Review Article

The Effect of Yoga Practice on Labor Pain: A Systematic Review and Meta-Analysis

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Abstract

Background: Labor pain management is a critical aspect of midwifery care and an essential purpose of childbirth-related care. There is a need for comprehensive results on relevant non-therapeutic methods of reducing labor pain. This systematic review and meta-analysis study was conducted to investigate the effect of yoga practice on labor pain. **Material and Methods:** We performed a systematic literature search from SCOPUS, PubMed, Web of Science, and Science Direct for relevant studies from January 1, 1990 to June 2, 2022. We selected published quasi-randomized and randomized controlled trial studies that evaluated the effect of yoga practice on labor pain. Quality research was applied. We pooled the Standardized Mean Dfference (SMD) of labor pain in pregnant women with and without yoga practice during pregnancy using a random-effects model at 95% Confidence Intervals (CIs). **Results:** Nine studies including 660 women were included in the meta-analysis. Pregnant women in the yoga practice group experienced statistically significantly low labor pain at the beginning of the active phase compared to the control group (SMD: -1.10, 95% CI: -1.61, -0.58, $p < 0.001$; I2 = 89%). Yoga interventions also reduced the intensity of labor pain in active (SMD: -1.32, 95% CI: -2.03, -0.60, $p < 0.001$; I2 = 92%) and transition (SMD: -1.93, 95% CI: -2.87, -0.99, $p < 0.001$; I2 = 92%) phases compared to the control group, respectively. **Conclusions:** The results of the study showed that yoga practice during pregnancy reduces the intensity of labor pain in different labor phases. However, these findings should be considered cautiously due to the substantial heterogeneity between studies.

Keywords: *Labor pain, muscle stretching exercises, pregnant women, yoga*

Introduction

Pain experienced during childbirth is a complex, multi-dimensional, and subjective phenomenon.[1] Labor pain management leads to a pleasant delivery, emotional recovery of the mother and baby, and a reduction in the need for analgesic drugs and the rate of cesarean section.[2,3] Most mothers demand the use of pain relief techniques in labor.[4] Labor pain management is a critical aspect of midwifery care and an essential aim of childbirth-related care.[5] Numerous pharmacological[6] and non-pharmacological methods are available to manage labor pain.[7,8] Pharmacological methods to reduce pain are usually associated with adverse effects such as prolonged labor, abnormal fetal rate heart, and the use of instruments for childbirth.[9] The use of non-pharmacological methods is recommended due to no side effects or a few side effects.[10] Also, non-pharmacological methods allow pregnant women to experience delivery in a natural way.[11] Effective non-drug methods in relieving pain in labor include breathing techniques,[12] music therapy,[13] massage and heat therapy,[14] aromatherapy virtual reality glass,[15] perinatal education,[16] and yoga.[17]

Historically, people do practiced yoga for about 4000 years to improve their health.[18] Yoga is a comprehensive method for health and personal growth and integrates physical exercise and meditation.[18] Yoga practice improves blood circulation, oxygen uptake, and hormonal system functions, and relaxation and meditation in yoga stabilize the autonomic nervous system.[19] The combination of these practices can reduce anxiety and stress,[20] empower mothers in this process, and reduce the severity of labor pain.[21] It also prepares the mother for childbirth with strength determination. Evidence illustrated that yoga practice

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during pregnancy is pleasant, feasible, safe, and useful for both the mental and physical health of pregnant women.[22,23]

The results of some clinical trial studies show that yoga practice during pregnancy reduces the severity of pain in labor.[3,20,24-29] Several systematic review and meta-analysis studies have been conducted on the role of yoga practice on psychological effects in pregnant women[30-32] and outcome pregnancy such as labor length, low birth weight, intra-uterine growth restriction, and preterm labor.[33] However, a systematic review and meta-analysis study was performed in connection with the effect of yoga practice on labor pain in English, Randomized Control Trial (RCT)-design articles.[17] Authors have suggested that more articles are needed for a more comprehensive conclusion. This systematic review and meta-analysis study was carried out to investigate the impact of yoga practice on labor pain.

