



Effect of Yoga and Classical Music on Uterine Artery Indices

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Article History	Abstract
Received: 06 June 2023 Revised: 05 Sept 2023 Accepted: 13 Oct 2023	<p><i>During antenatal period, the fetus and mother are connected through placenta, a structure that perform the functions of supplying nutrients to foetus, exchange of gases and elimination of waste through well maintained blood circulation. Thus, foetal health is dependent on this circulation. Any impairment in it can cause adverse effects on foetus. The present case study aimed at understanding the effect of yoga and Indian classical music on maternal and foetal health. Along with routine antenatal care, the patient was advised yoga exercises and listening to some Indian classical music ragas. Today, the effect of yoga and music has been examined on various physical and psychological dimensions of pregnant women. However, there are still sparse studies on the effect of yoga and music on the uterine artery indices as well as maternal and foetal complications. It was found that yoga and classical music resulted in improved uterine artery indices, foeto-maternal health and good foetal outcome.</i></p>
CC License CC-BY-NC-SA 4.0	Keywords: Yoga, Indian Classical Music, Uterine artery indices, Colour doppler

1. Introduction

The placenta is the thread of communication between mother and fetus. The placenta adapts itself to continuous vascular changes and differentiation so that efficient interaction between the utero-placental and foeto-placental circulation can be monitored and maintained so as to gain the optimum health of the foetus.

A condition where a foetus is unable to reach its optimum biological growth potential due to placental dysfunction, is known as foetal growth restriction (FGR)¹. The foetus is entirely dependent on placental perfusion for oxygenation and nutrient supply. A healthy utero-placental circulation is a prerequisite for foetal growth and development and normal pregnancy outcome. If the blood flow is compromised, circulatory and metabolic needs of the foetus are not fulfilled which result in foetal growth restriction (FGR). The mother as well as child may have to face the consequences of placental dysfunction during and after labour. The pregnancies of mothers affected with placental dysfunction can be linked to perinatal morbidity and mortality². In the long run, there may be increased chances of obesity, metabolic and cardiovascular diseases in future adult hood³.

In early pregnancy, it is very difficult to forecast which mother will develop pre-eclampsia and have a negative outcome because validated clinical tools or assays are not sufficiently sensitive and specific to predict these things. Systematic review for the uterine artery activity shows that in the second trimester, two Doppler ultrasound readings viz "Increased pulsatility index" and "bilateral notching" have quite reliable test performance in understanding which women are at low and high risk of developing severe pre-eclampsia.⁴

Various studies on the physical and psychological dimensions of pregnant mothers are available. But very few studies have been done to know the effect of yoga in improving uterine artery function. The present study was performed to examine the effect of yoga and classical music on uterine artery Doppler indices, maternal, and foetal complications. The study evaluated the significance of yoga and classical music in alterations in venous and arterial Doppler waveform indices in compromised foetus through pulsatility index.

Case History

A 25 yrs. old female (OPD no.33911) visited OBS-GYNAE OPD on 03/08/2022 in Government Autonomous Ayurvedic College & Hospital, Jabalpur, MP. She had H/O amenorrhoea since 1month 19 days and complaints such as headache and vertigo. First of all, Urine pregnancy test was performed and it was found to be positive. On routine ANC profile the findings were HB-10Gm%, Blood group - AB +ve, HIV, VDRL, HBsAG -Negative, RBS-94, and Urine albumin & sugar-NIL. On examination Pulse was -88/min, BP was 130/80mm of Hg. The patient was treated with routine medication as per the trimester.

After NT scan, she was advised some yogasana and classical music listening. The schedule is given ahead.

During, second trimester, she was advised Sukshma vyayama (light warm up exercises) followed by yogasana such as *Ardhakati chakrasana*, *ardhachakrasana*, *trikonasana*, *vajrasana*, *padmasana*, *baddhapadmasana*, *veerasana* and *shawasana*., *Anulom-vilom*, *Bhramari pranayama*, for 30 minutes according to her capacity and Indian Classical music ragas viz. *Bhupali*, *Kedar* and *Bageshri* were prescribed for listening at their particular time.

