

Integrated Approach of Yoga Therapy on Maternal and Fetal Outcome in Gestational Diabetes Mellitus

Abirami.P, A.Judie

S.R.M. College of Nursing, Potheri, Kattankulathur, Kancheepuram District, 603203, TamilNadu, India

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ABSTRACT

Purpose: To evaluate the effectiveness of Yoga on maternal and fetal outcome in Gestational Diabetes Mellitus at Government hospital, Tambaram, Chennai, Tamilnadu, South India. *Methods:* The intervention package for Yoga group consists of Yogic sukshma vyayama (20 -25 mts), Nadishodana pranayama (5-10 mts) and Dhyanam(5 mts) with hospital routine treatment from 24th week to till delivery where as control group received only routine hospital treatment. Self-designed tool to examine the maternal and fetal outcome variables were used. Independent t test was used to obtain P Value. P value of <0.05 were considered to indicate significant statistical difference. *Result:* Statistically significant difference found between maternal, fetal and neonatal outcome of mothers with Gestational Diabetes Mellitus between yoga group and control group at $p \leq 0.001$. *Conclusion:* Antenatal mother with Gestational diabetes mellitus should use yoga as an adjunct therapy to prevent or reduce the complications and to improve the maternal and fetal outcome of Gestational Diabetes Mellitus.

Key words: Gestational diabetes mellitus, Sukshnavyayamas, Nadishodana pranayama, Meditation

INTRODUCTION

The Journey of having a baby is a profound event and achieving motherhood is the event of her life for Woman. Becoming a mother is a precious gift of God to everywoman and Pregnancy is a very special time in a Women's life and it is a state of dynamic physiologic adaptations to meet the demands of a developing fetus, Childbirth and lactation. Some changes occurring during this period seem exciting and pleasant to the mother, others can create discomforts or the disorders¹. It is true that the development of the baby is affected by several maternal as well as fetal factors. Hypertension, Diabetes, Malnutrition, Chronic renal disease etc can cause harmful effects on the fetus².

Diabetes has long been associated with high maternal and perinatal morbidity and mortality³. The world health organization. (WHO) has predicted that between 1995 and 2025 there will be a 35% increase in the worldwide prevalence of diabetes. Gestational diabetes Mellitus occurs approximately 1 in 2,014 or 0.05% or 1,35,000 people in USA⁴. The prevalence of GDM in the low risk group of adolescent or Teenage pregnancies ranges from 1.2% to 1.8%. The prevalence of GDM in high risk populations generally ranges from 3.3% to 6.1%. (Totally in world wide 7% of all pregnancies are complicated by GDM, resulting in more than 2,00,000 cases annually. The prevalence may range from 1 to 14% of all pregnancies, depending on the population studied and the diagnostic tests employed⁵.

Indian Scenario

GDM occurs in 2-5% of all pregnancies. Prevalence of GDM in women with high risk factors ranges from 3.3 to

6.1% and that in women with low risk factors ranges from 1.4 – 2.8%. About 1 in 100 women of child bearing age have diabetes before pregnancy that is presentational diabetes. In 2001 4% of pregnancies were affected by GDM, In 2003 the number rose to 7% of pregnancies⁵.

Yoga has shown some beneficial results in treating Diabetes and works great for pregnancy. Yoga has 5 vital tools (yoga exercises, Breathing Exercise Or Pranayama, Mudras, meditation, and deep relaxation) for pregnancy. When followed together, it seemed to improve the well being of antenatal mothers and increase the chances of normal pregnancy and delivery. Moreover, these exercises are helpful in carbohydrate metabolism by absorbing excessive glucose, thereby reducing the blood sugar level. In addition, it helps the pancreas and the liver to function effectively by regulating the blood sugar levels. Meanwhile, asana are also beneficial in treating diabetes by increasing stability and comfort, thereby having a positive effect on the pancreas as well as on insulin functioning. Furthermore, it helps in rejuvenating the pancreatic cells, thereby assisting insulin secretion. It also induces relaxation that plays a key role in the healthy functioning of the internal organs. Therefore, it can be argued that exercises increasing muscular movements help in reducing the blood sugar levels⁶.

