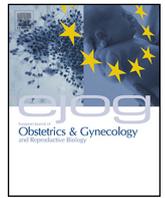




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Review article

Optimism during pregnancy and obstetrical outcomes: A systematic review



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ABSTRACT

Objective: To ascertain the strength of association between dispositional optimism, assessed with the Revised Life Orientation Test (LOT-R), and obstetrical outcomes, and to evaluate women's social characteristics that may lead to low dispositional optimism during pregnancy.

Study design: The research was conducted using MEDLINE, EMBASE, Scopus, Web of Sciences, Cochrane Database, and ClinicalTrials.gov as electronic databases. The articles were identified with the use of a combination of the relevant heading term, key words, and word variants for: "optimism" or "happiness" and "pregnancy" or "obstetrical outcomes", from the inception of each database to June 2019. Review of articles also included the abstracts of all references retrieved from the search. Randomized, cohort, case-control, or case series were all accepted study designs. Only studies reporting obstetrical outcomes in women undergone LOT-R to assess dispositional optimism during pregnancy were included. Obstetrical outcomes included preterm birth, pre-eclampsia and small for gestational age fetuses. All analyses were carried out using the random effects model. Dichotomous variables were analyzed using the odds ratio (OR) with a 95 % confidence interval (95 % CI). No continuous variables were compared in the analysis. Significance level was set at $P < 0.05$. Heterogeneity was measured using I-squared (Higgins I^2).

Results: Two prospective cohort studies, including 3,570 pregnancies undergone LOT-R - mostly during the second trimester - were included in the systematic review. Out of the 3,570 pregnancies included, 411 were in the lowest quartile of optimism, according to LOT-R score. Dispositional optimism showed a trend towards lower incidence of preterm birth (7.6 % vs 9.7 %; OR 0.76, CI 0.53–1.09); no difference between women at higher levels and women in the lowest quartile of optimism was found in preeclampsia and small for gestational age.

Women at higher levels of dispositional optimism were significantly associated with: age ≥ 30 years; marriage or "marriage-like status"; lower rates of public assistance and smoking; white ethnicity; higher rates of higher education.

Conclusion: There are limited data on optimism and obstetric outcomes. Higher levels of optimism, evaluated by the LOT-R tool in two studies, are associated with a non-significant decrease in preterm birth.

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Introduction

The pursuit of happiness has always been a mainstay in human life. During the Classical period in the Ancient Greece, Aristotle wrote that “*happiness is the meaning and the purpose of life, the whole aim and end of human existence*” and nowadays, when people are asked about what is really important in their lives, happiness is often considered as an essential goal to live a good life [1]. High subjective wellbeing has been shown to be associated with better health outcomes, mood, behavioral, sociability, productivity benefits, and longer life expectancy 2–4.

These findings seem to be confirmed also when evaluating the opposite association between depression and poor health outcomes. In fact, depression - as defined in the Diagnostic and Statistical Manual of Mental Disorders, 5th Edition (DSM-5) [5] - affects patients' overall clinical conditions with an increased risk of cardiovascular disease, diabetes, Parkinson disease, stroke, and composite morbidity 6–10 and has also been associated with a greater risk of mortality [11].

Although pregnancy is generally considered as a time of emotional wellbeing, minor and major depression affect up to 12.4% of pregnant women, with detrimental consequences upon pregnancy and the offspring [12].

Therefore, several studies have been published on the well-known effects of depression during pregnancy and the postpartum period [13], while the relationship between obstetrical outcomes and happiness evaluated as dispositional optimism is still a subject of debate.

Objective

The aim of this systematic review was to ascertain the strength of association between dispositional optimism, assessed with the Revised Life Orientation Test (LOT-R), and obstetrical outcomes, and to evaluate women's demographic characteristics that may lead to high dispositional optimism during pregnancy.

Methods

Search strategy

This study was performed according to a protocol recommended for systematic review [14]. The review protocol was

designed a priori defining methods for collecting, extracting and analyzing data. The research was conducted using MEDLINE, EMBASE, Scopus, Web of Sciences, Cochrane Database, and ClinicalTrials.gov as electronic databases. The articles were identified with the use of a combination of the relevant heading term, key words, and word variants, i.e. ((optimism) OR (happiness)) AND (pregnancy) OR (obstetrical outcomes) from the inception of each database to June 2019. Review of articles also included the abstracts of all references retrieved from the search.

