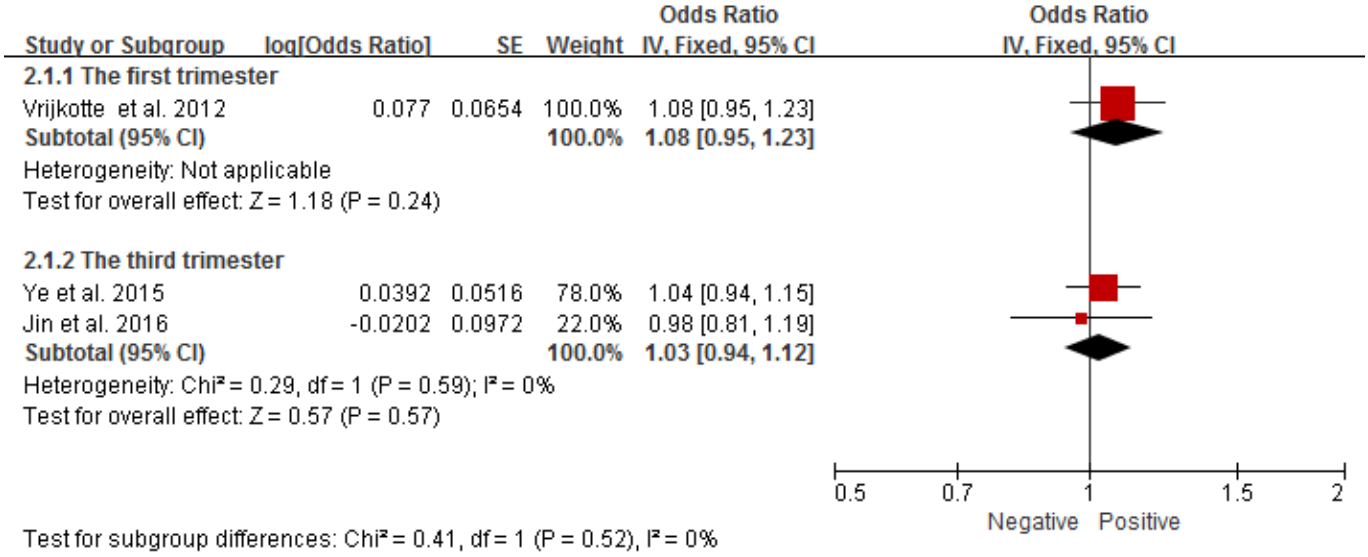
S8.1 Table Results summary of the association of maternal TC levels with LGA

Study ID	Population	Countries	Sample size	Trimesters	Reported measures	Effect size	Lower 95%CI	Upper 95%CI	p	Statistical methods	Quality	The control of confounding factors					
												a	b	c	d	e	f
Jin et al.2016	non-GDM	China	934	1	ND	ND			ND	ND	7	ND	ND	ND	ND	×	ND
Vrijkotte et al.2012	non-GDM	Netherlands	4,008	1	Crude OR	1.10	0.97	1.25	ND	Logistic regression	8	×	×	×	×	×	×
Vrijkotte et al.2012	non-GDM	Netherlands	4,008	1	Adjusted OR	1.08	0.95	1.22	ND	MLOR	8	√	√	×	×	×	×
Jin et al.2016	non-GDM	China	934	2	ND	ND			ND	ND	7	ND	ND	ND	ND	√	ND
Di et al.2005	OGTT+	Italy	83	2	ND	ND			ND	ND	5	ND	ND	ND	ND	×	ND
Mossayebi et al.2014	General	Iran	82	3	Crude OR*	**13.30**	**2.80**	**62.50**	ND	Chi-squared test	5	×	×	×	×	√	×
Mossayebi et al.2014	General	Iran	82	3	Adjusted OR*	1.10	0.20	8.10	ND	MLOR	5	√	√	×	√	√	√
Ye et al.2015	non-GDM	China	1,204	3	Adjusted OR	1.04	0.94	1.15	ND	MLOR	8	√	√	√	√	√	×
Jin et al.2016	non-GDM	China	934	3	Adjusted OR	0.98	0.81	1.11	0.715	MLOR	7	√	√	√	×	√	×
Hou et al.2014	non-GDM	China	2,790	3	Adjusted OR¶	1.08	0.75	1.56	ND	MLOR	7	√	√	×	×	√	×
Schaefer-Graf et al.2008	GDM	German	150	3	p	ND			>0.05	MLOR	5	√	√	√	√	×	×
Laleh et al.2013	GDM	Iran	112	3	p	ND			>0.05	ANCOVA	7	√	√	×	×	×	×
Kitajima et al.2001	OGTT +	Japan	146	3	ND	ND			ND	ND	6	ND	ND	ND	ND	√	ND
Retnakaran et al.2012	non-GDM	Canada	472	3	ND	ND			ND	ND	7	ND	ND	ND	ND	√	ND
Ahmad et al. 2006	non-GDM	Malaysia	246	3	ND	ND			ND	ND	6	ND	ND	ND	ND	√	ND
					mmol/L	***Reference***		***LGA***	**p**								
Slagjana et al.2014	non-GDM	Yugoslavia	200	3	$\bar{x} \pm SD$	6.5±1.4 (AGA)		6.0±1.0	>0.05	Student t test	5	×	×	×	×	×	×
Son et al.2010	GDM	Korea	104	3	$\bar{x} \pm SD$	5.8±1.1 (non-LGA)		5.5±0.9	0.352	Student t test	5	×	×	×	×	√	×
Hou et al.2014	non-GDM	China	2,790	3	Median (IQR)	6.30 (AGA) (5.62, 7.10)		6.18 (5.49,7.04)	**0.017**	Mann-Whitney U test	7	×	×	×	×	√	×

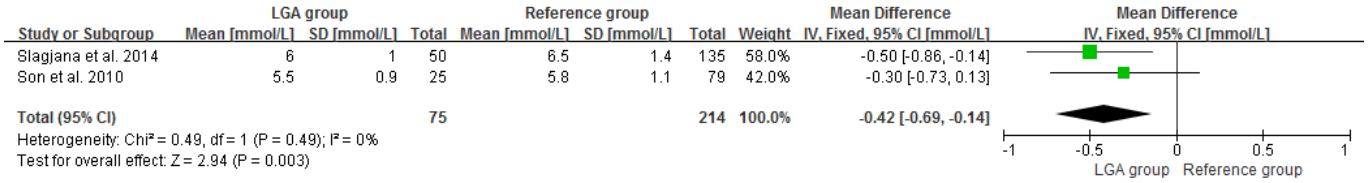
The bold font represents statistically significant results.
* Result was calculated by comparing the highest quartile with the lowest quartile maternal TC level
¶ Result was calculated by comparing the highest tertile with the lowest tertile maternal TC level
Confounding factors: a. Maternal age; b. Pre-pregnancy BMI; c. Gestational weight gain; d. Maternal glucose level; e. pre-term birth; f. Maternal lipid levels.
Abbreviation: Gestational diabetes mellitus(GDM), Positive screenes of Oral Glucose Tolerance test(OGTT+), Confidence interval(CI), Not documented(ND), Multiple logistic regression(MLOR), Analysis of covariance(ANCOVA), Standard deviation (SD), Interquartile range(IQR) and Appropriate for gestational age(AGA).

