

DOI: <https://dx.doi.org/10.18203/2320-1770.ijrcog20230126>

Original Research Article

Meditation and Yoga in pregnancy: maternal and fetal impact

Sumita Mehta¹, Anshul Grover^{1*}, Ekta Kale¹, Pratibha Nanda¹, Akshaj Mehta²

¹Department of Obstetrics and Gynecology, Babu Jagjivanram Memorial Hospital, Delhi, India

²University College of Medical Sciences, Delhi, India

Received: 27 November 2022

Accepted: 27 December 2022

***Correspondence:**

Dr. Anshul Grover,

E-mail: anshul_abc@yahoo.com

Copyright: © the author(s), publisher and licensee Medip Academy. This is an open-access article distributed under the terms of the Creative Commons Attribution Non-Commercial License, which permits unrestricted non-commercial use, distribution, and reproduction in any medium, provided the original work is properly cited.

ABSTRACT

Background: Yoga is a practice which amalgamates the emotional, mental, physical and spiritual aspects of the human body through physical postures (asanas), breathing exercises (pranayama), concentration and meditation (dharana and dhyana). Evaluation of databases suggests a positive role of yoga in pregnancies associated with depression, anxiety and lumbosacral pain and also in reducing antepartum complications and pain score during labor. These beneficial effects of yoga are suggested but more systematic researches are required to validate it. With the background of above researches, we undertook the study to evaluate the effect of prenatal yoga and meditation on maternal and fetal outcomes. Aim of the study was to determine the effect of antenatal meditation and yoga on obstetric and fetal outcome.

Methods: This was a prospective randomized trial conducted in the antenatal OPD of the institute. Sixty primigravida women with low risk pregnancy between 18 to 26 weeks gestation were included in the trial. They were randomly divided into two equal groups; interventional group underwent meditation and yoga sessions of 30 minutes twice in a week till delivery. Obstetric outcomes including gestational age, antepartum and intrapartum complications, cord blood cortisol levels at delivery and neonatal outcomes were recorded.

Results: Thirteen women went post-dated as compared to 3 in the interventional group which was statistically significant ($p=0.0003$). APGAR scores of neonates in the interventional group showed a highly significant improvement with $p=0.0013$ as compared to the control group. Cord blood cortisol levels were higher than 10 ng/ml in 16 women in the control group compared to 7 in the group who performed yoga and meditation with $p=0.01$. NICU admissions were significantly more ($p=0.002$) in the control group.

Conclusions: Meditation and yoga during pregnancy improves maternal and neonatal outcomes.

Keywords: Yoga, Meditation, Pregnancy, Stress, Exercise, Cord blood cortisol, Maternal outcomes

INTRODUCTION

The word yoga is derived from the Sanskrit word “yuj” meaning “to join” which amalgamates the emotional, mental, physical and spiritual aspects of the human body through physical postures (asanas), breathing exercises (pranayama), concentration and meditation (dharana and dhyana).^{1,2} The practice and philosophy of yoga was first described in India by Patanjali in the text “Yoga Sutra” and gained prominence in the West after being first introduced by Swami Vivekananda.⁵

Pregnancy is a distinct physiological condition which is associated with mood swings, altered dietary requirements, food cravings, anxiety and weight gain all of which can generate stress.⁶ Every woman responds differently to these stresses depending upon her mental status, family support and adequate knowledge regarding the changes and guidance provided. It is postulated that maternal stress can stimulate placental release of the corticotrophin releasing hormone and thereby increase cortisol levels. It is also suggested that stressful conditions reduce the placental blood flow and oxygen to the fetus, thus affecting fetal development.⁷ Association of early

gestational stress with blunted cognitive functions and behavioral issues such as attention deficit hyperactive disorder in childhood has also been documented.⁸ ACOG has evaluated the safety profile of moderate exercises like walking, swimming and yoga during pregnancy and recommend at least 20-30 minutes exercise per day on most or all days of the week which can be adjusted as medically indicated.⁹ Physical exercise during pregnancy is not only useful in weight management, prevention of associated conditions like gestational hypertension, diabetes, musculoskeletal aches but also contributes in having a vaginal delivery.¹⁰