Purpose

To examine the effect of yoga on maternal and fetal outcome among mothers with Gestational Diabetes Mellitus

Methods

Participants and Methods: In our prospective interventional study, quantitative approach and quasi-

Table 1: Frequency and percentage distribution of demographic variables among the mothers with Gestational Diabetes Mellitus in study and in control group (N=212)

Demographic variables	Groups				Chi square test	
	Study Group (n=104)		Control group (n=108)			
	n	%	n	%		
Age	< 20 yrs	13	12.5	11	10.2	$\chi^2=1.26$ p=0.53df=2
	20 -25 yrs	67	64.4	65	60.2	
	26 -30 yrs	24	23.1	32	29.6	
Religion	Hindu	79	76.0	89	82.4	$\chi^2=2.15$ p=0.34df=2
	Christian	11	10.6	11	10.2	
	Muslim	14	13.5	8	7.4	
Type of family	Joint family	46	44.2	46	42.6	$\chi^2=0.26$ p=0.88df=2
	Nuclear family	53	51.0	58	53.7	
	Extended family	5	4.8	4	3.7	
Educational status	Illiterate	12	11.5	16	14.8	$\chi^2=5.78$ p=0.21df=4
	primary school certificate	17	16.3	27	25.0	
	Middle school certificate	32	30.8	36	33.3	
	High School certificate	30	28.8	21	19.4	
Work pattern	Graduate or postgraduate	13	12.5	8	7.4	$\chi^2=2.74$ p=0.25df=2
	Sedentary	69	66.3	60	55.6	
	Moderate	32	30.8	45	41.7	
Monthly income	Heavy	3	2.9	3	2.8	$\chi^2=3.60$ p=0.16df=2
	< Rs.1600	17	16.3	12	11.1	
	Rs.1601 – Rs.4809	39	37.5	54	50.0	
Type of marriage	Rs.4810- Rs.8009	48	46.2	42	38.9	$\chi^2=0.98$ p=0.32df=1
	Non consanguineous	80	76.9	89	82.4	
	Consanguineous	24	23.1	19	17.6	

Table 2: Frequency and percentage distribution of obstetrical variables(Past obstetrical variables) among the mothers with Gestational Diabetes Mellitus in study and in control group (N=212)

Past Obstetrical Variables	Groups				Chi square test	
	Studygroup (n=104)		Control group (n=108)			
	n	%	n	%		
Diagnosis of GDM at previous pregnancy in gestational weeks	24 -28 wks	1	1.0	1	0.9	$\chi^2=3.18$ p=0.20df=2
	No H/O of GDM	44	42.3	33	30.6	
	Not applicable	59	56.7	74	68.5	
Treatment of gestational diabetes at previous pregnancy	Insulin	1	1.0	0	0	$\chi^2=1.04$ p=0.30df=1
	Not applicable	103	99.0	108	100	
previous history of type of delivery	Normal vaginal delivery	30	28.8	22	20.4	$\chi^2=3.18$ p=0.20df=2
	LSCS	14	13.5	11	10.2	
	Not applicable	60	57.7	75	69.4	
Weight of the previous child	2.5 -3.5kg	4	3.8	2	1.9	$\chi^2=2.94$ p=0.22df=2
	3.6 -4 kg	39	37.5	31	28.7	
	Not applicable	61	58.7	75	69.4	
Effect of diabetes in previous pregnancy	Fetal macrosomia	1	1.0	0	0	$\chi^2=2.35$ p=0.30df=2
	No problems	51	49.0	45	41.7	
	Not applicable	52	50.0	63	58.3	
previous history of children with congenital abnormalities	Anencephaly	1	1.0	1	0.9	$\chi^2=4.70$ p=0.20df=3
	Neural problems	2	1.9	0	0	
	No problems	41	39.4	32	29.6	
	Not applicable	60	57.7	75	69.4	
Family history of diabetes	Present	20	19.2	24	22.2	$\chi^2=0.28$ p=0.59df=1
	Absent	84	80.8	84	77.8	

experimental time-series design were adopted. Sample Size was detected using power analysis. Based on the inclusion and exclusion criteria, non-probability purposive sampling technique was employed for selecting samples. Samples were matched with regard to blood sugar levels at a Government Hospital, Tambaram, India. Of 220 antenatal mothers with GDM, the Yoga group included 110 mothers and the Control group had 110 mothers. Inclusion Criteria included those with a history of GDM between 24 and 28 weeks of gestation. Exclusion criteria involved those with polyhydramnios, multiple pregnancy, pregnancy induced hypertension, complicated pregnancy, cardiac problems, obesity, and mother who practice yoga and exercise.