Meta-analysis

S8.1 Figure Meta-analysis of adjusted odds ratio for the association between maternal TC levels and LGA



S8.2 Figure Meta-analysis for mean difference of maternal TC levels between LGA and reference groups in the third trimester



High-density lipoprotein cholesterol (HDL-C)

S8.2 Table Results summary of the association of maternal HDL-C levels with LGA

Study ID	Countries	Population	Sample size	Trimesters	Reported measures	Effect size	Lower 95%CI	Upper 95%CI	p	Statistical methods	Quality	The control of confounding factors					
												a	b	c	d	e	f
Jin et al.2016	China	non-GDM	934	1	ND	ND			ND	ND	7	ND	ND	ND	ND	×	ND
Lei et al.2016	China	General	5,535	2	Crude OR^	**0.75**	**0.63**	**0.89**	ND	Logistic regression	6	×	×	×	×	×	×
Jin et al.2016	China	non-GDM	934	2	ND	ND			ND	ND	7	ND	ND	ND	ND	√	ND
Di et al.2005	Italy	OGTT+	83	2	ND	ND			ND	ND	5	ND	ND	ND	ND	×	ND
Mossayebi et al.2014	Iran	General	82	3	Crude OR*	**0.06**	**0.01**	**0.29**	ND	Chi-squared test	5	×	×	×	×	√	×
Retnakaran et al.2012	Canada	non-GDM	472	3	Crude OR	0.89	0.69	1.15	ND	Logistic regression	7	×	×	×	×	√	×
Ye et al.2015	China	non-GDM	1,204	3	Adjusted OR	**0.62**	**0.47**	**0.82**	ND	MLOR	8	√	√	√	√	√	×
Retnakaran et al.2012	Canada	non-GDM	472	3	Adjusted OR	0.99	0.70	1.39	ND	MLOR	7	√	√	√	√	√	√
Jin et al.2016	China	non-GDM	934	3	Adjusted OR	0.79	0.52	1.21	0.281	MLOR	7	√	√	√	×	√	×
Mossayebi et al.2014	Iran	General	82	3	Adjusted OR*	1.67	0.19	14.29	ND	MLOR	5	√	√	×	√	√	√
Hou et al.2014*	China	non-GDM	2,790	3	Adjusted OR¶	0.81	0.64	1.04	ND	MLOR	7	√	√	×	×	√	×
Laleh et al.2013	Iran	GDM	112	3	p	ND			>0.05	ANCOVA	7	√	√	×	×	×	×
					mmol/L	***Reference***		***LGA***									
Hou et al.2014	China	non-GDM	2,790	3	Median (IQR)	**1.76 (AGA) (1.52, 2.05)**		**1.70 (1.48, 1.95)**	**0.000**	Mann-Whitney U test	7	×	×	×	×	√	×
Slagjana et al.2014	Yugoslavia	non-GDM	200	3	$\bar{x}\pm$SD	**1.6±0.4(non-LGA)**		**1.3±0.4**	**0.001**	Student t test	5	×	×	×	×	×	×
Son et al.2010	Korea	GDM	104	3	$\bar{x}\pm$SD	1.7±0.5(non-LGA)		1.6±0.3	0.232	Student t test	5	×	×	×	×	√	×

The bold font represents statistically significant results.

^ Results was calculated with self-defined cut-off point: 1.3 mmol/L

* Result was calculated by comparing the highest quartile with the lowest quartile maternal HDL-C level

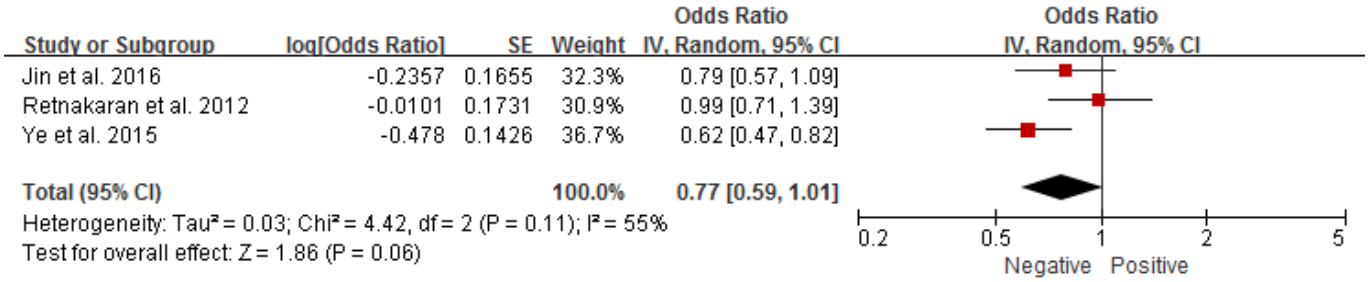
¶ Result was calculated by comparing the highest tertile with the lowest tertile maternal HDL-C level

Confounding factors: a. Maternal age; b. Pre-pregnancy BMI; c. Gestational weight gain; d. Maternal glucose level; e. pre-term birth; f. Maternal lipid levels.

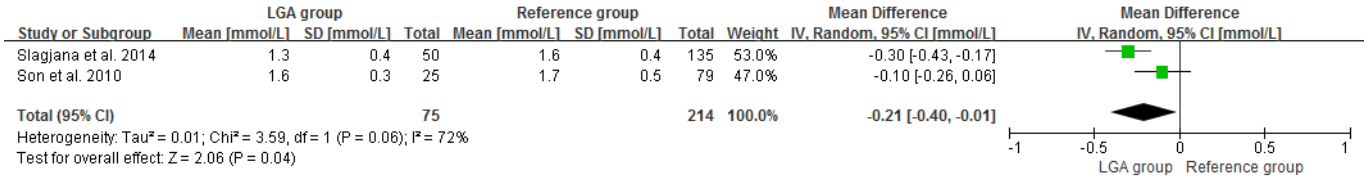
Abbreviation: Gestational diabetes mellitus(GDM), Positive screenes of Oral Glucose Tolerance test(OGTT+), Confidence interval(CI), Not documented(ND), Multiple logistic regression(MLOR), Analysis of covariance(ANCOVA), Standard deviation (SD), Interquartile range(IQR) and Appropriate for gestational age(AGA).

Meta-analysis

S8.3 Figure Meta-analysis of adjusted odds ratio for the association between maternal HDL-C levels and LGA in the third trimester

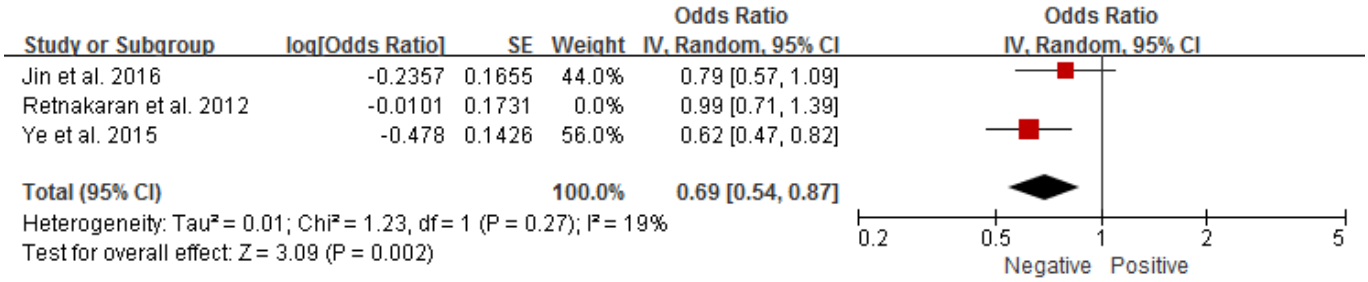


S8.4 Figure Meta-analysis for mean difference of maternal HDL-C levels between LGA and reference groups in the third trimester



Sensitivity analysis

S8.5 Figure Sensitivity analysis_ Adjusted odds ratio_ Exclude study adjust for other maternal lipid levels



Low-density lipoprotein cholesterol (LDL-C)

S8.3 Table Results summary of the association of maternal LDL-C levels with LGA

Study ID	Countries	Population	Sample size	Trimesters	Reported measures	Effect size	Lower 95%CI	Upper 95%CI	p	Statistical methods	Quality	The control of confounding factors					
												a	b	c	d	e	f
Jin et al.2016	China	non-GDM	934	1	ND	ND			ND	ND	7	ND	ND	ND	ND	×	ND
Jin et al.2016	China	non-GDM	934	2	ND	ND			ND	ND	7	ND	ND	ND	ND	√	ND
Di et al.2005	Italy	OGTT+	83	2	ND	ND			ND	ND	5	ND	ND	ND	ND	×	ND
Retnakaran et al.2012	Canada	non-GDM	472	3	Crude OR	0.80	0.61	1.05	ND	Logistic regression	7	×	×	×	×	√	×
Mossayebi et al.2014	Iran	General	82	3	Crude OR*	**5.80**	**1.50**	**22.60**	ND	Chi-squared test	5	×	×	×	×	√	×
Mossayebi et al.2014	Iran	General	77	3	Adjusted OR*	0.80	0.10	4.40	ND	MLOR	5	√	√	×	√	√	√
Hou et al.2014	China	non-GDM	2,790	3	Adjusted OR¶	0.83	0.59	1.17	ND	MLOR	7	√	√	×	×	√	×
Ye et al.2015	China	non-GDM	1,204	3	Adjusted OR	**1.25**	**1.06**	**1.47**	ND	MLOR	8	√	√	√	√	√	×
Jin et al.2016	China	non-GDM	934	3	Adjusted OR	0.93	0.78	1.11	0.418	MLOR	7	√	√	√	×	√	×
Retnakaran et al.2012	Canada	non-GDM	472	3	Adjusted OR	0.98	0.72	1.34	ND	MLOR	7	√	√	√	√	√	√
Laleh et al.2013	Iran	GDM	112	3	p	ND			>0.05	ANCOVA	7	√	√	×	×	×	×
Son et al.2010	Korea	GDM	104	3	ND	ND			ND	ND	5	ND	ND	ND	ND	√	ND
					mmol/L	***Reference***		***LGA***									
Hou et al.2014	China	non-GDM	2,790	3	Median (IQR)	**3.07 (AGA) (2.47, 3.74)**		**2.95 (2.30, 3.65)**	0.003	Mann-Whitney U test	7	×	×	×	×	√	×
Slagjana et al.2014	Yugoslavia	non-GDM	200	3	$\bar{x}\pm$SD	3.5±1.2		3.8±1.0	>0.05	Student t test	5	×	×	×	×	×	×

The bold font represents statistically significant results.