Yoga which is a mild to moderate form of exercise has gained popularity with pregnant women due to its holistic approach in modifying mind and body function and also as a means to establish a connection with the unborn fetus. Previous researches suggest the positive role of yoga in pregnancies associated with depression, anxiety, lumbosacral pain and also its beneficial effect in reducing antepartum complications and pain score during labor.¹¹⁻¹⁴ Though these beneficial effects of yoga are have been suggested but more systematic researches are required to validate it. Very few studies have evaluated the role of cord blood cortisol levels as a measure of stress.¹⁵ With the background of above researches, we undertook the study to objectively evaluate the effect of prenatal yoga and meditation on stress levels in pregnant women using cord blood cortisol levels as an indicator and to study the impact on maternal and fetal outcomes.

Aims and objectives

Aim and objectives were to study the maternal outcomes, fetal outcomes and cord blood cortisol levels in pregnant women who undertook at least 8 weeks of meditation and yoga sessions during pregnancy and to compare these results with a control group.

METHODS

A prospective randomised control pilot study was conducted from January 2020 to December 2020 after taking approval from the internal ethical committee of the institute {F.8 (1)/04}. The study was of parallel design with allocation ratio of 1:1.

Study population

Based on the number of women attending the antenatal OPD, the inclusion criteria and resource constraints, it was decided to limit the sample size to 60 women. The inclusion of the participants into the study and control group was based on simple randomization using a computer-generated randomized table. The women were divided into two equal groups of 30 each; study group in which the participants underwent the intervention and the other as the control group. All the participants in both the groups were required to give consent for collection of cord

blood at the time of delivery for evaluation of cortisol levels.

Inclusion criteria

Primigravida women with planned, singleton, low risk pregnancy, period of gestation between eighteen to twenty-six weeks (to allow for at least eight weeks of intervention), women residing within a distance of five km from the hospital, women who were consenting to attend regular yoga and meditation sessions were included in the study.

Exclusion criteria

Multigravida women, women who had any medical complications like anaemia, hypertension, diabetes or thyroid disorder, working women to avoid disruption in either work or yoga schedule and women who did not give consent to be part of the study were excluded from the study.

Intervention group

An informed and written consent was taken from all the participants in the group and they undertook meditation and yoga sessions of thirty minutes twice a week (Monday and Friday) conducted in the hospital till delivery. These sessions were supervised by the same qualified yoga trainer. Each session began with patients sitting in "Sukhasana" or easy pose followed by "OM" chanting and prarthana (or prayer). There after a few body loosening exercises in sitting position with legs stretched were performed-Padangulinama (toe bending), Goolfnaman and chakra (ankle bending and rotation), Janu naman (knee bending), Manibandhanaman and chakra (wrist bending and rotation), Kehuninaman (elbow bending), Skanda chakra (shoulder rolls bent elbow close up) and Greevasanchalana (Neck rotation). This was followed by pregnancy safe postures which included Baddha konasana (Butterfly pose- loosens the hip joint, increases blood supply to the pelvis and reduces stretch on the inner thighs), Vajrasana (improves digestion, increases blood supply to the pelvic muscles and strengthens them) and Upavisthakonasana (opens the hip joint and releases the lumbar spine thus creating more space around the pelvis). In standing position Tadasana (Mountain pose-to relieve lumbosacral pain) and Virbhadrasana II (Warrior II pose helps to stretch the thighs, shoulders, and pelvic area) were performed. The asanas were followed by breathing exercises, Bhramari Pranayama (Humming bee breathing technique) and meditation for ten minutes. The session ended with a prayer.

The pulse rate and blood pressure of each participant was recorded before and after completion of the session. Each patient was asked to perform the same session at home daily and maintain the record in a diary. Telephonic reminders were given to them for home sessions and

scheduled next visit. The women continued to receive routine antenatal care as appropriate.

Control group

Women in the control group underwent routine antenatal care with all required investigations and appropriate management.