In third trimester, *Sukshma vyayama* followed by *yogasana* viz *ardhakatichakrasana*, *ardhachakrasana*, *vajrasana*, *malasana*, butterfly (only in 9th month), *badhhakonasana* (only during 9th month), *shawasana* (in lateral position). *Anulom-vilom* and *Bhramari pranayama* for 30 minutes were also advised according to her capacity. Indian classical music ragas like *Bhupali*, *Kalyana* and *Malkauns* at their prescribed time were advised to listen.

Table 1 -Follow-Up And Observations

Date	Treatment	Follow- up
1st visit 03/08/2022 (OPD NO. 33911)	C/O – Amenorrhea since 1 month 19 days	LMP -14.6.2022 EDD -21.03.2023 Investigations Advised & findings at first visit Hemoglobin-10 gm% Blood Group -AB ^{+ve} HIV, VDRL, HbsAg -Negative Blood Sugar- 94 Urine Albumin -Nil Urine Sugar -Nil
04/08/2022 Patient revisited OPD	C/O – Giddiness with fever H/O- 2 months Amenorrhea R_x Tab. Folic acid -5 mg 1 OD Syp. Zymnet 2tsf BD Tab-Prexia BD	O/E –Afebrile P- 88/min BP-120/80mm of Hg Weight -50.6 kg P/A- Uterus –Not Palpable Investigations Advised & findings at first visit Hemoglobin-10 gm% Blood Group -AB ^{+ve} HIV, VDRL, HbsAg -Negative Blood Sugar- 94 Urine Albumin -Nil

		Urine Sugar -Nil
		O/E
		Pulse- 84 beats per min/Regular
		B.P. -120/80 mm of Hg
		P/A – Soft,
		Uterus-Not Palpable
		Weight -50.6 kg
		Advice –
		Blood Sugar- were
		Thyroid Profile within
		(T3, T4, TSH) normal
		limits
		H/O- 3 Month + 6 Days
		O/E
		Pulse- 88 beats per min
		B.P. -130/84 mm of Hg
		Weight – 52 kg
		P/A -soft
		Uterus -just above pubic symphysis
		Adv-Complete blood Count (CBC)- was WNL
		USG Obs (NT Scan)
		H/O- 3 Month + 26 Days
		amenorrhoea
		O/E
		Pulse- 88 beats/min
		B.P. -120/70 mm of Hg
		Weight – 52 kg
		P/A-Uterus -14 wks -16 wks
		Foetal Heart Sound (FHS) - 140/ min
		Lie -changing
		Colour Doppler Study - SLF with MGA 15 weeks+5 Days
		Increased PI with early compromised blood flow
		SLF with MGA 15 weeks+5 Day
		H/O- 4 Month + 5 Days
		O/E
		Pulse-- 88 beats per min
		B.P. -100/70 mm of Hg
		Weight. – 53 kg
		P/A-Uterus -16-18 wks-
		FHS -136/ min
		Lie -changing
		Target Scan-SLF with MGA-18weeks+/-2 weeks, CPR-1.3
		S/O-early hypoxia
		H/O- 5 Months amenorrhoea
		O/E
		Pulse-- 88 beats/ min
10/08/2022	C/O – Weakness H/O- 2 months Amenorrhoea R_x Tab. Folic acid -5 mg 1 OD Tab. Prexia 1 BD	
20/09/2022	C/O – Headache, Vertigo R_x Tab. IFA 1BD Tab Calcium 1 BD Tab. MV/BC 1OD Promin protein Powder 2tsf BD with milk	
10/10/2022	C/O – No any Fresh complaint R_x Tab. IFA/ Calcium -1- OD Tab. MV 1 BC -1- OD protein Powder (2-0-2) Spoon with milk Advised –Yogasana , Anulom-Vilom and Bhramari Pranayam, Raaga- Bhupali, Kedar, Bageshri	
19/10/2022	C/O – No Fresh complaints R_x Continued same treatment. Advised –Yogasana, Anulom-Vilom and Bhramari Pranayam, Raaga- Bhupali, Kedar, Bageshri	
16/11/2022	C/O – Whole body itching R_x Continued same treatment.	