* Result was calculated by comparing the highest quartile with the lowest quartile maternal LDL-C level

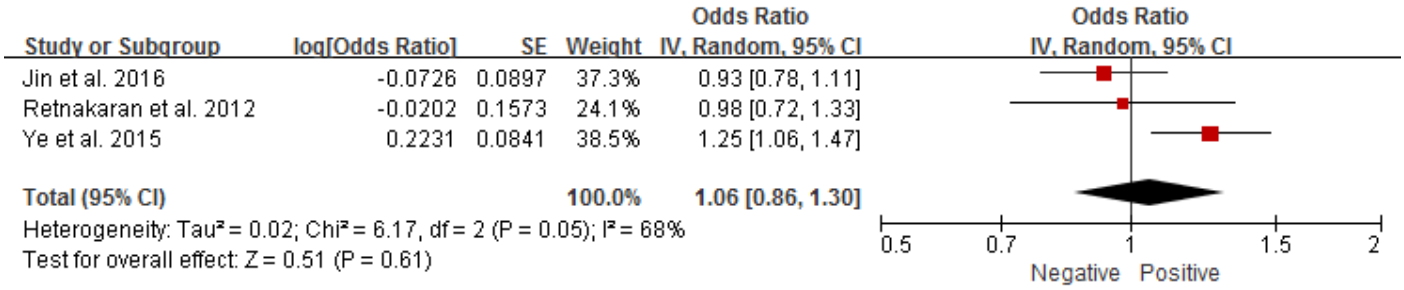
¶ Result was calculated by comparing the highest tertile with the lowest tertile maternal LDL-C level

Confounding factors: a. Maternal age; b. Pre-pregnancy BMI; c. Gestational weight gain; d. Maternal glucose level; e. pre-term birth; f. Maternal lipid levels.

Abbreviation: Gestational diabetes mellitus(GDM), Positive screenes of Oral Glucose Tolerance test(OGTT+), Confidence interval(CI), Not documented(ND), Multiple logistic regression(MLOR), Analysis of covariance(ANCOVA), Standard deviation (SD), Interquartile range(IQR) and Appropriate for gestational age(AGA).

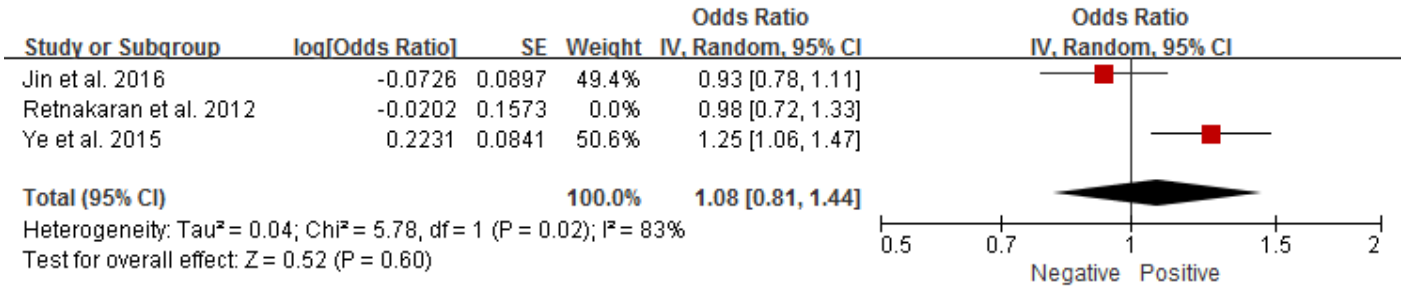
Meta-analysis

S8.4 Figure Meta-analysis of adjusted odds ratio for the association between maternal LDL-C levels and LGA in the third trimester



Sensitivity analysis

S8.5 Figure Sensitivity analysis _ Adjusted odds ratio _ The third trimester_ exclude studies adjust for other maternal lipid levels



Triglycerides (TG)

S8.4 Table Results summary of the association of maternal TG levels with LGA

Study ID	Countries	Population	Sample size	Trimesters	Reported measures	Effect size	Lower 95%CI	Upper 95%CI	P	Statistical methods	Quality	The control of confounding factors					
												a	b	c	d	e	f
Jin et al.2016	China	non-GDM	934	1	ND	ND			ND	ND	7	ND	ND	ND	ND	×	ND
Vrijkotte et al.2012	Netherlands	non-GDM	4,008	1	Adjusted OR	**1.48**	**1.23**	**1.78**	ND	MLOR	8	√	√	×	×	×	×
Vrijkotte et al.2012	Netherlands	non-GDM	4,008	1	Crude OR	**1.44**	**1.20**	**1.71**	ND	Logistic regression	8	×	×	×	×	×	×
Lei et al.2016	China	General	5,535	2	Crude OR^	**1.60**	**1.42**	**2.01**	ND	Logistic regression	6	×	×	×	×	×	×
Di et al.2005	Italy	OGTT+	83	2	Crude OR^	5.60	0.93	33.77	ND	Chi-squared test	5	×	×	×	×	×	×
Jin et al.2016	China	non-GDM	934	2	ND	ND			ND	ND	7	ND	ND	ND	ND	√	ND
Retnakaran et al.2012	Canada	non-GDM	472	3	Crude OR	1.26	0.98	1.62	ND	Logistic regression	7	×	×	×	×	√	×
Ahmad et al. 2006	Malaysia	non-GDM	246	3	Crude OR^	**3.07**	**1.33**	**7.08**	ND	Chi-squared test	6	×	×	×	×	√	×
Kitajima et al.2001	Japan	OGTT +	146	3	Crude OR^	**14.80**	**1.59**	**137.28**	**0.012**	Chi-squared test	6	×	×	×	×	√	×
Mossayebi et al.2014	Iran	General	154	3	Adjusted OR	**1.04**	**1.02**	**1.05**	ND	MLOR	5	√	√	×	√	√	√
Ye et al.2015	China	non-GDM	1,204	3	Adjusted OR	**1.15**	**1.03**	**1.27**	ND	MLOR	8	√	√	√	√	√	×
Retnakaran et al.2012	Canada	non-GDM	472	3	Adjusted OR	0.98	0.70	1.38	ND	MLOR	7	√	√	√	√	√	√
Jin et al.2016	China	non-GDM	934	3	Adjusted OR	**1.13**	**1.02**	**1.26**	**0.025**	MLOR	7	√	√	√	×	√	×
Hou et al.2014	China	non-GDM	2,790	3	Adjusted OR¶	**3.30**	**1.18**	**9.27**	ND	MLOR	7	√	√	×	×	√	×
Ahmad et al. 2006	Malaysia	non-GDM	246	3	Adjusted OR^	**1.48**	**1.15**	**1.93**	ND	MLOR	6	×	√	×	√	√	×
Kitajima et al.2001	Japan	OGTT +	146	3	Adjusted OR^	**11.60**	**1.10**	**122.00**	**0.040**	MLOR	6	×	×	×	×	√	×
Son et al.2010	Korea	GDM	104	3	Adjusted OR^	**4.43**	**1.33**	**14.82**	ND	MLOR	5	√	√	√	×	√	×
Schaefer-Graf et al.2008	German	GDM	150	3	p	**ND**			**0.040**	MLOR	5	√	√	√	√	×	×
Laleh et al.2013	Iran	GDM	112	3	p	+			**0.040**	ANCOVA	7	√	√	×	×	×	×
					mmol/L	***Reference***		***LGA***									
Hou et al.2014	China	non-GDM	2,790	3	Median (IQR)	**3.02 (AGA) (2.48, 3.69)**		**3.19 (2.61, 3.97)**	**0.000**	Mann-Whitney U test	7	×	×	×	×	√	×
Slagjana et al.2014	Yugoslavia	non-GDM	200	3	$\bar{x}\pm$SD	**3.1±1.1**		**3.8±1.8**	**0.012**	Student t test	5	×	×	×	×	×	×

The bold font represents statistically significant results.