Materials and Methods

We carried out a systematic review and meta-analysis based on Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines.[34] We performed the systematic literature research from Scopus, PubMed, Web of Science, and Science Direct with the following search terms: "Yoga" OR "Muscle Stretching Exercises" OR mindfulness OR "mind concentration" OR "relaxation techniques" OR meditation AND "labor pain". Two authors (M.D., E.J.) independently conducted an initial search and screening for related articles via title and abstract. Disagreements were resolved by the discretion of the third author (MN). Duplicated studies were removed, and the rest were evaluated according to inclusion and exclusion criteria. The literature search was applied between January 1, 1990 and June 2, 2022, without geographic and language limitations.

Studies were considered in our review if they fulfilled the following criteria: (I) the study was an RCT in parallel or crossover design and quasi-experimental, (II) the intervention was administration of yoga practice, (III) the control group was any other routine prenatal care such as mental or physical care, (IV) the outcome of interest was intensity of labor pain through visual analog index (10 cm), and (V) the population of interest was healthy and nulliparous pregnant women. Studies were excluded if those were (I) evaluated exercise without meditation and also evaluated other pre-natal outcomes such as labor length, comfort, fear, and anxiety of mother; (II) case-control, case series, cross-sectional, animal, or cell culture studies; (III) did not report adequate details of study methodology or results; and (IV) presented only as abstracts, conference paper, and letters to the editor and editorials. The visual analog index[35] is commonly used to measure pain intensity. The number "0" indicates painless, and the number "10" indicates the worse pain. Intensity of labor pain at three phases of childbirth was assessed: 1. The beginning of the active phase (3–4 cm of cervix dilatation); 2. Active phase (5–8 cm of cervix dilatation); 3. Transitional phase (8–10 cm of cervix dilatation).

Two investigators (MN, MF) extracted and evaluated the essential data independently. These data entered into standardized data extraction forms and then were mutually checked for completeness and accuracy. Disagreements were solved by consulting with the expert investigator (MS). The characteristics of the studies (the name of researchers, year of publication, study location, and setting), participants (amount of participants, average or age rang, gestational age), interventions (study design, the instrument used for measurement, characteristics of yoga intervention, duration and frequency of yoga intervention, number of withdrawal, and reasons for withdrawal), and outcomes (mean and standard deviation of labor pain intensity in the intervention and control groups at three time) were assessed. Quality research of RCT and semi-intervention studies were applied with a checklist for RCTs and quasi-experimental (Critical Appraisal tools for use in JBI Systematic Reviews).[36] The checklist for RCT contains 13 items. All RCT studies independently were scored based on these 13 items. These items are related to "assignment and allocation of participants in the groups; blindness of participants in groups, and outcomes assessors; the similarity groups at the baseline; were those delivering treatment blind to treatment assignment; fallow up in the groups; The process of outcomes assessment in the groups and Statistical analysis methods". The checklist for quasi-experimental has seven items. In this tool, the following items are checked: is it clear what is the 'cause' and what is the 'effect'; were the participants included in any comparisons similar; were the participants included in any comparisons receiving similar treatment/care; was there a control group; were there multiple measurements of the outcome both pre and post the intervention/exposure; was follow-up complete; were the outcomes of participants included in any comparisons measured in the same way; were outcomes measured in a reliable way; was appropriate statistical analysis used? Answers were scored as 'yes' (one), 'no', and unclear (zero). Two reviewers (MN, MF) independently assessed the quality studies, and disagreements were solved by consulting with the expert investigator (MS).

The effect size of labor pain in pregnant women with and without yoga practice was measured as the Standardized Mean Difference (SMDs) with corresponding 95% Confidence Intervals (CIs). The pooled SMD of labor pain in pregnant women with and without yoga practice during pregnancy at the three phases was estimated using DerSimonian and Laird Random-Effects Model (REM). The heterogeneity of the studies was assessed graphically with forest plots and statistically by Chi-square-based Q statistic and I^2 value. Heterogeneity was considered significant at a P value of < 0.10 in Q-test or $I^2 > 40\%$. Statistical analyses

were performed using Stata software (Version 17.0) (Stata Corp, College Station, Texas) and Review Manager Software (v 5.4; Cochrane Collaboration).

Ethical considerations

This manuscript has no plagiarism. Ethical approval was not required due to the design of this study. This study is registered in the PROSPERO (Number: 336923).