Analysis

Both the groups were analyzed for any antenatal or intrapartum complications, gestational age at delivery, mode of delivery, neonatal outcomes and cord blood cortisol levels. Women requiring elective caesarean section for maternal or fetal indications like contracted pelvis, placenta previa or non-vertex presentation were excluded from the study as stress of surgery itself causes rise in the cortisol levels in the mother. Four ml cord blood sample was collected at delivery for each participant in both the groups, centrifuged at 300 rpm for 15 minutes and stored at -20 °C for processing by CMIA (Chemiluminescent microparticle immuno-assay) for cortisol levels. The study data was entered in MS excel sheets and analysis of the data was done using the “two-sample t test” on various maternal as well as fetal variables.

RESULTS

Of the 30 women in the intervention group, two participants were excluded. One of the participants had defaulted from the interventional protocol as she did not attend the yoga sessions and another had to undergo elective LSCS due to contracted pelvis. In the control group, two participants were lost to follow up. Therefore, the analysis was done with 28 participants in both the interventional and control group respectively.

The demographic characteristics of both the interventional and control group revealed no significant difference (Table 1). Two women (7.14%) in the control group were diagnosed with pregnancy induced hypertension (PIH) as compared to one (3.57%) in the intervention group; the difference was not statistically significant (Table 2).

Seven women (25%) in the control group developed fetal growth restriction (FGR) compared to only 1 (3.57%) in the yoga group. Two women (7.14%) in the intervention group presented with preterm premature rupture of membranes at 35.4 and 36.5 weeks respectively and progressed into labor. The neonates had birth weights of 2.3 kg and 2.6 kg respectively and APGAR score was 8 at 5 minutes in both. None of these babies required nursery admission (Table 2).

Thirteen women (46.4%) in the control group went post-dated as compared to 3 (10.71%) in the interventional group which was statistically significant (p=0.0003) (Table 2).

Of the 28 women evaluated in both the groups, 3 women (10.7%) in the study group and 4 women (14.2%) in control group underwent emergency caesarean section. Twenty-four women (85.7%) in the interventional group went into spontaneous labor and only 4 (14.2%) were induced as compared to 20 (71.4%) and 8 (28.5%) in the control group. The indications for induction in the intervention group were postdated pregnancy, PIH, FGR and premature rupture of membranes; of the 8 women induced in the control group, 4 were due to postdated pregnancy, 1 due to PIH and 3 for FGR (Table 2).

Cord blood cortisol levels were higher than 10 ng/ml in 16 women (57.14%) in the control group as compared to 6 women (21.43%) in the yoga group and was statistically significant with p=0.01 (Table 3).

APGAR scores of 23 neonates (82.1%) were more than 8 in the intervention group as compared to 19 (67.8%) in the control group with p=0.0013. Eleven neonates (39.2%) in control group had low birth weight as compared to only Seven (25%) in the study group but this difference was not statistically significant (Table 4).

No neonate in the intervention group required nursery admission while 7 (25%) neonates in the control group were admitted in the nursery and this was statistically significant with p=0.002. Of these 7 neonates, two children had birth asphyxia, 4 had meconium aspiration due to meconium-stained liquor and 1 was low birth weight. One neonate developed meconium aspiration with pneumonia and succumbed on day 2 of life (Table 4).

Table 1: Demographic profile.

Demographic variable	Intervention group, (n=28) (%)	Control group, (n=28) (%)
Age (Years)		
18-20	8 (28.57)	7 (25)
21-25	10 (35.7)	12 (42.8)
26-30	8 (28.5)	7 (25)
31-35	2 (7.1)	1 (3.5)
35-40	0	1(3.5)
Religion		
Hindu	26 (92.8)	25 (89.2)
Muslim	2 (7.1)	3 (10.7)
Education		
Illiterate	1 (3.5)	1 (3.5)
Primary education	1 (3.5)	3 (10.7)
Secondary education	10 (35.7)	11 (39.2)
Senior secondary education	8 (28.5)	7 (25)
Graduate	5 (17.8)	4 (14.2)
Postgraduate	3 (10.7)	2 (7.1)

Table 2: Antepartum and intrapartum outcomes.