Study selection and outcomes

Only studies reporting obstetrical outcomes in women assessed for dispositional optimism during pregnancy were included. We excluded papers whose authors were contacted for further information without receiving any answer. Only full text articles were considered eligible for the inclusion. Randomized, cohort, case-control, or case series were all accepted study designs. Studies with fewer than 5 cases were excluded to avoid publication bias.

Revised Life Orientation Test (LOT-R)

We included only studies that used LOT-R to assess dispositional optimism during pregnancy. We excluded studies reporting data of women undergone other psychological tests, those with a psychological assessment protocol unspecified or unclear.

LOT-R [15] is a widely used instrument in psychological research with good psychometric properties (the internal consistency - Cronbach's alpha - ranged between .74 and .78 ; Cronbach alpha of .71 for the total score and of .64 and .77 for the optimism and pessimism subscale scores) [16]. The LOT-R consists of 10 items: three items are positively worded, three items are negatively worded, and four items are filler items. The respondents are asked to indicate their agreement on a 5-point Likert scale with response categories ranging from strongly agree to strongly disagree. Although originally composed as a unidimensional scale, some studies suggest a bi-dimensionality of two independent factors: optimism and pessimism. Both sub-scales have a scoring range of 0 to 12, with higher scores indicating more optimism or more pessimism. Norm scores are not available for the LOT-R [15].

Women were divided into two groups: women at higher levels (top three quartiles) of dispositional optimism (LOT-R \geq 12)

compared with women in the lowest quartile of optimism (LOT-R <12).

Data extraction

Two authors (IG, DDM) reviewed all abstracts independently. Agreement regarding potential relevance was reached by consensus. Full text copies of those papers were obtained and the same reviewers independently extracted relevant data regarding study characteristics and pregnancy outcome. Inconsistencies were discussed by the reviewers and consensus reached or by discussion with a third author (VB). Data not presented in the original publications were requested from the principal investigators. If more than one study had been published on the same cohort with identical endpoints, the report containing the most comprehensive information on the population was included to avoid overlapping populations. For those articles in which information was not reported but the methodology was such that this information would have been recorded initially, the authors were contacted.

Risk of bias assessment

Quality assessment of the included studies was performed using the Newcastle-Ottawa Scale (NOS) for cohort studies. According to NOS, each study is judged on three broad perspectives: the selection of the study groups, the comparability of the groups, and the ascertainment outcome of interest [17].

Assessment of the selection of a study includes the evaluation of the representativeness of the exposed cohort, selection of the non-exposed cohort, ascertainment of exposure and the demonstration that outcome of interest was not present at start of study. Assessment of the comparability of the study includes the evaluation of the comparability of cohorts based on the design or analysis. Finally, the ascertainment of the outcome of interest includes the evaluation of the type of the assessment of the outcome of interest, length and adequacy of follow-up. According to NOS a study can be awarded a maximum of one star for each numbered item within the Selection and Outcome categories. A maximum of two stars can be given for Comparability [17].

Outcomes

The primary aim of this systematic review was to ascertain the strength of association between dispositional optimism, assessed with LOT-R, and obstetrical outcomes. Obstetrical outcomes included preterm birth (PTB), defined as gestational age < 37 weeks, pre-eclampsia (PE) (as defined by authors) and small for gestational age (SGA), defined as birth weight <10th percentile.

We also planned sub-group analyses considering patients' social history, including interpersonal, occupational, or financial stressors to identify women's social weakness potentially leading to a low level of optimism.

Data analysis

The systematic review was reported following the Preferred Reporting Item for Systematic Reviews and Meta-analyses (PRISMA) statement [18].

Baseline demographic data for each group within each study was collected and merged. Pregnancy outcomes were collected for each of the included group. Data analysis was performed with Review Manager Version 5.3 (Nordic Cochrane Centre, Cochrane Collaboration, Denmark). All analyses were carried out using the random effects model (of DerSimonian and Laird, assuming that the data being analyzed was drawn from a hierarchy of different populations). Dichotomous variables were analyzed using the

odds ratio (OR) with a 95 % confidence interval (95 % CI). No continuous variables were compared in the analysis. Significance level was set at $P < 0.05$. Heterogeneity was measured using I-squared (Higgins I^2).