Results

Characteristics of included studies

The first using the search terms, we identified 3970 studies that at the end, 9 studies with 660 samples selected for meta-analysis [Figure 1]. These studies were from five countries (Iran, Korean, India, Thailand, and Indonesia). Eight of studies were RCT, and one study was quasi-experimental design. Six of the studies were written in English, two in Persian, and one in Korean language. The authors and country name, main study characteristics, and intensity of labor pain in the three phases in pregnant women illustrated in these nine studies are given in Table 1.

Quality assessment

Table 2 shows studies' quality score. Out of eight studies with RCT design, six studies received scores of 7, 8, and 9, and two other studies received 10 and 11 out of 13 total scores. A study with a quasi-experimental design also received 6 out of 9 total scores [Table 3].

Intensity of labor pain in the pregnant women

Pregnant women in the yoga practice group experienced statistically significantly less labor pain at the beginning of the active phase compared to the control group (SMD: -1.10, 95% CI: -1.61, -0.58, $p < 0.001$; $I^2 = 89\%$; Figure 2). Yoga interventions also reduced intensity of labor pain in active (SMD: -1.32, 95% CI: -2.03, -0.60, $p < 0.001$; $I^2 = 92\%$; Figure 3) and transition (SMD: -1.93, 95% CI: -2.87, -0.99, $p < 0.001$; $I^2 = 92\%$; Figure 4) phases compared to the control group, respectively.

Discussion

This systematic review and meta-analysis were performed to determine the effect of yoga during pregnancy on the intensity of labor pain in pregnant women. The results of a review of 9 clinical trial articles and 660 samples showed that yoga practice reduces the severity of pain in the active phase of labor and the transitional phase.

The results of this study are in line with the study of Riawati (2021) *et al.* In that meta-analysis, where five studies evaluated the effect of yoga exercise on pain intensity, yoga reduced the severity of labor pain in pregnant women compared to pregnant women with routine care.[17] The results were also in line with the studies of Babbar, *et al.*[37] and Kathryn Curtis *et al.*[33]

There are different mechanisms for reducing the severity of labor pain in women who practice yoga during pregnancy. These mechanisms include proper breathing techniques, increased concentration of mind, reduced stress and anxiety, increased flexibility of the perinea, vaginal and sphincter muscles,[3] gate control theory of pain,[30] and increased blood serotonin and endorphins.[38] Yoga practice emphasizes correct breathing, relaxation, and meditation of the mother's body and mind so that the mother can exercise control over pain.[17] Yoga exercises during pregnancy include several phases: pranayama, asana, relaxation, and meditation techniques.[39] Pranayama is a technique (regular manipulation of breathing) by which the mother practices during pregnancy as well as childbirth to feel relaxed. Relaxation of the body can affect oxygen uptake and ATP secretion for the uterine contraction process so that the cervix opens faster.[39] By regulating inhaling and exhaling, breathing techniques in yoga deliver enough oxygen to the neurons in the brain, and prolonged exhalation reduces exposure to carbon dioxide and other harmful gases, activates the parasympathetic system, and intensifies anxiety and relaxation, thereby reducing pain perception.[40]

Relaxation techniques help enhance self-awareness, concentration, and energy retention and reduce tension during contractions. Meditation calms the mind to focus on the body.[17] In a qualitative study (2020), women's perceptions of yoga practice during pregnancy were divided into three categories: "benefits of yoga practice", "self-knowledge, autonomy and self-care", and "empowerment for the moment of delivery".[41] Yoga is associated with physical and psycho-social benefits for pregnant women, including the strengthened pelvic floor, relieved pain, improved breathing, reduced stress and anxiety, boosted confidence, self-esteem, and independence in managing pregnancy and self-care.[41] In various studies, yoga exercises reduced stress, anxiety, and fatigue[30,31] in pregnant women. The results of a study by I-Hui Lin *et al.* (2022) showed that practicing yoga reduces stress in pregnant women with and without depression.[31] Also, in a systematic review of 3591 people in 51 studies, Mohammadi *et al.* (2021) showed that relaxation (meditation) reduces stress and anxiety in people.[42] However, Schlegel R, Richard N, *et al.* (2020) reported in their review that there is no strong evidence that yoga exercises relieve maternal stress and anxiety during pregnancy.[43] By regulating heart rate and blood pressure, meditation increases alpha brain waves[44] and strengthens the parts of the brain that are related to emotions,[45] which causes happiness and relaxation, and some researchers believe that meditation reduces mental rumination as well as anxiety and stress.[46]