^ Results was calculated with self-defined cut-off point: Lei et al.2016, 3.49 mmol/L; Di et al.2005, 2.30mmol/L; Ahmad et al. 2006, 2.78mmol/L; Kitajima et al. 2001, 2.92 mmol/L; Son et al. 2010, 3.33mmol/L.

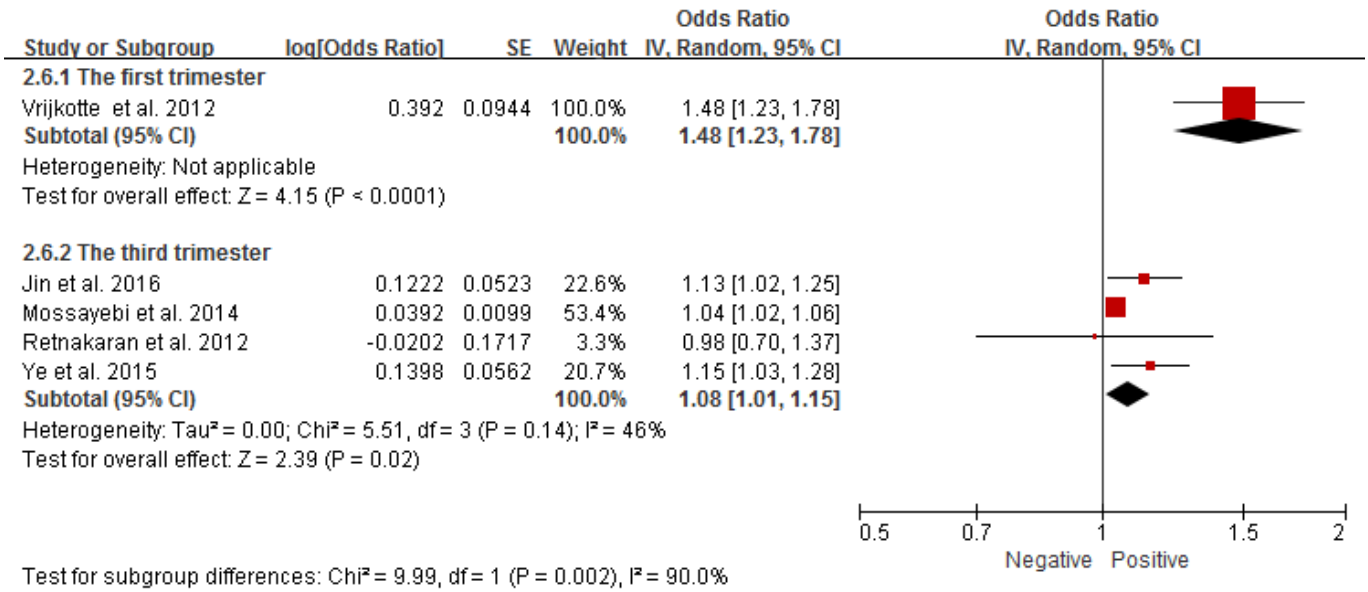
¶ Result was calculated by comparing the highest tertile with the lowest tertile maternal TG level

Confounding factors: a. Maternal age; b. Pre-pregnancy BMI; c. Gestational weight gain; d. Maternal glucose level; e. pre-term birth; f. Maternal lipid levels.

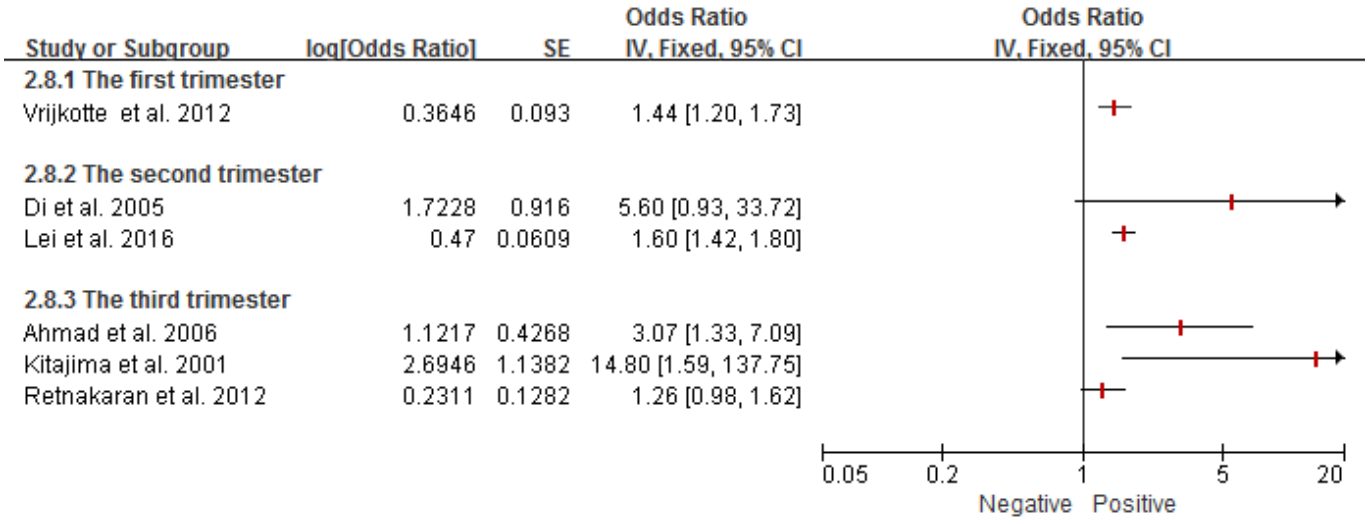
Abbreviation: Gestational diabetes mellitus(GDM), Positive screenes of Oral Glucose Tolerance test(OGTT+), Confidence interval(CI), Not documented(ND), Multiple logistic regression(MLOR), Analysis of covariance(ANCOVA), Standard deviation (SD), Interquartile range(IQR) and Appropriate for gestational age(AGA).

Meta-analysis

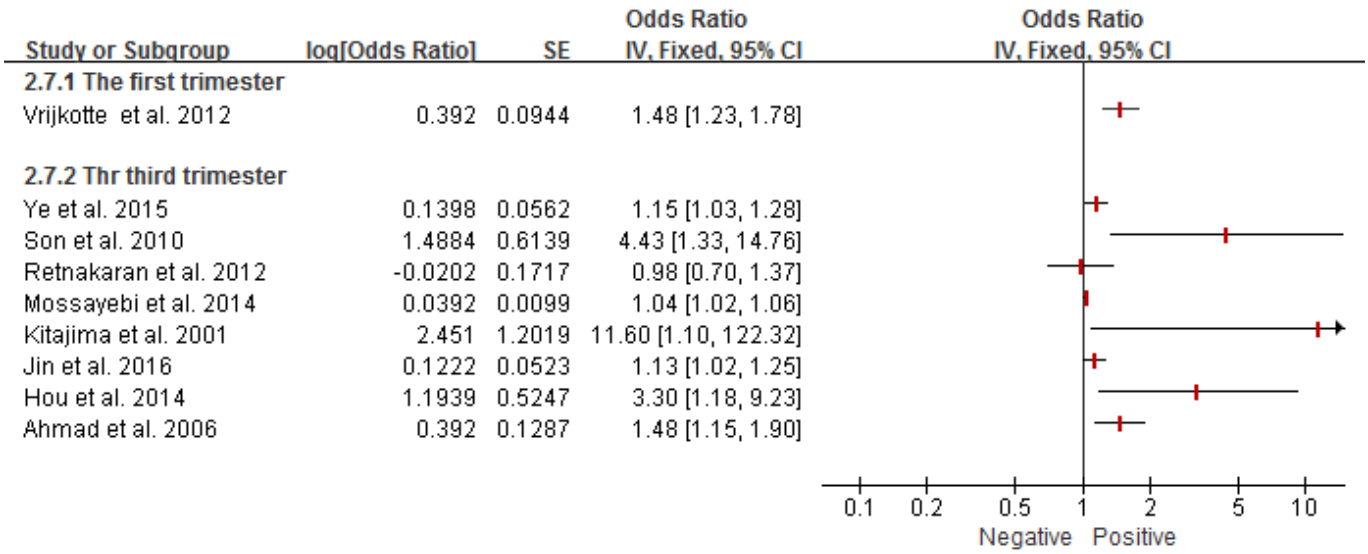
S8.6 Figure Meta-analysis of adjusted odds ratio for the association between maternal TG levels and LGA throughout pregnancy