Variables	Intervention group, (n=28) (%)	Control group, (n=28) (%)
Medical complications		
Anemia (Hb<10 gm%)	0	01 (3.57)
Hypothyroidism	0	01 (3.57)
Obstetric complications		
Fetal growth restriction	01 (3.57)	07 (25)
Hypertensive disorder of pregnancy	01 (3.57)	02 (7.14)
Preterm pregnancy	02 (7.14)	0
Post-dated pregnancy	03 (10.71)	13 (46.4); p=0.0003
Intrapartum complications		
Prolonged labor	01 (3.57)	01 (3.57)
Meconium-stained liquor	01 (3.57)	02 (7.14)
Fetal distress	0	02 (7.14)
Mode of delivery		
Vaginal delivery	25 (89.2)	24 (85.7)
Caesarean delivery	03 (10.7)	04 (14.2)
Indications for caesarean	03 (10.71)	04 (14.2)
Fetal distress	0	01
Meconium-stained liquor	01	01
Cephalopelvic disproportion	02	01
Failed induction	0	01
Spontaneous labor		
Induced labor	04 (14.2)	08 (28.5)
Post-dated pregnancy	01	04
PIH	01	01
FGR	01	03
Preterm premature rupture of membranes	01	0

Table 3: Cord blood cortisol levels.

Cortisol levels (ng/ml)	Interventional group, n (%)	Control group, n (%)
<5	7 (25)	4 (14.2)
5-9.99	15 (53.5)	8 (28.5)
10-14.99	2 (7.1)	11 (39.2)
15-19.99	4 (14.2)	5 (17.8)
>20	0	0

Table 4: Neonatal outcomes.

Variables	Intervention group, (n=28) (%)	Control group, (n=28) (%)
APGAR score (at 5 mins)		
>8	23 (82.1)	19 (67.8); p=0.0013
7	3 (10.7)	4 (14.2)
6	2 (7.1)	5 (17.8)
Birth weight (kg)		
<2	0	0
2-2.59	7 (25)	11 (39.2)
2.6-3.09	15 (53.5)	13 (46.4)
3.1-3.5	6 (21.4)	4 (14.2)
NICU admission	0	7 (25%); p=0.002
Neonatal mortality	0	1 (3.5%)

DISCUSSION

Yoga down-regulates the hypothalamic-pituitary- adrenal axis and the sympathetic nervous system and thus helps to counteract the physiological cardiovascular changes of pregnancy such as increased heart rate, cardiac output and plasma volume. Deep breathing exercises or pranayam, act on the sympathetic system to slow down the reactions to stress and thereby reduce blood cortisol levels and bring about an increase in neuroplasticity and improve concentration and motor control.¹⁶ Both together have a significant positive effect on maternal and thereby fetal health.

In the present study, maternal and fetal outcomes and cord blood cortisol levels were analyzed in pregnant women who undertook meditation, pranayam and yoga sessions during pregnancy with a control group of pregnant women who did not follow this regimen. The demographic profile of both the groups was comparable with regards to age, parity, and level of education. In the study, development of antenatal complications was less in the interventional group as compared to control group; FGR was seen in 7 women (25%) and PIH in 2 women (7.1%) in the control group whereas only one woman (3.5%) developed FGR and PIH respectively in the intervention group. Similar results were observed by Narendran et al in their study comparing integrated yoga in pregnant women from 18-20 weeks of gestation till delivery. They observed that in the yoga group, number of infants with birth weight of >2.5 kg was significantly more (p<0.01), lesser preterm births (p<0.0006) and decreased number of isolated growth restricted fetuses (p<0.003).¹⁷ Rakshani et al reported significantly fewer hypertensive disorders (p<0.028), fewer small for gestational age (p=0.006) and growth restricted neonates (p=0.05) in yoga group. Jayashree et al observed significantly lesser women developing pregnancy induced hypertension with absolute reduction by 12%.^{18, 13}