Ethical consideration: Formal approval was obtained from the Institutional review board and Institutional ethical committee of SRM University, Kattankulathur, Chennai, Tamilnadu, India. In addition, the participants were informed of their right to withdraw anytime during the course of the study.

Instruments: Questionnaires comprises two sections. Section I includes demographic data. Section II comprises data on Obstetrical information which includes Past obstetrical history and the. Present Obstetrical history

variables Section III comprises Self-designed tool to examine the maternal fetal outcome.

Description of the Intervention: The intervention package for Yoga group consists of Yogic sukshma vyayama (20 - 25 mts), Nadishodana pranayama(5-10 mts) and Dhyanam(5 mts) with hospital routine treatment which includes Counseling on diet, exercises, and regular monitoring of blood glucose level, Insulin therapy based on the blood glucose level and regular dose of Iron, folic acid and Calcium tablets from 24th week to till delivery. They were instructed to follow up the visits regularly in the antenatal outpatient department. The intensive training on yoga was given to the mothers with GDM for 6 days continuously for 30-40 minutes a day and the doubts were clarified by the Investigator. After the intensive training of Yoga for 6 days the antenatal mother with GDM should practice yoga daily at home for 30-40 minutes a day and group session weekly once was conducted as a reassessment and reinforcement from 24th week to till delivery. Investigator by participatory observation assessed the correct practice of the yoga with the check list in every group session to assess the level of practice. Daily yoga practice calendar was used to verify the regular practice of yoga by the antenatal mother with

Table 3: Frequency and percentage distribution of obstetrical Variables (Present obstetrical variables) among the mothers with Gestational Diabetes Mellitus in yoga group and in control group (N=212)

Present obstetrical variables		Groups				Chi square test
		Study group (n=104)		Control group (n=108)		
		n	%	n	%	
Height	< 140 cm	2	1.9	2	1.9	$\chi^2=5.22$ p=0.15df=3
	140 -150 cm	52	50.0	70	64.8	
	151 -160 cm	39	37.5	30	27.8	
	>160 cm	11	10.6	6	5.6	
Gravida	1	59	56.7	72	66.7	$\chi^2=2.59$ p=0.45df=3
	2	35	33.7	29	26.9	
	3	7	6.7	4	3.7	
	4	3	2.9	3	2.8	
Parity	1	61	58.7	75	69.4	$\chi^2=3.93$ p=0.26df=3
	2	35	33.7	29	26.9	
	3	6	5.8	2	1.9	
	4	2	1.9	2	1.9	
Abortions	1	4	3.8	2	1.9	$\chi^2=1.830$ p=0.40df=2
	2	1	1.0	-	-	
	No abortion	99	95.2	106	98.1	
Still birth	1	-	-	1	0.9	$\chi^2=0.96$ p=0.32df=1
	No still birth	104	100.0	107	99.1	
Death	No death	104	100.0	108	100.0	$\chi^2=0.00$ p=1.00df=1
No of children	1	38	36.5	29	26.9	$\chi^2=4.70$ p=0.20df=3
	2	5	4.8	2	1.9	
	No children	61	58.7	77	71.3	
Medication Taken during pregnancy	Tab. Calcium & Tab FST	26	25.0	29	26.9	$\chi^2=0.09$ p=0.75df=1
	Tab Calcium ,Tab FST & Inj Insulin	78	75.0	79	73.1	

GDM. Control group were received the routine hospital treatment. Maternal, fetal and neonatal outcome was assessed after 36th week for both the yoga and control group.

Drop outs: After the initial assessment,6 Mothers from yoga group and 2 mothers from control group have withdrawn from their study. But it was not affected the study because the investigator expected the 10% drop outs and chosen appropriate number of samples.

Statistical analysis: The information collected from the study participants was scored and tabulated. The data was entered into the master coding sheet and saved in EXCEL.Statistical analysis was conducted with the help of the Statistical Package for Social Sciences (SPSS)-16. Mean, percentage and Standard deviation was used to explain the demographic, Obstetrical variables and Independent‘t’ test was used to examine the effect of yoga on maternal and fetal outcome in Gestational Diabetes Mellitus between the study and control group.