S8.7 Figure Forest plots of crude odds ratio for the association between maternal TG levels and LGA throughout pregnancy

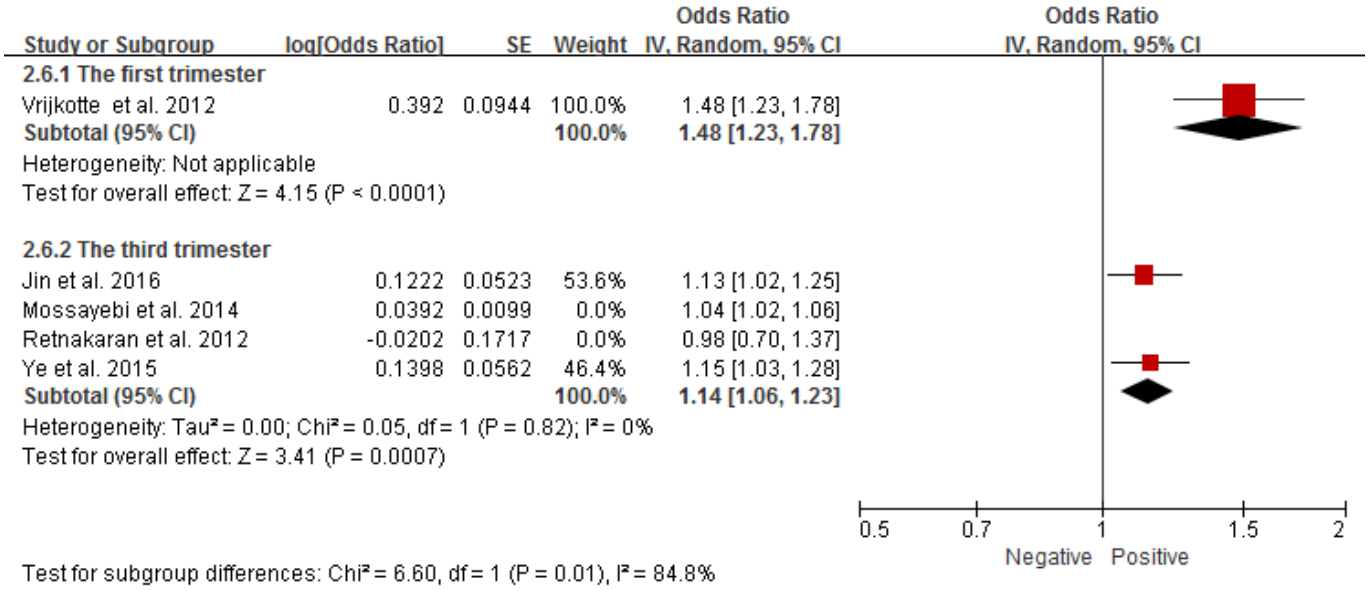


S8.8 Figure Forest plots of adjusted odds ratio for the association between maternal TG levels and LGA throughout pregnancy



Sensitivity ananlysis

S8.9 Figure Sensitivity analysis_ Exclude studies adjust for other maternal lipid levels



Free fatty acids (FFAs)

S8.5 Table Results summary of the association of maternal FFAs levels with LGA

Study ID	Countries	Population	Sample size	Trimesters	Reported measures	Effect size	p	Statistical methods	Quality	The control of confounding factors						Unit
										a	b	c	d	e	f	
Schaefer-Graf et al.2008	German	GDM	150	3	p	**ND**	**0.008**	MLOR	5	√	√	√	√	×	×	μmol/L
Kitajima et al.2001	Japan	OGTT +	146	3	ND	ND	ND	ND	6	×	×	×	×	√	×	ND

Supplementary 9 Data analysis for Small for gestational age (SGA)

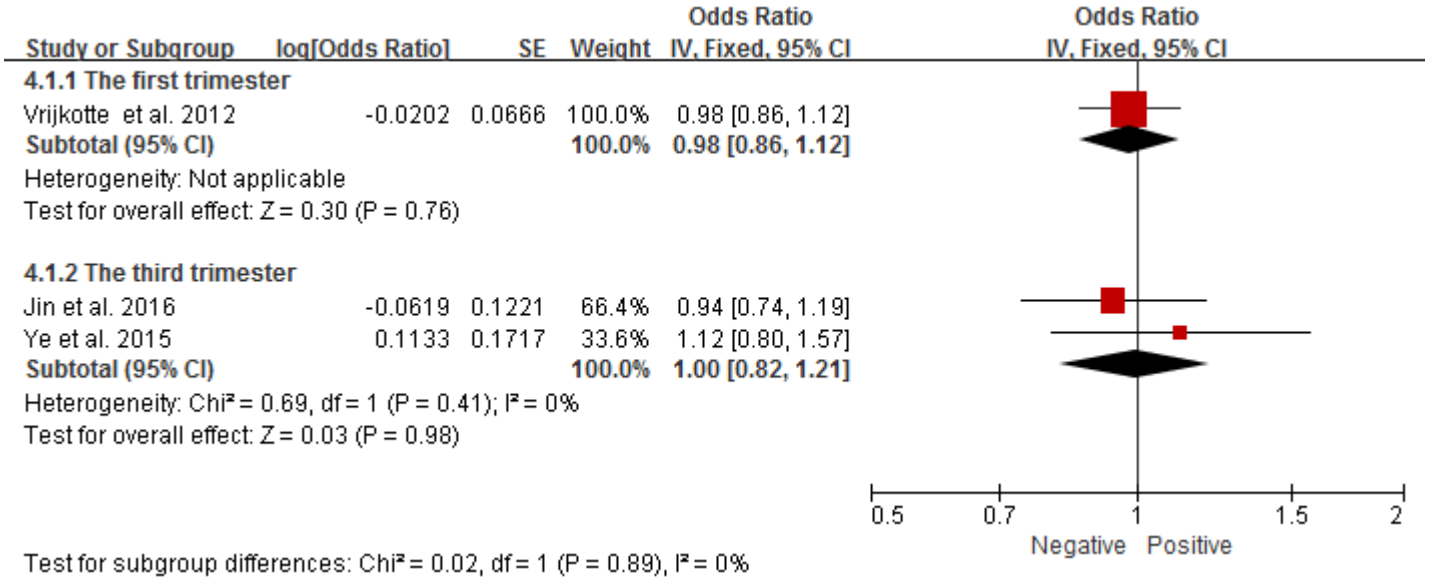
Total cholesterol (TC)

S9.1 Table Results summary of the association of maternal TC levels with SGA

Study ID	Countries	Population	Sample size	Trimesters	Reported measures	Effect size	Lower 95%CI	Upper 95%CI	p	Statistical methods	Quality	The control of confounding factors					
												a	b	c	d	e	f
Vrijkotte et al.2012	Netherlands	non-GDM	4,008	1	Crude OR	0.97	0.85	1.10	ND	Logistic regression	8	×	×	×	×	×	×
Vrijkotte et al.2012	Netherlands	non-GDM	4,008	1	Adjusted OR	0.98	0.86	1.12	ND	MLOR	8	√	√	×	×	×	×
Jin et al.2016	China	non-GDM	934	1	ND	ND			ND	ND	7	ND	ND	ND	ND	√	ND
Jin et al.2016	China	non-GDM	934	2	ND	ND			ND	ND	7	ND	ND	ND	ND	√	ND
Ye et al.2015	China	non-GDM	912	3	Adjusted OR	0.94	0.74	1.20	ND	MLOR	8	√	√	√	√	√	×
Jin et al.2016	China	non-GDM	934	3	Adjusted OR	1.12	0.80	1.56	0.520	MLOR	7	√	√	√	×	√	×
Slagjana et al.2014	Yugoslavia	non-GDM	200	3	p				>0.05	Student t test	5	×	×	×	×	×	×

Confounding factors: a. Maternal age; b. Pre-pregnancy BMI; c. Gestational weight gain; d. Maternal glucose level; e. pre-term birth; f. Maternal lipid levels.
Abbreviation: Gestational diabetes mellitus(GDM), Confidence interval(CI), Not documented(ND), Multiple logistic regression(MLOR).