A significant observation in the present study was that pregnancy in 46.3% (n=13) women in the control group continued beyond 40 weeks gestation as compared to only 10.7% (n=3) in the yoga group and this difference was statistically significant (p=0.0003). Four women in the control group required induction of labor for postdated pregnancy in the control group as compared to 1 in the intervention group, though there was no difference in the incidence of cesarean deliveries in both the groups. Previous studies have observed statistically significant reduction in the need for induction and need for cesarean delivery with yoga and meditation in the antenatal period. Jahdi et al observed that mothers who received yoga care in the antenatal period required less induction of labor (p=0.008) and lower percentage of cesarean section (p=0.002) than the control group.¹⁴ In a single blinded randomized control trial by Bolanthakodi et al for 100 women recruited in each group at 30 weeks of gestation, there were significantly a greater number of normal vaginal deliveries (p<0.037) in the study group practicing yoga.¹⁹ Mohyadin et al evaluated the effect of prenatal yoga consisting of 6 sessions of 60 minutes each on length, anxiety and pain during various stages of labor. They concluded that women in the control group required more induction compared to intervention group (p=0.003).²⁰ Yekefallah et al showed that yoga reduced the induction of labor, and had a significant effect on normal birth weight and delivery at the appropriate gestational age.²¹ In the present study also the incidence of prolonged labor, meconium-stained liquor and fetal distress was more in the women who did not undertake yoga in the antenatal period but this was not statistically significant.

The fetal outcomes of the present study were very promising with neonates of mothers in the yoga group showing higher APGAR scores, higher birth weights and no admission in nursery. Similar results were also noted in various other studies.^{17,19} Rakshani et al in a comparative evaluation of obstetric Doppler in high-risk pregnancy observed significantly higher BPD (p=0.001), HC (p=0.002), FL (p=0.005), estimated fetal weight (p=0.19) in the yoga group.²² In another randomized control trial, Chuntharapat et al compared yoga and meditation with standard prenatal care and evaluated duration of labor and APGAR scores but found no differences in labor augmentation or newborn APGAR scores at 1 and 5 min.²³ Wadhwa et al conducted a questionnaire based retrospective analysis of 200 primiparous patients and found that women who were exercising regularly in the antenatal period, had better maternal and neonatal outcomes like optimal maternal weight gain, lower rates of cesarean section, greater birth weight of newborn and early post-partum recovery.²⁴ Recently, many studies have assessed the benefits of yoga in management of stress and documented reductions in stress scores or improvement in pain scores and sleep patterns which may indirectly have effect on both maternal and fetal outcomes.²⁵⁻²⁷

Cortisol is the primary glucocorticoid produced by the adrenal gland in response to any form of psychological

stress. Pregnancy also witnesses a rise in the cortisol levels, as a result of placental cortisol production. Placental cortisol releasing hormone (CRH) is generated and released into the maternal circulation from the second trimester onwards. Only 10-20% of this cortisol is able to cross the placental barrier after 16 weeks of gestation due to production of placental enzyme 11 β -hydroxysteroid dehydrogenase-2, which converts cortisol to inactive cortisone. This leads to much lower cortisol levels in the fetus as compared to maternal levels and consequently even a small increase in maternal cortisol can have a substantial effect on fetal cortisol levels.²⁸ Evans et al in their clinical trial observed that pregnant women in the third trimester who are suffering from anxiety or depression have higher levels of cortisol levels than healthy controls.²⁹ In another study by Wadhwa et al, elevated levels of ACTH and cortisol at 28 weeks were observed in pregnant women with self-reported stress.³⁰ Field et al in their clinical trial of fetal activity and maternal cortisol between 20 and 28 weeks gestation, observed a positive correlation of maternal cortisol levels with increased fetal activity and lower estimated fetal weight.³¹ In most of the above studies pre and post-yoga session salivary cortisol levels were measured for assessment of maternal cortisol levels. In the present study we wanted to measure the composite effect of yoga and meditation over 8-10 weeks in helping the mother to handle stress throughout pregnancy and labor rather than measuring after every session, so an assessment of cortisol level was done at parturition. Also, salivary cortisol can be influenced by diet, medication and drug consumption and many women find it inconvenient to give the sample. In the present study we took cord blood sample to assess cortisol levels to avoid any variations due to the above factors and for ease of collection with no inconvenience to the participant. Cord blood cortisol levels in the present study were higher than 10 ng/ml in 16 (57.1%) women in the control group as compared to 6 (21.4%) in the intervention group which was statistically significant (p=0.01). Correlation of maternal stress with cord blood cortisol levels has not been documented in any studies till date and further research is required in this direction.