RESULTS

Table 1 shows in yoga group majority 67(64.4%) of the mothers belong to the age of 20-25 Yrs,79(76%) were hindus,53(51%) were in the nuclear family,32(30.8%) had middle school certificate,69(66.3%) were sedentary workers,48(46.2%) had Rs 4810-8009 as their Income and 80(76.9%) of them had Non consanguineous Marriage. Regarding control group majority 65(60.2%) of the mother belongs to the age of 20-25 Yrs,89(82.4%) were hindus,58(53.7%) were in the nuclear family,36(33.3%) had middle school certificate 1,60(55.6%) were sedentary workers,54 (50%) had between Rs 1601 to Rs 4809 as their income and 89(82.4%) of them had non consanguineous Marriage. Table 2 shows the past obstetrical variables in which 59(56.7%)in Yoga group,72(66.7%) in control group

were primi mothers and 44(42.3%) in Yoga group,33(30.6%) in control group were not having a previous history of Gestational Diabetes Mellitus. Regarding family history of diabetes 84(80.8%) in Yoga group and 84(77.8%) in control group had no family history of diabetes. Table 3 shows the present obstetrical information in Yoga group, majority 52(50%) of their height was 140-150cm,59(56.7%) were in the category of gravida1, 61(58.7%) were in the category of parity1,99(95.2%)of them had no abortion, 100(104%) none of them had still birth and death of their child,61(58.7%) of them had no children and 78(75%) of them received Tab.calcium,Tab.FST and Inj.Insulin..Regarding present obstetrical information in control group majority 70(64.8%) of their height was 140-150cm,72(66.7%) were in the category of gravida1, 75(69.4%) were in the category of parity1,106(98.1%)of them had no abortion, 107(99.1%) had no still birth and 100(104%) none of them had death of their child,77(71.3%) of them had no children and 79(73.1%) of them received Tab. Calcium, Tab. FST and Inj. Insulin. Table 4 inferred that Statistically high significant difference was found between Yoga and control group at p value (p=0.0). Table 5 illustrated that statistically significant difference was found between Yoga and Control group at p value (p=0.0001).

CONCLUSION

In this study statistically significant difference found between maternal,fetal and neonatal outcome of mothers with Gestational Diabetes Mellitus between yoga group and control group at p≤0.001. Negrato CA.,et al reported that understanding the underlying mechanisms of adverse fetal and maternal outcomes of GDM, which in turn may lead to strategies for its prevention⁷. Angadi Rajasab Nilofer.,et al reported that the increased morbidity in

Table 4: Comparison of maternal outcome of mothers with Gestational Diabetes Mellitus between yoga and control group (N=212)

S.No	Maternal outcome	Study group (n=104)		Control group (n=108)		Chi Square test
		n	%	n	%	
1.	Weeks of gestation at Delivery	16	15.4	67	62	$\chi^2 = 50.2$ df = 3 p = 0.0
	a.Less than 37 weeks of Gestation					
	b. 37 weeks to 39 weeks of gestation	47	45.2	21	19.4	
	c.39 weeks to 42 weeks of gestation	37	35.6	20	18.2	
	d. More than 42 weeks of gestation	4	3.8	0	0	
2	Mode of Delivery	18	17.3	0	0	$\chi^2 = 58.049$ df = 3 p = 0.00
	a.Normal vaginal delivery					
	b.Normal vaginal delivery with episiotomy	34	32.7	6	5.6	
	c.Forceps delivery	15	14.4	19	17.6	
	d..LSCS	37	35.6	83	76.9	
3.	Complications during labour	14	13.5	35	32.4	$\chi^2 = 14.11$ df = 3 p = 0.002
	a.Perineal injuries					
	b.Primary postpartum hemorrhage	5	4.8	7	6.5	
	c.Prolonged labour	11	10.6	15	13.8	
	d.No complications	74	71.2	51	47.2	

*** Very high significance at p≤0.001

Table 5: Comparison of fetal and neonatal outcome of mothers with Gestational Diabetes Mellitus between Yoga and control group (N=212)