S9.1 Figure Meta-analysis of adjusted odds ratio for the association between maternal TC levels and SGA throughout pregnancy



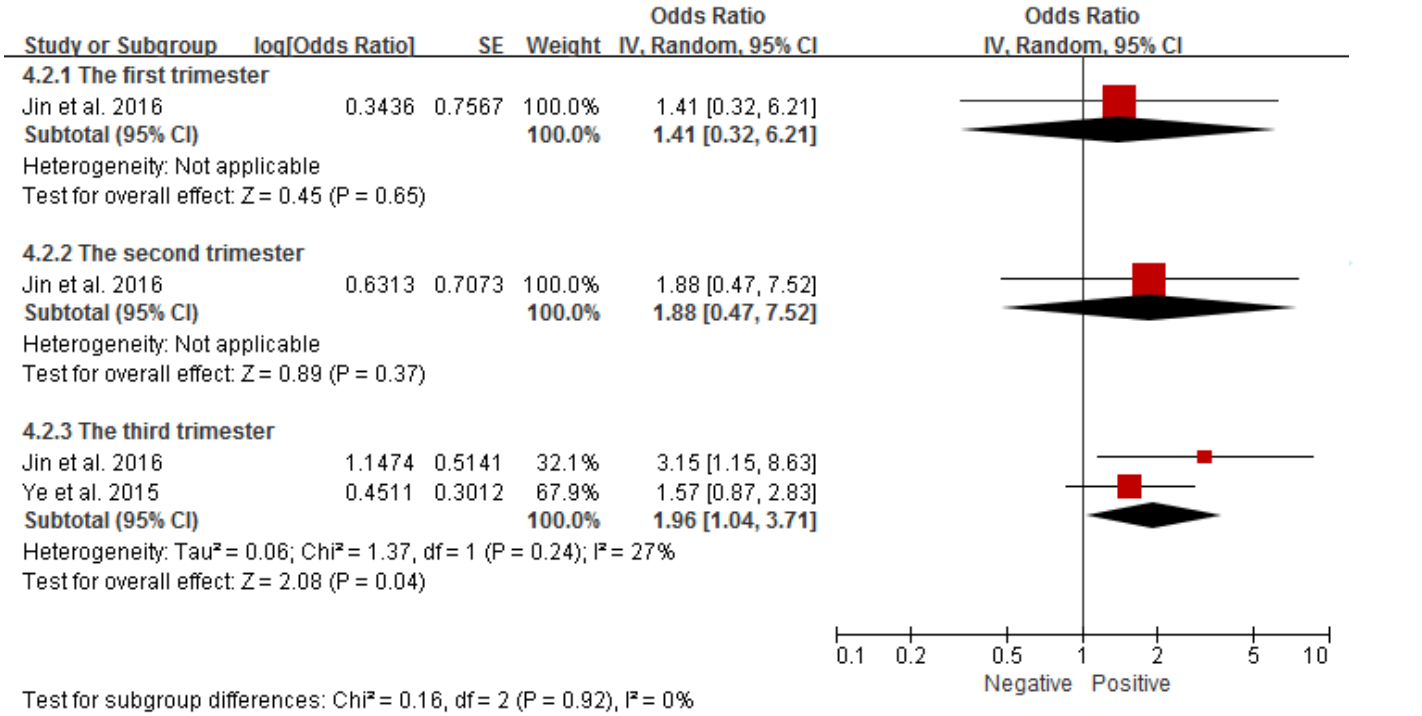
High-density lipoprotein cholesterol (HDL-C)

S9.2 Table Results summary of the association of maternal HDL-C levels with SGA

Study ID	Countries	Population	Sample size	Trimesters	Reported measures	Effect size	Lower 95%CI	Upper 95%CI	p	Statistical methods	Quality	The control of confounding factors					
												a	b	c	d	e	f
Jin et al.2016	China	non-GDM	934	1	Adjusted OR	1.41	0.32	5.38	ND	MLOR	7	√	√	√	×	√	×
Lei et al.2016	China	General	5,535	2	Crude OR^	1.13	0.80	1.61	ND	Logistic regression	6	×	×	×	×	×	×
Jin et al.2016	China	non-GDM	934	2	Adjusted OR	1.88	0.47	7.59	ND	MLOR	7	√	√	√	×	√	×
Ye et al.2015	China	non-GDM	912	3	Adjusted OR	1.57	0.87	2.83	ND	MLOR	8	√	√	√	√	√	×
Jin et al.2016	China	non-GDM	934	3	Adjusted OR	**3.15**	**1.15**	**8.65**	**0.026**	MLOR	7	√	√	√	×	√	×
Slagjana et al.2014	Yugoslavia	non-GDM	200	3	p				>0.05	Student t test	5	×	×	×	×	×	×

The bold font represents statistically significant results.
^ Results was calculated with self-defined cut-off point: 1.3 mmol/L
Confounding factors: a. Maternal age; b. Pre-pregnancy BMI; c. Gestational weight gain; d. Maternal glucose level; e. pre-term birth; f. Maternal lipid levels.
Abbreviation: Gestational diabetes mellitus(GDM), Confidence interval(CI), Not documented(ND), Multiple logistic regression(MLOR).

S9.2 Figure Meta-analysis of adjusted odds ratio for the association between maternal HDL-C levels and SGA throughout pregnancy



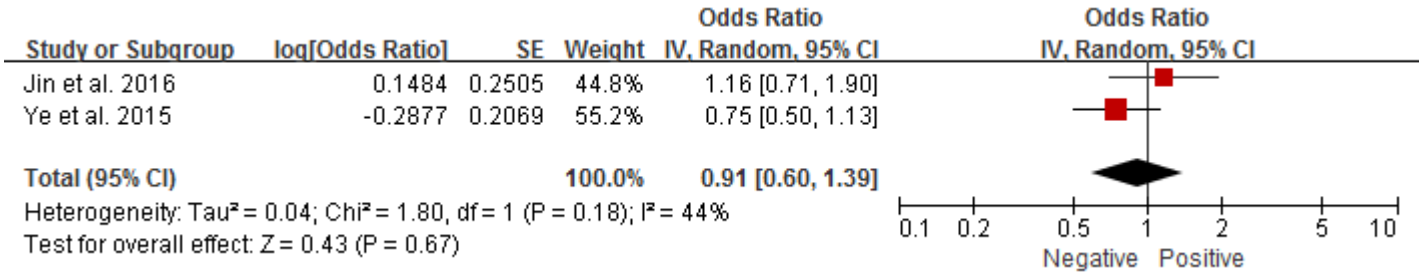
Low-density lipoprotein cholesterol (LDL-C)

S9.3 Table Results summary of the association of maternal LDL-C levels with SGA

Study ID	Countries	Population	Sample size	Trimesters	Reported measures	Effect size	Lower 95%CI	Upper 95%CI	p	Statistical methods	Quality	The control of confounding factors					
												a	b	c	d	e	f
Jin et al.2016	China	non-GDM	934	1	ND	ND			ND	ND	7	ND	ND	ND	ND	√	ND
Jin et al.2016	China	non-GDM	934	2	ND	ND			ND	ND	7	ND	ND	ND	ND	√	ND
Ye et al.2015	China	non-GDM	912	3	Adjusted OR	0.75	0.50	1.14	ND	MLOR	8	√	√	√	√	√	×
Jin et al.2016	China	non-GDM	934	3	Adjusted OR	1.16	0.71	1.89	0.565	MLOR	7	√	√	√	×	√	×
Slagjana et al.2014	Yugoslavia	non-GDM	200	3	p				>0.05	Student t test	5	×	×	×	×	×	×

Confounding factors: a. Maternal age; b. Pre-pregnancy BMI; c. Gestational weight gain; d. Maternal glucose level; e. pre-term birth; f. Maternal lipid levels.
Abbreviation: Gestational diabetes mellitus(GDM), Confidence interval(CI), Not documented(ND), Multiple logistic regression(MLOR).