Limitations

The sample size of our study was small, a trial with a larger study size is recommended.

More than 50% of our study population were well educated. Thus, it is a reflection of only a small stratum of our population.

Only 2 sessions of yoga per week were supervised while the rest were only confirmed by the diary maintained by the participant.

CONCLUSION

Yoga is a “skill in action” which helps to harmonize the mind and body and thus alleviates the physical, mental and

emotional stresses of pregnancy. The practice of yoga and meditation during the antenatal period should be encouraged by healthcare providers and this healthy practice should inculcated by the pregnant women in their daily routine for a positive effect not only on their health but also neonatal health.

Funding: No funding sources

Conflict of interest: None declared

Ethical approval: The study was approved by the Institutional Ethics Committee

REFERENCES

- Bijlani RL. Yoga: an ancient tool in modern medicine. *Natl Med J India.* 2008;21(5):215-6.
- Salmon P, Lush E, Jablonski M, Sephton SE. Yoga and Mindfulness: Clinical Aspects of an Ancient Mind/Body Practice. *Cognitive and Behavioral Practice.* 2009;16:59-72.
- Lasater J. The heart of Patanjali. *Yoga J.* 1997;137-44.
- Desikachar K, Bragdon L, Bosart C. The yoga of healing: Exploring yoga's holistic model for health and well-being. *Int J Yoga Ther.* 2005;15:17-39.
- Gordon WD. The "Yoga Sutra of Patanjali": A Biography. Princeton University Press. 2014.
- World Health Organization. Promoting optimal fetal development: report of a technical consultation. Geneva: WHO. 2006. Available at: <http://www.who.int/nutrition/publications/fetomaternal/9241594004/en/index.html>. Accessed on 23 Nov, 2022.
- Markham JA, Koenig JI. Prenatal stress: role in psychotic and depressive diseases. *Psychopharmacology.* 2010;214(1):89-106.
- Charil A, Laplante DP, Vaillancourt C, King S. Prenatal stress and brain development. *Brain Research Reviews.* 2010;65(1):56-79.
- ACOG Committee Opinion No. 650: Physical activity and exercise during pregnancy and the postpartum period. *Am College Obstetr Gynecolog-Obstet Gynecol.* 2015.
- Melzer K, Schutz Y, Boulvain M, Kayser B. Physical activity and pregnancy: cardiovascular adaptations, recommendations and pregnancy outcomes. *Sport Med.* 2010;40(6):493-507.
- Bridges L, Sharma M. The Efficacy of Yoga as a Form of Treatment for Depression. *J Evid Based Complementary Altern Med.* 2017;22(4):1017-28.
- Bali Y, Ebnezar J, John R. Role of Yoga Therapy in Chronic Low Back Ache-A Randomized Controlled Trial. *Ann Yoga Phys Ther.* 2016;1(2):1008.
- Jayashree R, Malini A, Rakhshani A, Nagendra H, Gunasheela S, Nagarathna R. Effect of the integrated approach of yoga therapy on platelet count and uric acid in pregnancy: a multicenter stratified randomized single-blind study. *Int J Yoga.* 2013;6:39-46.
- Jahdi F, Sheikhan F, Haghani H, Sharifi B, Ghaseminejad A, Khodarahmian M et al. Yoga during pregnancy: The effects on labor pain and delivery outcomes (A randomized controlled trial). *Complement Ther Clin Pract.* 2017;27:1-4.
- Dahlerup BR, Egsmose EL, Siersma V, Mortensen EL, Hedegaard M, Knudsen LE et al. Maternal stress and placental function, a study using questionnaires and biomarkers at birth. *PLoS One.* 2018;13(11):e0207184.