Results

Study selection and study characteristics

Fig. 1 shows the flow diagram (PRISMA template) of information derived from review of potentially relevant articles. Eight articles used other assessment tests than the LOT-R, and none of them could be included in this systematic review as each used a different survey tool. Moreover, none of them reported on pregnancy outcomes (Table 1). Two articles [19,20], including 3,570 pregnancies assessed for dispositional optimism using LOT-R – mostly during the second trimester – were included in the systematic review. Both the included studies were prospective cohort studies (Fig. 2).

The results of the quality assessment of the included studies using Newcastle-Ottawa Scale (NOS) are shown in Table 2. The included studies showed an overall moderate score regarding the selection and comparability of the study groups, and for ascertainment of the outcome of interest. Characteristics and social history of the women included are shown in Table 3.

Synthesis of results

Out of the 3,570 pregnancies included, 3,159 women were at higher levels (top three quartiles) of dispositional optimism and 411 were in the lowest quartile of optimism, according to LOT-R score. Table 4 shows the pooled data of obstetrical outcomes of the systematic review.

Dispositional optimism showed a trend towards a lower incidence of PTB (7.6 % vs 9.7 %; OR 0.76, CI 0.53–1.09) without reaching statistical significance; instead, no difference between women at higher levels and women in the lowest quartile of optimism was found in terms of PE (6.5 % vs 5.5 %; OR 1.2 CI 0.75 vs 1.91) and SGA (10.8 % vs 10.7 %; OR 1.01 CI 0.72–1.44).

Table 5 shows results from the sub-group analysis on patients' social history, including interpersonal, occupational, or financial

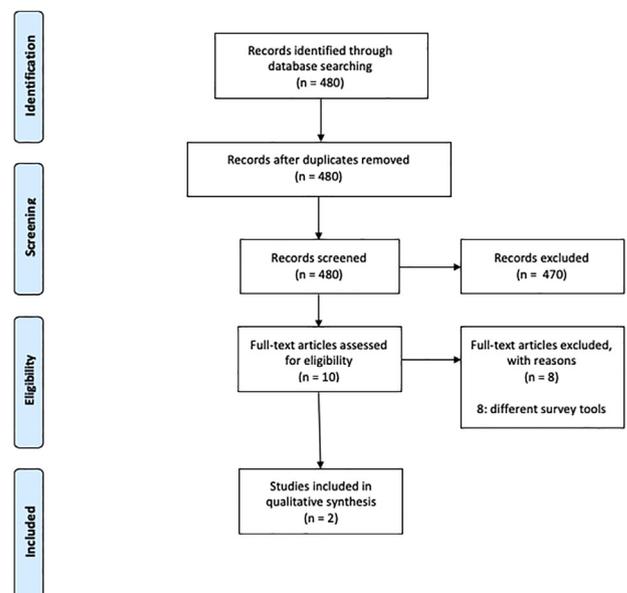
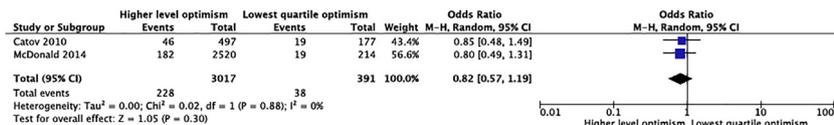


Fig. 1. PRISMA flow diagram.

Table 1
Excluded studies.