During prenatal yoga practice, Asana techniques increase spinal flexibility and cerebrospinal fluid circulation[25] and facilitate labor by increasing the flexibility of the perineal, vaginal, and sphincter muscles.[43] Yoga exercises help strengthen the muscles of the back, abdomen, and buttocks

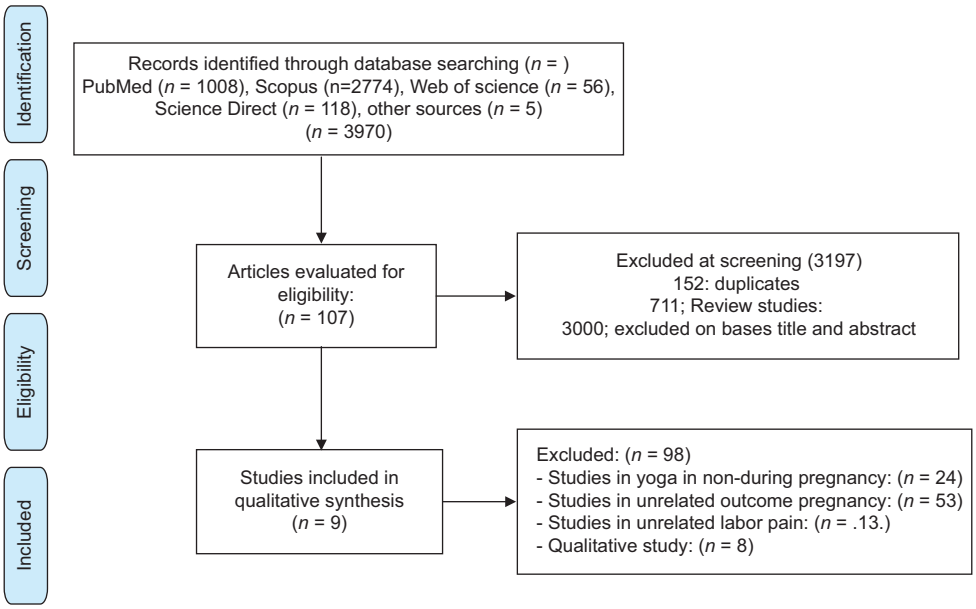

Figure 1: Flow chart of the systematic literature review

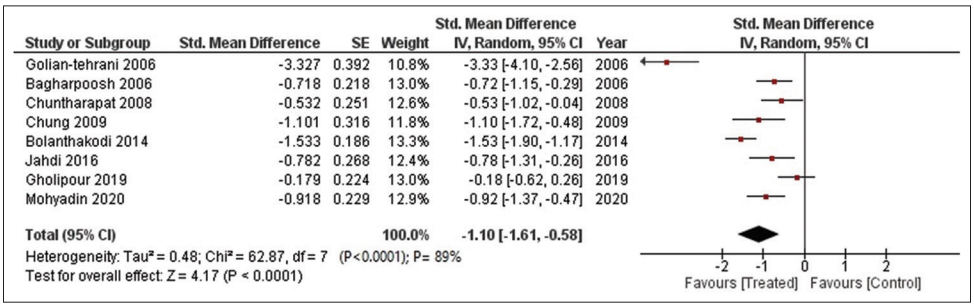

Figure 2: Forest plot for intensity of labor pain at the beginning of the active phase in pregnant women

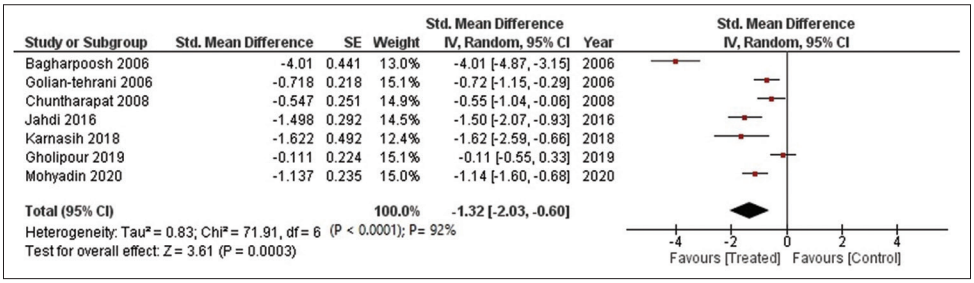

Figure 3: Forest plot for intensity of labor pain at the active phase in pregnant women