		B.P. -130/90 mm of Hg Weight. – 55 kg P/A-Uterus -20-22 weeks FHS -144/ min ,reg Lie -changing Advised -LFT- was WNL CBC-Hb-10.9 Urine-Alb-sugar-Nil
20/12/2022	C/O – No Fresh complaint R_x Continued same treatment	H/O- 6 Month + 6 Days O/E Pulse-- 88 beats per min B.P. -110/60 mm of Hg Weight. – 58 kg P/A-Uterus -24 weeks FHS -136/ min Lie -changing
01/02/2023 (OPD NO. 6139)	C/O – No any Fresh complaint R_x Continued same treatment. Advised- Yogasana-Ardhakatichakrasana, Ardhachakrasana, Vajrasana, Malasana. Anulom-vilom and Bhramari pranayama Raaga- Bhupali,kalyan , Malkauns	H/O- 7 Month + 18 Days O/E Pulse-- 87 beats per min B.P. -120/70 mm of Hg Weight. – 59 kg P/A-Uterus -28-30 weeks FHS -144/ min, Reg Lie -LOA Presentation-Cephalic
14/02/2023	C/O – No Fresh complaint R_x continued same treatment. Yogasana-Ardhakatichakrasana, Ardhachakrasana, Vajrasana, Malasana. badhhakonasana, butterfly Anulom-vilom and Bhramari pranayama Raaga- Bhupali,kalyan , Malkauns	H/O- 8 Months Amenorrhoea O/E Pulse-- 82 beats per min B.P. -120/80 mm of Hg Weight. – 60 kg P/A-Uterus -32 wks FHS -136/ min Lie -LOA Presentation-Cephalic ADV-USG OBS for fetal well-being (Colour Doppler)
22/02/2023	C/O – No Fresh complaints R_x continue same medicine. Yogasana-Ardhakatichakrasana, Ardhachakrasana, Vajrasana, Malasana. badhhakonasana, butterfly Anulom-vilom and Bhramari pranayama Raaga- Bhupali,kalyan , Malkauns	H/O- 8 Months +7 days amenorrhoea O/E Pulse-- 84 beats per min B.P. -120/70 mm of Hg Weight. – 61kg P/A-Uterus -32-34wks FHS -140/ min Lie -LOA, Presentation-Cephalic USG-SLF with MGA 35weeks+5 days Doppler study-Normal
18/03/2023	C/O-Pain in lower abdomen, low backache	A full-term female baby of weight 3.1 delivered by the patient vaginally on date 18/03/2023 at 11-29 Am

3. Results and Discussion

To assess the foetal well-being basic parameters included were -biparietal diameter, head circumference, femur length, estimated foetal weight, foetal heart rate and colour Doppler study. It was found that yoga and classical music improved various foetal indices (BPD, HC, FL, HR, EFW) at the end of 35 weeks of gestation. The results show that yoga and music lead to improvement in the left uterine artery function parameters (Systolic/diastolic ratio (S/D), Pulsatility index (PI) which was high during 15 weeks and 18 weeks and low CPR (cerebro-placental ratio), compromised blood flow and early hypoxia of foetus. The study also found that yoga and music lead to improved fetal-placental perfusion function indices. Also, during 1st visit the blood pressure was on higher side which was lowered after intervention.

USG findings of patient -

	15weeks+5 days	20weeks (anomaly scan)	35 weeks.
CRL	10.4 cm		
BPD	3.2cm	4.47cm(19wks+4D)	8.9 cm (36 wks.)
HC	11.4Cm	15.5cm(18wks+3D)	30.5(34wks)
AC	9.9cm	13.1cm(18wks+4D)	29.6(33wks+4D)
FL	1.9cm	2.73cm(18wks+2D)	7.4(38wks)
FHR	156Bpm	144 Bpm	127 Bpm
Liquor	adequate	Adequate AFI-13	Adequate AFI-9-10
pl	Posterior, Grade 0 maturity	Posterior- Grade I maturity	Posterior- grade II maturity
EFW		244 gm+/-36 gm	2600+/-10%
	Date-30-09-2022	Date -17-10-2022	Date-20-02-2023
doppler	RT UT artery-PI-0.65,RI-0.47,SD-1.89 LT UT artery-PI-1.53, RI-0.77, SD-4.29 IMP-increased PI with early compromised blood flow	RT UT artery-PI-0.8, RI-0.5, LT UT artery-PI-1.6, RI-0.7, UMB ART-PI-1.2, RI-0.7 MCA-PI-0.8, RI-1.6 CPR-1.3 IMP-early hypoxia	RT UT artery PI-0.38, RI-0.31 LT UT artery PI-0.71, RI-0.49 MCA-PI-0.71, RI-0.49 IMP-Normal blood flow, no reversal flow, Doppler study normal