First author	Sample size	Evaluation tool	Results
Moore et al 2015	75	Semi-structured interviews (Linguistic Inquiry and Word Count software)	Higher verbal positivity and anxiety during pregnancy independently predicted lower mother-infant synchrony with potentially different consequences for infant development.
Garipey et al 2017	161	London Measures of Unplanned Pregnancy	Women reporting mixed feelings about wanting to have a “baby”, an unplanned pregnancy, that the pregnancy occurred at the wrong time, an undesired pregnancy or reported feeling unhappy or very happy about pregnancy news had increased odds of low physical health-related quality of life, compared to women reporting that the pregnancy was wanted, planned, occurred at the right time, was desired, and that they felt happy about the pregnancy.
Lou et al 2017	20	Not validated tool: A happy/worried continuum with a carefree and happy pregnant woman at one end and a worried and concerned pregnant woman at the other end of the continuum.	The majority of women acknowledge that pregnancy involves simultaneous feelings of happiness and worry.
Polansky et al 2018	258	Not validated tool: A questionnaire assessing pregnancy intendedness validated in an inner-city public prenatal clinic	Women who felt the pregnancy was too soon were less happy being pregnant. Prenatal depressive symptoms were inversely associated with happiness with being pregnant and completing high school.
Tiemeyer et al 2019	5721	Not validated tool: A numeric scale where 1 means very unhappy to be pregnant and 10 means very happy to be pregnant	Pregnancy loss can be a highly distressing experience, women's happiness about a subsequent pregnancy is not reduced due to prior pregnancy loss.
Kemet et al 2018	161	London Measure of Unplanned Pregnancy	Happiness about new pregnancies was more likely among Black non-Hispanic than White non-Hispanic women.
Blake et al 2007	1044	National Survey of Family Growth Short version of the Negative Mood Regulation Scale	Pregnancy intentions and happiness were strongly associated, but happiness was the better predictor of risk. Unhappy women had higher odds than happy women of smoking, being depressed, experiencing intimate partner violence, drinking and using illicit drugs.
Lundsberg et al 2017	123	London Measures of Unplanned Pregnancy	Unintended pregnancy is associated with significant patient-reported disutility, as is pregnancy occurring in other unfavorable contexts.

**Fig. 2.** Forest plot of preterm birth outcome.

stressors. Women at higher levels of dispositional optimism were significantly associated with: aged ≥ 30 years (58.1% vs 34.7%; OR 2.6, CI 2.09–3.25); married or committed in a “marriage-like status” (88.6% vs 68.6%; OR 3.57, CI 2.8–4.57); lower rates of public assistance (46.4% vs 72.9%; OR 0.32, CI 0.22 to 0.47); lower incidence of smoking (12.5% vs 24.8%; OR 0.43, CI 0.34–0.55); white ethnicity (78.2% vs 73.7%; OR 1.28, CI 1.01–1.62); higher rates of at least a high school education (96.2% vs 87%; OR 3.75, CI 2.66–5.27). The only variable that was similar in both groups was pre-pregnancy overweight (35.2% vs 39.9%; OR 0.82, CI 0.66–1.01).

Comment

Main findings

This systematic review, including 3,570 pregnant women who underwent LOT-R during pregnancy, showed that dispositional

Table 2

Quality assessment of the included studies according to Newcastle-Ottawa Scale (NOS). A study can be awarded a maximum of one star for each numbered item within the Selection and Outcome categories. A maximum of two stars can be given for Comparability.

Author	Selection	Comparability	Outcome
Catov 2010 [19]	**	*	**
McDonald 2014 [20]	**	*	**

optimism was associated with a trend towards lower incidence of PTB, without influencing PE and SGA rates.

Furthermore, there are several social stressors that are significantly associated with dispositional optimism, such as maternal age ≥ 30 years, married or married-like status, lower rates of public assistance and smoking, white ethnicity, and educational levels \geq high school.

Strength and limitations

To our knowledge, there is no published systematic review that assessed the association between dispositional optimism and obstetrical outcomes. Moreover, the LOT-R tool is one of the most accepted and used tools to assess dispositional optimism [21]. Both the included studies were prospective. The main limitation is that while there are several studies on happiness/dispositional optimism/other measure of emotional wellbeing, and pregnancy outcomes (Fig. 1/ Table 1), the tools used to assess it were varied and made a systematic review difficult, in the end revealing only two studies, on dispositional optimism, available for analysis. Moreover, these two included studies had small sample size. While several factors (Table 5) are associated with dispositional optimism, these could not be controlled for given lack of raw data. It was not possible to obtain data from the highest quartile of optimism, and therefore the analysis evaluated women at higher levels (top three quartiles) of optimism, and therefore both ‘optimistic’ and ‘neutral’, compared with women at the lowest

Table 3

Characteristics of the women included in the studies.