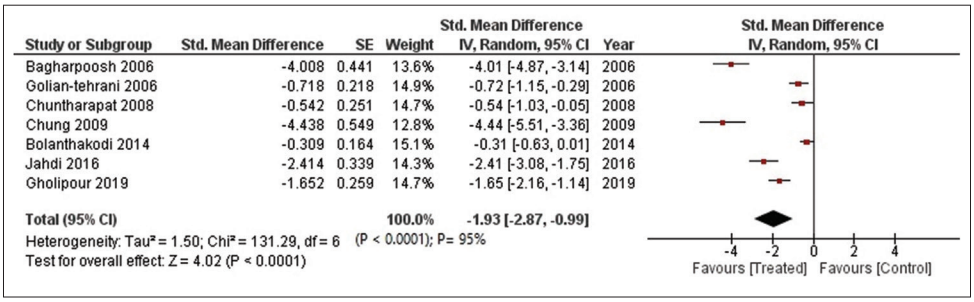

Figure 4: Forest plot for intensity of labor pain at the transition phase in pregnant women

and increase the woman's strength.[27] Yoga connects the body, mind, and soul. Increasing awareness of the pelvic floor can help the individual gain new insights into how the body moves, how to improve posture, and how to

Table 1: Characteristics of selected studies

n	Author. Year	Place	Sample	Age (Years) Mean (SD)/rang	Design	Instrument	Yoga practice	Labor Pain Experimental/Control	*P*
1	Jahdi *et al.* (2016)	Iran	60	27.44 (4.37)	Single blinded RCT	VAS	Yoga asanas, chanting om, breathing awareness, yoga Nidra, Dhyana	Dil 3-4 cm: 2.63 (0.90)/3.55 (1.40)**	0.01
								2 h late: 3.58 (0.90)/6.0 (2.10)	0.000*
								4 h late: 3.90 (1.09)/8.4 (2.40)	0.000*
2	Karnasih IGA *et al*. (2018)	Indonesia	22	27.44	Pre-experimental	NPS	Mattresses, aroma therapies, audio visual/ relaxation music and yoga vcd)	Active Phase: 6.82 (1,53(/8.91) 0.99)	<0.05
3	Chuntharapat S *et al*. (2008)	Tilaned	66	NA/18-35	Single blinded RCT	VASPS	Yoga asanas, chanting om, breathing awareness, yoga Nidra, Dhyana	Dil 3-4 cm: 51.79 (10.46)/57.91 (12.83)	<0.05
								2 h late: 67.24 (9.41)/71.91 (7.70)	<0.05
								4 h late: 83.48 (8.89)/88.03 (8.05)	<0.05
4	BolanthnKodi Ch *et al*. (2014)	India	150	23.71 (3.40)	Single blinded RCT	NPS	Yoga asanas, chanting om, breathing awareness, yoga Nidra, Dhyana	Dil 3-4 cm: 6.43 (1.05)/7.95 (0.93)	<0.001
								Dil 8 cm: 9.43 (0.61)/9.62 (0.62)	0.089
5	Chung Sin Sh *et al*. (2009)	Korean	46	32.6 (3.80)	A quasi experimental study	VAS	Based on posture, full body relaxation and abdominal breathing, and education for pregnant women	Active Phase: 3.73 (0.75)/5.60 (1.03)	<0.001
								Dil 8 cm: 5.21 (0.99)/8.43 (0.27)	<0.001
6	Gholipour Sh *et al*. (2019)	Iran	80	29.75 (7.00)	Single blinded RCT	VAS	Yoga asanas, chanting om, breathing awareness, yoga Nidra, Dhyana	Dil 4-6 cm: 4.0 (5.46)/5.10 (5.70)	<0.001
								Dil 6-8 cm: 6.10 (7.45)/7.10 (10.33)	<0.001
								Dil 8-10 cm: 8.10 (75.51)/9.10 (4.04)	<0.001
7	Mohyadin *et al*. (2020)	Iran	84	24.75 (4.22)	RCT	VAS	Physical postures (Asana) accompanied with breathing ex-excises (pranayama) followed by meditation	Dil 4-5 cm: 4.03 (1.99(/5.77 (1.89)	0.001
								2 h late: 6.17 (1.64)/8.14 (1.82)	<0.001
8	Bagharpoosh M *et al*. (2006)	Iran	62	NA/20-30	RCT	VAS	Relaxing the toes and feet and then ankles, calves, knees, thighs, lower abdomen, upper abdomen (or chest), shoulders, arms, hand and fingers, neck, face and heads.	Dil 3-4 cm: 4.50 (2.50/6.25 (2.50)	<0.001
								Dil 6-8 cm: 7.03 (3.66(/9.12 (3.66)	<0.001
								Dil 10 cm: 6.96 (2.50)/9.64 (2.50)	<0.001
9	Golian Tehrani Sh *et al*. (2006)	Iran	90	NA/20-35	RCT	VAS		Dil 3-4 cm: 4.0 (4.18)/7.0 (4.18)	<0.001
								1 h late: 7.0 (3.07)/8.0 (3.07)	<0.001
								2 h late: 7.0 (3.07)/10.0 (3.07)	<0.001