S9.3 Figure Meta-analysis of adjusted odds ratio for the association between maternal LDL-C levels and SGA in the third trimester



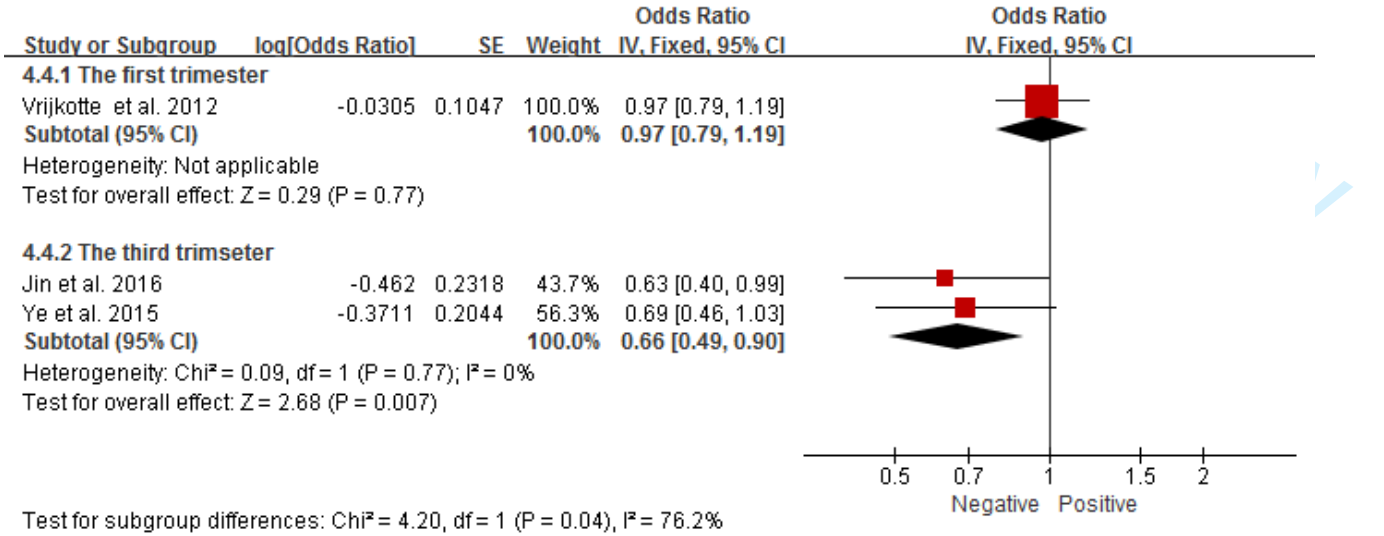
Triglycerides (TG)

S9.4 Table Results summary of the association of maternal TG levels with SGA

Study ID	Countries	Population	Sample size	Trimesters	Reported measures	Effect size	Lower 95%CI	Upper 95%CI	p	Statistical methods	Quality	The control of confounding factors					
												a	b	c	d	e	f
Jin et al.2016	China	non-GDM	934	1	ND	ND			ND	ND	7	ND	ND	ND	ND	√	ND
Vrijkotte et al.2012	Netherlands	non-GDM	4,008	1	Crude OR	1.06	0.87	1.29	ND	Logistic regression	8	×	×	×	×	×	×
Vrijkotte et al.2012	Netherlands	non-GDM	4,008	1	Adjusted OR	0.97	0.79	1.19	ND	MLOR	8	√	√	×	×	×	×
Jin et al.2016	China	non-GDM	934	2	ND	ND			ND	ND	7	ND	ND	ND	ND	√	ND
Lei et al.2016	China	General	5,535	2	Crude OR^	**1.51**	**1.08**	**2.12**	ND	Logistic regression	6	×	×	×	×	×	×
Ye et al.2015	China	non-GDM	912	3	Adjusted OR	0.69	0.47	1.03	ND	MLOR	8	√	√	√	√	√	×
Jin et al.2016	China	non-GDM	934	3	Adjusted OR	**0.63**	**0.40**	**0.99**	**0.046**	MLOR	7	√	√	√	×	√	×
Slagjana et al.2014	Yugoslavia	non-GDM	200	3	p				**0.012**	Student t test	5	×	×	×	×	×	×

The bold font represents statistically significant results.
^ Results was calculated with self-defined cut-off point: 3.49 mmol/L
Confounding factors: a. Maternal age; b. Pre-pregnancy BMI; c. Gestational weight gain; d. Maternal glucose level; e. pre-term birth; f. Maternal lipid levels.
Abbreviation: Gestational diabetes mellitus(GDM), Confidence interval(CI), Not documented(ND), Multiple logistic regression(MLOR).

S9.4 Figure Meta-analysis of adjusted odds ratio for the association between maternal TG levels and SGA throughout pregnancy



Supplementary 10 Data analysis for Macrosomia

Total cholesterol (TC)

S10.1 Table Results summary of the association of maternal TC levels with macrosomia

Study ID	Countries	Population	Sample size	Tri.	Reported measures	Effect size	Lower 95%CI	Upper 95%CI	p	Statistical methods	Quality	The control of confounding factors							
												a	b	c	d	e	f	g	h
Jin et al.2016	China	non-GDM	934	1	ND	ND			ND	ND	7	ND	ND	ND	ND	ND	ND	×	ND
Clausen et al.2005	Norway	General	1,037	2	Crude OR*	1.10	0.60	2.00	ND	Logistic regression	8	×	×	×	×	×	×	√	×
Clausen et al.2005	Norway	General	1,037	2	Adjusted OR*	1.10	0.60	2.00	ND	MLOR	8	×	×	√	×	×	×	√	×
Zhou et al.2012	China	General	1,000	2	P				>0.05	Non-parametric Mann-Whitney Test	5	×	×	×	×	×	×	×	×
Jin et al.2016	China	non-GDM	934	2	ND	ND			ND	ND	7	ND	ND	ND	ND	ND	ND	√	ND
Jin et al.2016	China	non-GDM	934	3	Adjusted OR	0.99	0.81	1.21	0.903	MLOR	7	×	√	√	√	√	×	√	×
Laleh et al.2013	Iran	GDM	112	3	P	ND			>0.05	Bonferroni multiple comparison test	7	×	×	√	√	×	×	×	×
Mossayebi et al.2014	Iran	General	154	3	ND	ND			ND	ND	5	ND	ND	ND	ND	ND	ND	√	ND

* Result was calculated by comparing the highest quartile with the lowest quartile maternal TC level

Confounding factors: a. Maternal age; b. Pre-pregnancy BMI; c. Gestational weight gain; d. Maternal glucose level; e. pre-term birth; f. Maternal lipid levels.

Abbreviation: Gestational diabetes mellitus(GDM), Positive screenes of Oral Glucose Tolerance test(OGTT+), Confidence interval(CI), No documented(ND), Multiple logistic regression(MLOR), Analysis of covariance(ANCOVA), Standard deviation (SD), Interquartile range(IQR) and Appropriate for gestational age(AGA).

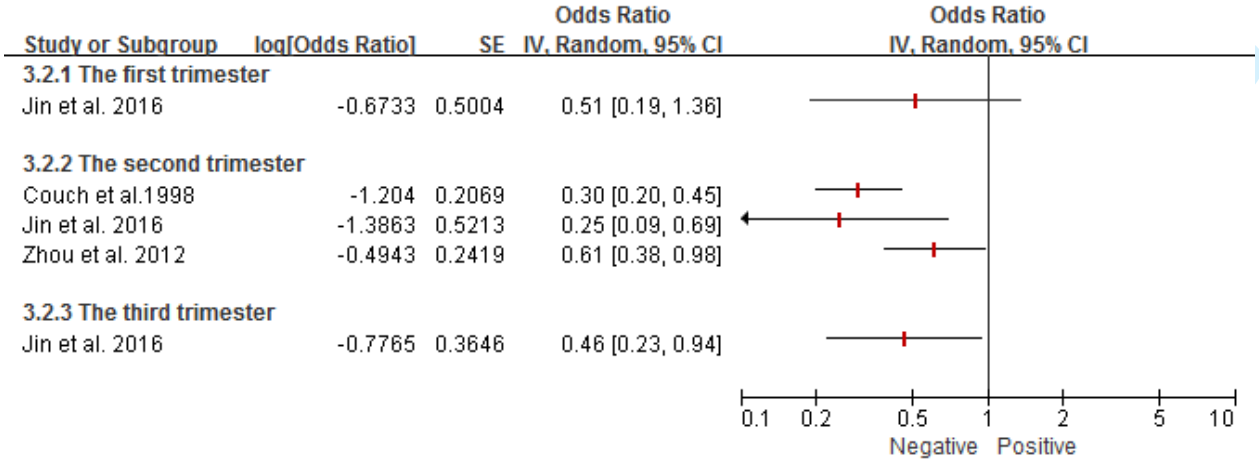
High-density lipoprotein cholesterol (HDL-C)

S10.2 Table Results summary of the association of maternal HDL-C levels with macrosomia