- Jerath R, Edry JW, Barnes VA, Jerath V. Physiology of long pranayamic breathing: neural respiratory elements may provide a mechanism that explains how slow deep breathing shifts the autonomic nervous system. *Med Hypotheses.* 2006;67:566-71.
- Narendran S, Nagarathna R, Narendran V, Gunasheela S, Nagendra HR. Efficacy of yoga on pregnancy outcome. *J Altern Complement Med.* 2005;11:237-44.
- Rakhshani A, Maharana S, Raghuram N, Nagendra HR, Venkatram P. Effects of integrated yoga on quality of life and interpersonal relationship of pregnant women. *Qual Life Res.* 2010;19:1447-55.
- Bolanthakodi C, Raghunandan C, Saili A, Mondal S, Saxena P. Prenatal Yoga: Effects on Alleviation of Labor Pain and Birth Outcomes. *J Altern Complement Med.* 2018;24(12):1181-8.
- Mohyadin E, Ghorashi Z, Molamomanaei Z. The effect of practicing yoga during pregnancy on labor stages length, anxiety and pain: a randomized controlled trial. *J Complement Integr Med.* 2020;18(2):413-7.
- Yekefallah L, Namdar P, Dehghankar L, Golestaneh F, Taheri S, Mohammadkhaniha F. The effect of yoga on the delivery and neonatal outcomes in nulliparous pregnant women in Iran: a clinical trial study. *BMC Pregnancy Childbirth.* 2021;21:351.
- Rakhshani A, Nagarathna R, Mhaskar R, Mhaskar A, Thomas A, Gunasheela S. Effects of yoga on utero-fetal-placental circulation in high-risk pregnancy: a randomized controlled trial. *Adv Prev Med.* 2015;2015:373041.
- Chuntharapat S, Petpichetchian W, Hatthakit U. Yoga during pregnancy: effects on maternal comfort, labor pain and birth outcomes. *Complement Ther Clin Pract.* 2008;14:105-15
- Wadhwa Y, Alghadir AH, Iqbal ZA. Effect of Antenatal Exercises, Including Yoga, on the Course of Labor, Delivery and Pregnancy: A Retrospective Study. *Int J Environ Res Public Health.* 2020;17(15):5274.
- Satyapriya M, Nagarathna R, Padmalatha V, Nagendra HR. Effect of integrated yoga on anxiety, depression & wellbeing in normal pregnancy. *Complement Ther Clin Pract.* 2013;19:230-6.
- Bershadsky S, Trumfheller L, Kimble HB, Pipaloff D, Yim IS. The effect of prenatal Hatha yoga on affect, cortisol and depressive symptoms. *Complement Ther Clin Pract.* 2014;20:106-13.
- Newham JJ, Wittkowski A, Hurley J, Aplin JD, Westwood M. Effects of antenatal yoga on maternal

- anxiety and depression: a randomized controlled trial. *Depress Anxiety.* 2014;31:631-40.
28. Boll CM, Khamirchi R, Alonsol L, Ilurba E, Pozo OJ, Miri M, Dadvand P. Prenatal green space exposure and cord blood cortisol levels: A cross-sectional study in a middle-income country. *Environment Int.* 2020;144:106047.
29. Evans LM, Myers MM, Monk C. Pregnant women's cortisol is elevated with anxiety and depression - but only when comorbid. *Arch Womens Ment Health.* 2008;11(3):239-48.
30. Wadhwa PD, Garite TJ, Sandman CA. The neurobiology of stress in human pregnancy: Implications for prematurity and development of the fetal central nervous system. *Progress Brain Res.* 2001;133:131-42.
31. Field T, Diego M, Hernandez-Reif M. Prenatal depression effects on the fetus and newborn: a review. *Infant Behav Dev.* 2006;29(3):445-55.

Cite this article as: Mehta S, Grover A, Kale E, Nanda P, Mehta A. Meditation and Yoga in pregnancy: maternal and fetal impact. *Int J Reprod Contracept Obstet Gynecol* 2023;12:413-9.