	Catov 2010 [19]	McDonald 2014 [20]	Total
Age			
<18	11/490 (0.2%) vs 2/177 (1.1%)	0/2489 (0%) vs 0/209 (0%)	11/2979 (0.4%) vs 2/386 (0.5%)
18 to <25	267/490 (54.5%) vs 141/177 (79.7%)	142/2489 (5.7%) vs 23/209 (11%)	409/2979 (13.7%) vs 164/386 (42.5%)
25 to <30	118/490 (24.1%) vs 23/177 (13%)	711/2489 (28.6%) vs 63/209 (30.1%)	829/2979 (27.8%) vs 86/386 (22.3%)
≥ 30	94/490 (19.2%) vs 11/177 (6.2%)	1636/2489 (65.7%) vs 123/209 (58.9%)	1730/2979 (58.1%) vs 134/386 (34.7%)
Married or marriage-like	247/490 (50.4%) vs 49/137 (35.8%)	2552/2668 (95.7%) vs 204/232 (87.9%)	2799/3158 (88.6%) vs 253/369 (68.6%)
Public assistance	227/489 (46.4%) vs 129/177 (72.9%)	Not reported	227/489 (46.4%) vs 129/177 (72.9%)
Cigarette smoking	106/490 (21.6%) vs 60/177 (33.9%)	291/2683 (10.8%) vs 42/234 (17.9%)	397/3173 (12.5%) vs 102/411 (24.8%)
Pre-pregnancy overweight	211/488 (43.2%) vs 71/176 (40.3%)	885/2623 (33.7%) vs 89/225 (39.6%)	1096/3111 (35.2%) vs 160/401 (39.9%)
Ethnicity			
African American	144/490 (29.4%) vs 56/177 (31.6%)	38/2669 (1.4%) vs 2/232 (0.9%)	182/3159 (5.8%) vs 58/411 (14.1%)
White	346/490 (70.6%) vs 121/177 (68.4%)	2125/2669 (79.6%) vs 182/232 (78.4%)	2471/3159 (78.2%) vs 303/411 (73.7%)
Education			
< High school	54/490 (11%) vs 35/176 (19.9%)	67/2667 (2.5%) vs 18/232 (7.8%)	121/3157 (3.8%) vs 53/408 (13%)
High school	132/490 (26.9%) vs 68/176 (38.6%)	180/2667 (6.7%) vs 27/232 (11.6%)	312/3157 (9.9%) vs 95/408 (23.2%)
> High school	304/490 (62%) vs 73/176 (41.5%)	2420/2667 (90.7%) vs 187/232 (80.6%)	2724/3157 (86.2%) vs 260/408 (63.7%)

Data are always presented as women with LOT-R ≥ 12 versus women in the low quartile of optimism (LOT-R <12).

Table 4

Obstetrical outcomes.

	Catov 2010 [19]	McDonald 2014 [20]	Total	OR (95% CI)
PTB	46/497 (9.3%) vs 19/177 (10.7%)	182/2,520 (7.2%) vs 19/214 (8.9%)	228/3,017 (7.6%) vs 38/391 (9.7%)	0.76 (0.53 to 1.09)
PE	22/496 (4.4%) vs 6/177 (3.4%)	161/2,329 (6.9%) vs 15/207 (7.2%)	183/2,825 (6.5%) vs 21/384 (5.5%)	1.20 (0.75 to 1.91)
SGA	59/496 (11.9%) vs 21/176 (11.9%)	251/2,368 (10.6%) vs 19/198 (9.6%)	310/2,864 (10.8%) vs 40/374 (10.7%)	1.01 (0.72 to 1.44)

PTB, preterm birth; SGA, small for gestational age; PE, preeclampsia; OR, odds ratio; CI, confidence interval.

Data are always presented as women with LOT-R ≥ 12 versus women in the low quartile of optimism (LOT-R <12).

Table 5

Sub-group analysis on patients' social history and association with higher or lower level of dispositional optimism.

	Total	OR (95% CI)	p-value
Age ≥ 30	1,730/2,979 (58.1%) vs 134/386 (34.7%)	2.6 (2.09 to 3.25)	< 0.0001
Married or marriage-like	2,799/3,158 (88.6%) vs 253/369 (68.6%)	3.57 (2.80 to 4.57)	< 0.0001
Public assistance	227/489 (46.4%) vs 129/177 (72.9%)	0.32 (0.22 to 0.47)	< 0.0001
Cigarette smoking	397/3,173 (12.5%) vs 102/411 (24.8%)	0.43 (0.34 to 0.55)	< 0.0001
Ethnicity: White	2,471/3,159 (78.2%) vs 303/411 (73.7%)	1.28 (1.01 to 1.62)	0.04
Ethnicity: African American	182/3,159 (5.8%) vs 58/411 (14.1%)	0.37 (0.27 to 0.51)	< 0.0001
Education: ≥ High school	3,036/3,157 (96.2%) vs 355/408 (87%)	3.75 (2.66 to 5.27)	< 0.0001
Pre-pregnancy overweight	1,096/3,111 (35.2%) vs 160/401 (39.9%)	0.82 (0.66 to 1.01)	0.07

OR, odds ratio; CI, confidence interval.