A thorough search for the literature regarding classical music, yogasana which are safe during pregnancy and their importance before and after conception was done. Similarly, its effects on foetal well-being were also studied. Other research journals, papers, books related to conception, pregnancy, stress, music, yoga and its effect, including effect on foetal velocimetry etc. were also explored.

Understanding the knowledge of obstetrics show that optimum foetal growth and normal pregnancy outcome require good utero-placental circulation. Uterine artery pulsatility index is a non-invasive method of assessing vascular resistance with the use of Doppler ultrasonography, commonly measured at 11-13+6 weeks to predict adverse pregnancy outcomes including hypertensive disorders and small-for-gestational age.⁵ Maternal health and normal placenta development are the factors that affect embryogenesis, foetal growth and survival in post-natal period.⁶ Early initiatives in prenatal period have shown enhancement in uterine perfusion and reduction in maternal and foetal complications.^{7,8}

Preeclampsia has been shown to be prevented by regular exercise because it promotes placental development and vascularity, lowers oxidative stress, and improves endothelial functions.⁹ Yoga can be a good substitute for expecting mothers because it improves fitness and microcirculation.

Some studies have linked higher stress with higher chances of spontaneous preterm labour and lower birth weight¹⁰. Some evidence shows the negative impact of stress on the (unborn) child's cognitive and motor development¹¹ and emotional and behavioural facets.¹² Yoga has demonstrated beneficial

effects on anxiety and stress during anti natal period^{13,14,15} faster and simpler delivery, as well as increased foetal weight.¹⁶

NatyaShastra, a Sanskrit treatise on performing arts mention that a *raga* has the capacity to evoke one of the nine emotions: *sringara* (love), *hasya* (happiness), *adhuta* (wonder and curiosity), *vira* (bravery), *shanta* (serenity), *karuna* (sorrow), *raudra* (anger), *bhayanaka* (fear) and *vibhasta* (disgust). The ragas are categorised accordingly.

Ragas have been assigned a specific time of the day on the basis that their very vibrations affect doshas Vata, Pitta and Kapha. Physiologically a particular dosha is dominant at a specific time in twenty-four-hour cycle. A study titled “An effect of Raga Therapy on our human body” published by the International Journal of Humanities and Social Science Research states that, a person suffering from a specific dosha disorder should be treated with ragas specified during that time as the ragas conciliate these doshas.

The ragas not only balance *doshas* but also affect the energy flow through *nadis* (astral nerves). *SwaraShastra*, an old Indian text, states that the 72 *melakarta* (parent) *ragas* control 72 vital nerves in the human body. According to quantum physics, we, as energy beings, vibrate at different frequencies. And certain frequencies are said to treat ailments

Various reviews highlight that during antenatal period music interventions also have a general anxiety alleviation effect¹⁷, bring down blood pressure and depression score, improves sleep quality¹⁸. It can be assumed in general that music creates beneficial effects on the psychological health like perceived stress, anxiety and depressive symptoms during pregnancy¹⁹

Study shows that use of low dose aspirin in foetal growth retardation show improvement in foetal growth²⁰. While other study contradicts the same. One study conducted with low dose aspirin and its association with fetal abnormalities didn't show any significant difference between control and trial group. Thus, the use of aspirin does not surely guarantee positive foetal health changes. Also, there are safety concerns with extensive use of aspirin in obstetrics and reproductive medicine. Long term effects of LDA on cognitive and behavioural pattern of children is not known.

4. Conclusion

This case study was done to examine the impact of yoga and classical music on uterine artery function, as well as maternal and foetal complications. The results showed that yoga and music caused a significant change in Uterine artery PI in compromised blood flow of the foetus. Thus it can said that yoga and music therapy can be used as an additional tool in stress reduction and improving foetal growth through improved foeto-placental circulation.

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