**Mean (Standard Deviation)/Mean (Standard Deviation)

Table 2: Quality assessment of the effect of prenatal yoga on labor pain (RCT*)

n	Author. Year	1	2	3	4	5	6	7	8	9	10	11	12	13	Total score
1	Jahdi *et al*. (2016)	1	1	1	0	0	1	1	1	1	1	1	1	1	11
2	Karnasih *et al*. (2018)	1	0	0	0	0	0	1	1	1	1	1	0	0	6
3	Chuntharapat *et al*. (2008)	1	0	1	0	1	1	1	1	1	1	1	0	0	9
4	Bolanthn Kodi *et al*. (2014)	1	0	1	0	1	1	1	1	1	1	1	1	0	10
5	Gholipour *et al*. (2019)	0	0	1	1	0	1	1	1	1	1	1	0	0	8
6	Golian Tehrani *et al*. (2006)	0	0	1	1	0	1	1	1	1	1	1	0	0	8
7	Mohyadin *et al*. (2020)	0	1	1	1	0	1	1	1	1	1	1	0	0	9
8	Bagharpoosh *et al*. (2006)	0	1	1	1	0	0	1	1	1	1	1	0	0	8

Ranodaized Clinical Trial (RCT)

Table 3: Quality assessment of the effect of prenatal yoga on labor pain (quasi experimental study)

n	Author. Year	1	2	3	4	5	6	7	8	9	Total score
1	Chung Sin *et al* (2009)	1	1	1	1	0	1	1	0	0	6

improve strength and flexibility. Practicing yoga raises the threshold for perceived pain during childbirth and leads to increased secretion of endorphins and serotonin.[38] In the study by Karimi *et al.* (2018), yoga exercises elevated serotonin in pregnant women.[38] Also in the study of Sri Sumarni (2022), yoga exercises increased beta-endorphin levels and decreased dysmenorrhea in adolescents.[47] Studies selected of this review were systematic, conducted in 5 Asian countries (Taiwan, India, Iran, Indonesia, and Thailand). Clinical trial studies in countries with different cultures could give a better interpretation of the results, and the study limitations could be identified.

Conclusion

The results of studies showed that yoga practice during pregnancy reduces the intensity of labor pain in different labor phases. Therefore, maternal yoga practice can be used during pregnancy to reduce the severity of labor pain. Considering the benefits of yoga during pregnancy, it has increasingly been accepted as a self-care activity during pregnancy and in preparation for childbirth. In pregnancy care planning, holding yoga classes seems useful to help the mother to have both physical and psychological preparation for childbirth. Also, using different yoga techniques by reducing the severity of labor will be effective in promoting vaginal delivery and reducing cesarean section. Mothers who practice yoga regularly during pregnancy experience a healthy, comfortable pregnancy and delivery, low labor pains, and mental well-being.

Acknowledgments

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Nil.

Conflicts of interest

Nothing to declare.

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