Data are always presented as women with LOT-R ≥ 12 versus women in the low quartile of optimism (LOT-R <12).

level of optimism. Comparison of the highest quartile (truly 'optimistic') versus lowest quartile (least 'optimistic') as well as the lack of information about depression, anxiety, or other psychiatric diagnoses may have revealed different results.

Comparison with existing literature

To our knowledge, prior studies even peripherally evaluating happiness/dispositional optimism/other measure of emotional wellbeing during pregnancy, (Table 1) used different psychometric tools. Some of tools used in these studies were not even validated, all did not evaluated just positive psychology and happiness per se as an influence on outcomes, and none of these reported on pregnancy outcomes (Table 1). To our knowledge, no reviews combining data from more than one study on happiness/dispositional optimism/other measure of emotional wellbeing during pregnancy, and pregnancy outcomes, have been previously reported.

Implications and conclusion

There is a vast literature on the negative psychology, e.g. depression. Antenatal depression has been shown to be associated

with multiple poor obstetrical outcomes, such as PTB, low birth weight, fetal growth restriction, stillbirth, vaginal bleeding, PE, operative delivery, and lower rates of initiating exclusive breastfeeding [13,22–25]. Depressive symptoms experienced during pregnancy have also been related with infant and child development disorders, such as sudden infant death, impaired neurobehavioral functioning, disorganized sleep patterns, excessive infant crying and behavioral problems as well as impairments in cognitive functioning, mostly occurring with delays in acquiring language skills and emotional dysfunction [26–35]. We found in our review that several risk factors were associated with lower level of dispositional optimism (Table 5).

Instead, the literature on positive psychology, e.g. happiness, is scant. One way to evaluate happiness is by assessing dispositional optimism. Most studies do not really evaluate happiness/dispositional optimism effect on obstetric outcomes (Table 1), revealing only two prospective studies evaluating happiness with a validated tool, i.e. LOT-R, summarized in this review.

Regarding associations with dispositional optimism, our study found that being >30 years of age and married or married-like, as well as having lower rates of public assistance and smoking, white ethnicity, and educational levels ≥ high school were associated

with higher level of dispositional optimism (Table 5). It is unclear if optimistic people get pregnant later, get married more often, smoke less and study more, or if these characteristics contribute to make a woman optimistic. Assessing direction of causality it is difficult and literature on this topic in controversial.

A recent review reported that there is a high correlation between happiness and marital status, at least in Western countries, and that there is a trend towards lower level of happiness in people belonging to social minorities, such as ethnic minorities. Moreover, authors showed a correlation between happiness and education that was higher in poor countries and lower or even negative in high income nations [36].

The relationship between happiness and aging is even more challenging. There are two main hypotheses of correlation between happiness throughout life: the socioemotional selectivity theory states that as people get older, they increasingly attend to positive information and memories, leading to a stable or increased level of happiness with age; the U-shaped hypothesis suggests a curvilinear shape, with a dip during midlife. Anyway, recent researches are focusing always more on the socioeconomic influence on happiness among different ages rather than on the single happiness-age relationship [37].

Regarding outcomes, happiness has been associated in non-pregnant adults with better cardiovascular and endocrine health, improvement in immune (i.e. fewer cold signs and symptoms), reduced inflammation, less stress and anxiety, lower suicide rates and quick recovery from disease [2]. To our knowledge, there are no studies in pregnancy evaluating any of these effects found outside pregnancy. Our review was the first though to evaluate dispositional optimism and PTB, PE and SGA in pregnancy.

In summary, this study found a trend towards lower incidence of PTB and no difference in terms of PE and SGA incidences in women at higher levels compared with women in the lowest quartile of dispositional optimism. A higher level of dispositional optimism was also associated with many social variables, such as maternal age ≥ 30 years, married or married-like status, lower rates of public assistance and smoking, **white** ethnicity, and educational levels \geq high school.

Further prospective research investigating happiness/dispositional optimism during pregnancy with validated psychometric tool, such as LOT-R, are needed to better evaluate the association with pregnancy outcomes and to highlight demographic characteristics related with happiness during pregnancy in order to help women at least with modifiable traits.

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Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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