S.No	Fetal and neonatal outcome	Study group (n=104)		Control group (n=108)		Chi Square test
		n	%	n	%	
1.	Fetal outcome					
	a. Congenital malformation	4	3.8	11	10.2	$\chi^2 = 29.1$ df = 4 p = 0.0003
	b. Fetal macrosomia	31	29.8	52	48.1	
	c. Intra uterine growth restriction	4	3.8	14	13	
	d. Intrauterine fetal death	2	1.9	4	3.7	
	e. No complications	63	60.6	27	25	
2.	Neonatal outcome					
	APGAR Score at 1 st minute					$\chi^2 = 35.3$ df = 1 p = 0.0001
	a. <7	8	7.7	47	43.5	
	b. ≥7	96	92.3	61	56.5	
3.	APGAR Score at 5 th minute					$\chi^2 = 17.5$ df = 1 p = 0.0001
	a. <7	10	9.6	36	33.3	
	b. ≥7	94	90.4	72	66.7	
4.	Birth weight of the Baby					$\chi^2 = 21.9$ df = 2 p = 0.00017
	<2.5 kg	12	11.5	23	21.3	
	2.5 -3.5 kg	61	58.7	29	26.9	
	>3.5 Kg	31	29.8	56	51.9	
5.	Neonatal complications					$\chi^2 = 90.8$ df = 3 p = 0.0
	Birth trauma	8	7.7	29	26.9	
	Hypoglycemia	8	7.7	0	0	
	Birth asphyxia	0	0	46	42.6	
	No complications	88	84.6	33	30.6	

*** Very high significance at $p \leq 0.001$

GDM is preventable by meticulous antenatal care⁸. Wahabi HA., et al concluded in his study that Pre-existing Diabetes Mellitus is associated with increased risk for C/S delivery, macrosomia, stillbirth, preterm delivery and low APGAR scores at 5 min⁹. All these studies reports that there is a evidence that the complications and maternal, fetal outcome is poor among mother with Gestational Diabetes Mellitus but it can be prevented or occurrence rate can be reduced by practicing Yoga. Many studies have reported the beneficial effect of the practice of yoga on diabetes, confirming that the practice of Yogasana [Yoga Postures] can stimulate the insulin producing cells in the pancreas. Practitioners of yoga, pranayama and meditation, usually find a shift in their attitude towards life. Yoga asana [Yoga Postures] and Pranayama [Voluntary regulated Yoga Breathing] is a highly effective part of diabetes treatment because it increases insulin sensitivity and lowers blood sugar level. Although the effect of yoga on maternal and neonatal outcome variables has not been studied more in pregnancy, several studies have looked at these variables Available evidence like Rakhshani A., et al reported that yoga can potentially be an effective therapy in reducing the complications of pregnancy and improving fetal outcomes¹⁰. Narendran S performed a study to assess the efficacy of yoga on pregnancy outcome. The study concluded that an integrated approach to yoga during pregnancy is safe. It improves birth weight, decreases

preterm labor, and decreases IUGR either in isolation or associated with PIH, with no increased complications¹¹. Studies of diabetics have shown that practicing yoga leads to decreases in blood glucose, increased glucose tolerance, decreased need for diabetes medications, and improved insulin processes. Yoga also enhances the sense of well-being. To treat Gestational Diabetes Mellitus naturally the Antenatal Mother with Gestational Diabetes Mellitus should practice yogis positions (Asanas) along with Pranayam (breathing exercises), Relaxation & Meditation It is the best recommend to pregnant women and women with gestational diabetes mellitus (Health & yoga 2009). Good prenatal care with proper nutrition and medical supervision has gone a long way in reducing infant and maternal mortality in both developed and developing countries, if yoga is practiced along with this will provide the good sense of well being. Pregnancy affects both the maternal and fetal metabolism and even in non-diabetic Women exerts a Diabetogenic effect. Among Pregnant women 2 to 17.8 develop GDM. There is a growing evidence that Yoga may offer Cost-effective Intervention for mother with GDM. Yoga can help women get through their pregnancy with minimal discomfort. It also helps the birth and post-delivery stages. A Positive outcome of these study findings indicate that the Sukshma vyayamas, Pranayama and Meditation practiced together, it brings marked reduction in the all the clinical parameters of Gestational diabetes mellitus

where it directly prevents complications..The Researcher conclude that the Antenatal mother with Gestational diabetes mellitus should Practice yoga to prevent or reduce the complications and to improve the maternal and fetal outcome of Gestational Diabetes Mellitus.

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CONFLICT OF INTEREST

Mrs. Abirami. P, Dr. A. Judie declares that no conflict of interest. In addition, this study was not funded

Statement of Human and Animal Rights

All procedures followed were in accordance with the ethical standards of the responsible committee on human experimentation (institutional and national) and with the Helsinki Declaration of 1975, as revised in 2008 (5).

Statement of Informed Consent

Informed consent was obtained from all patients for being included in the study.

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