Study ID	Countries	Population	Sample size	Tri.	Reported measures	Effect size	Lower 95%CI	Upper 95%CI	p	Statistical methods	Quality	The control of confounding factors							
												a	b	c	d	e	f	g	h
Jin et al.2016	China	non-GDM	934	1	Adjusted OR	0.51	0.19	1.36	0.178	MLOR	7	×	√	√	√	√	×	√	×
Zawiejska et al. 2008	Poland	GDM	357	2	Crude RR	0.59	0.32	1.02	ND	Chi-squared test	5	×	×	×	×	×	×	×	×
Clausen et al.2005	Norway	General	1,025	2	Crude OR*	**0.30**	**0.20**	**0.60**	ND	Logistic regression	8	×	×	×	×	×	×	√	×
Clausen et al.2005	Norway	General	1,025	2	Adjusted OR*	**0.30**	**0.20**	**0.60**	ND	MLOR	8	×	×	√	×	×	×	√	×
Zhou et al.2012	China	General	1,000	2	Adjusted OR^	**0.61**	**0.38**	**0.98**	ND	MLOR	5	×	×	√	√	√	×	×	×
Jin et al.2016	China	non-GDM	934	2	Adjusted OR	**0.25**	**0.09**	**0.73**	0.011	MLOR	7	×	√	√	√	√	×	√	×
Jin et al.2016	China	non-GDM	934	3	Adjusted OR	**0.46**	**0.22**	**0.94**	0.034	MLOR	7	×	√	√	√	√	×	√	×
Laleh et al.2013	Iran	GDM	112	3	p	ND			>0.05	Bonferroni multiple comparison test	7	×	×	√	√	×	×	×	×
Mossayebi et al.2014	Iran	General	154	3	ND	ND			ND	ND	5	ND	ND	ND	ND	ND	ND	√	ND

The bold font represents statistically significant results.
^ Results was calculated with self-defined cut-off point: 2.205mmol/L
* Result was calculated by comparing the highest quartile with the lowest quartile maternal HDL-C level
Confounding factors: a. Maternal age; b. Pre-pregnancy BMI; c. Gestational weight gain; d. Maternal glucose level; e. pre-term birth; f. Maternal lipid levels.
Abbreviation: Gestational diabetes mellitus(GDM), Positive screenes of Oral Glucose Tolerance test(OGTT+), Confidence interval(CI), Not documented(ND), Multiple logistic regression(MLOR), Analysis of covariance(ANCOVA), Standard deviation (SD), Interquartile range(IQR) and Appropriate for gestational age(AGA).

S10.1 Figure Forest plots of adjusted odds ratio for the association between maternal HDL-C levels and macrosomia throughout pregnancy



Low-density lipoprotein cholesterol (LDL-C)

S10.3 Table Results summary of the association of maternal LDL-C levels with macrosomia

Study ID	Countries	Population	Sample size	Tri.	Reported measures	Effect size	Lower 95%CI	Upper 95%CI	p	Statistical methods	Quality	The control of confounding factors							
												a	b	c	d	e	f	g	h
Jin et al.2016	China	non-GDM	934	1	ND	ND			ND	ND	7	ND	ND	ND	ND	ND	ND	×	ND
Clausen et al.2005	Norway	General	1,018	2	Crude OR*	**2.20**	**1.20**	**4.00**	ND	Logistic regression	8	×	×	×	×	×	×	√	×
Clausen et al.2005	Norway	General	1,018	2	Adjusted OR*	**2.10**	**1.20**	**3.90**	ND	MLOR	8	×	×	√	×	×	×	√	×
Zhou et al.2012	China	General	1,000	2	p				>0.05	Non-parametric Mann-Whitney Test	5	×	×	×	×	×	×	×	×
Jin et al.2016	China	non-GDM	934	2	ND	ND			ND	ND	7	ND	ND	ND	ND	ND	ND	√	ND
Jin et al.2016	China	non-GDM	934	3	Adjusted OR	0.93	0.69	1.25	0.621	MLOR	7	×	√	√	√	√	×	√	×
Laleh et al.2013	Iran	GDM	112	3	p	ND			>0.05	Bonferroni multiple comparison test	7	×	×	√	√	×	×	×	×
Mossayebi et al.2014	Iran	General	154	3	ND	ND			ND	ND	5	ND	ND	ND	ND	ND	ND	√	ND

The bold font represents statistically significant results.
* Result was calculated by comparing the highest quartile with the lowest quartile maternal LDL-C level
Confounding factors: a. Maternal age; b. Pre-pregnancy BMI; c. Gestational weight gain; d. Maternal glucose level; e. pre-term birth; f. Maternal lipid levels.
Abbreviation: Gestational diabetes mellitus(GDM), Positive screenes of Oral Glucose Tolerance test(OGTT+), Confidence interval(CI), Not documented(ND), Multiple logistic regression(MLOR), Analysis of covariance(ANCOVA), Standard deviation (SD), Interquartile range(IQR) and Appropriate for gestational age(AGA).

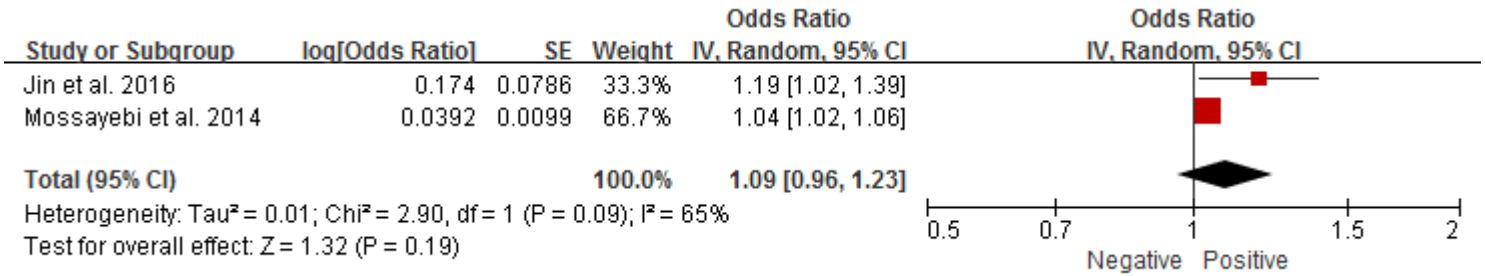
Triglycerides (TG)

S10.4 Table Results summary of the association of maternal TG levels with macrosomia

Study ID	Countries	Population	Sample size	Tri.	Reported measures	Effect size	Lower 95%CI	Upper 95%CI	p	Statistical methods	Quality	The control of confounding factors							
												a	b	c	d	e	f	g	h
Jin et al.2016	China	non-GDM	934	1	ND	ND			ND	ND	7	ND	ND	ND	ND	ND	ND	×	ND
Clausen et al.2005	Norway	General	988	2	Crude OR*	**2.90**	**1.40**	**5.90**	ND	Logistic regression	8	×	×	×	×	×	×	√	×
Clausen et al.2005	Norway	General	988	2	Adjusted OR*	**2.90**	**1.40**	**5.90**	ND	MLOR	8	×	×	√	×	×	×	√	×
Zhou et al.2012	China	General	1,000	2	p				>0.05	Non-parametric Mann-Whitney Test	5	×	×	×	×	×	×	×	×
Jin et al.2016	China	non-GDM	934	2	ND	ND			ND	ND	7	ND	ND	ND	ND	ND	ND	√	ND
Mossayebi et al.2014	Iran	General	154	3	Adjusted OR	**1.04**	**1.02**	**1.07**	ND	MLOR	5	×	×	√	√	×	√	√	√
Jin et al.2016	China	non-GDM	934	3	Adjusted OR	**1.19**	**1.02**	**1.39**	**0.024**	MLOR	7	×	√	√	√	√	×	√	×
Lin et al.2013	China	General	ND	ND	OR^	**2.20**	**1.54**	**3.14**	ND	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND
Laleh et al.2013	Iran	GDM	112	3	p	+			**0.001**	Bonferroni multiple comparison test	7	×	×	√	√	×	×	×	×

The bold font represents statistically significant results.
^ Results was calculated with self-defined cut-off point: 2.27 mmol/L
* Result was calculated by comparing the highest quartile with the lowest quartile maternal TG level
Confounding factors: a. Maternal age; b. Pre-pregnancy BMI; c. Gestational weight gain; d. Maternal glucose level; e. pre-term birth; f. Maternal lipid levels.
Abbreviation: Gestational diabetes mellitus(GDM), Positive screenes of Oral Glucose Tolerance test(OGTT+), Confidence interval(CI), No documented(ND), Not applicable(NA), Multiple logistic regression(MLOR), Analysis of covariance(ANCOVA), Standard deviation (SD), Interquartile range(IQR) and Appropriate for gestational age(AGA).

S10.2 Figure Meta-analysis of adjusted odds ratio for the association between maternal TG levels and macrosomia



S10.3 Figure Forest plots of adjusted odds ratio for the association between maternal TG levels and macrosomia