

Impact of Comprehensive Antenatal Care to Reduce the Complications during Pregnancy Like Pregnancy-induced Hypertension and Intrauterine Growth Retardation

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ABSTRACT

Aim and objectives: The impact of comprehensive antenatal care to reduce the complications during pregnancy like pregnancy-induced hypertension (PIH) and intrauterine growth restriction (IUGR).

Materials and methods: Five hundred thirty-two women attending the antenatal clinic at Neel clinic in Panvel, Navi Mumbai, India were enrolled between 18–28 weeks of pregnancy from May 2015 and April 2017, in prospective non-randomized, matched, interventional study.

A total of 254 women were enrolled in the study group; 278 women were enrolled in the control group. Women were matched for age, gravida, parity, educational, religion, and residential area.

Comprehensive antenatal care included:

- Stress management through *rajayoga* meditation (Brahma kumaris)
- Nutritious and *satwik* food
- Antenatal physical and breathing exercises

Exercises, walking and Meditation were practiced by the study group from date of entry into the study until delivery. The control group walked half an hour twice a day (standard obstetric advice) during the study period. Compliance in both groups was ensured by frequent telephone calls and maintenance of daily activity charts.

Results: Complications such as isolated intrauterine growth retardation (IUGR) (p 0.002) and pregnancy-induced hypertension (PIH) with associated IUGR (p 0.001) were also significantly lower in the comprehensive antenatal care group.

Conclusion: Stress management through meditation as well as exercise and nutritional management may contribute to decreasing risk of isolated intrauterine growth retardation (IUGR)

(p 0.002) and pregnancy-induced hypertension (PIH) with associated IUGR, and eventually would decrease problems in the infant, children, adolescent and fetal origin of adult diseases.

“Comprehensive antenatal care is safe, relatively cheap to implement and would reduce the costs of long-term health care.”

Keywords: Comprehensive antenatal care, Intrauterine growth retardation, Pregnancy-induced hypertension, Stress management, *Rajayoga* meditation

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INTRODUCTION

A pregnancy complication is defined as a problem that arises during pregnancy and can potentially put the health of the mother, fetus or both at risk (Beers et al.).¹

Some of the maternal complications are PIH and IUGR. The reported prevalence of pregnancy-induced hypertension was 6–8% for the USA² while for Asia it was 1.4%.³ A PIH development of new arterial hypertension (BP systolic \geq 140 mm Hg diastolic \geq 90 mm Hg) after 20 weeks of gestation without proteinuria. Preeclampsia is a major contributor to maternal and fetal morbidity and mortality. A PIH leads to fetal complications such as pre-term births and fetal growth retardation.^{4,5} It also leads to maternal morbidities including eclampsia, nephropathy, hepatic changes, HELLP syndrome, disseminated intravascular coagulation and maternal death.⁶ Preeclampsia is also related to cardiovascular disease in later life.^{7,8}

The IUGR fetus unable to reach its required growth potential for its gestational age due to some pathological inhibition calculated using estimated fetal weight and gestational age from the ultrasound and Doppler data.

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The IUGR is a when the baby is under the 10th percentile of weight for their gestational age while in the womb. Many factors could contribute to IUGR, some include, preeclampsia, hypertension, diabetes, abnormal placenta, and cardiovascular disease. This complication, known as intrauterine growth restriction or IUGR, can cause permanent harm to a baby's health and development. The American Pregnancy Association (APA) links IUGR to pneumonia, low blood sugar, neurological disease, blood disorders and delays in motor development. Low-birthweight babies are also at an increased risk of hypoxia, or low oxygen supply, at birth.

It is not a far jump to think the reason IUGR numbers were decreased among the yoga group, was because there were significant improvements seen with the possible causing factor. While management of IUGR must be individualized for each patient, one management treatment, although not of proven benefit, is bed rest which may maximize uterine blood flow. Again, we see the benefit of stress management through meditation as well as an exercise in comprehensive antenatal care. Stress management through meditation as well as exercise increases blood flow which can maximize blood flow to the placenta. Decreasing maternal blood pressure dilates the blood vessels, also allowing for better blood flow to the uterus.

Psychosocial stress has been observed to be associated with maternal complications during pregnancy by several pieces of research.⁹⁻¹¹

Almost all women experience stress at some point during pregnancy. Mood swings and emotional disturbances are a completely normal reaction to the physical, emotional and lifestyle changes associated with pregnancy. While normal levels of stress are unlikely to be detrimental to the health of a pregnancy, excessive stress may be detrimental to the health of an unborn child.

The etiology of these complications is not clearly understood; however, there is increasing evidence that maternal oxidative stress (Agarwal et al.,¹² Hsieh et al.,¹³ Lappas et al.)¹⁴ and psychological stress (Austin and Leader,¹⁵ Mancuso et al.,¹⁶ Nakamura et al.,¹⁷ Orr et al.,¹⁸ Roy-Matton et al.)¹⁹ play a strong role. Recent studies have shown yoga to be effective in reducing oxidative (Hegde et al.)²⁰ and psychological stress (Chong et al.),²¹ Stoller et al.,²² Streeter et al.,²³ Vancampfort et al.)²⁴

In this preliminary study, we investigated whether stress management through meditation as well as exercise techniques can prevent the incidence of pregnancy complications.

Narendran et al. investigated the effectiveness of yoga during pregnancy and reported higher birth weights and fewer complications in the yoga group.²⁵

Stress during pregnancy is often unavoidable. However, by making healthy lifestyle choices, expectant mothers can

help prevent many of the complications associated with stress in pregnancy. Women struggling with pregnancy-related stress should avoid all harmful behaviors, such as eating disorders, smoking, and drinking, to prevent the complications associated with stress. The March of Dimes also recommends relaxation techniques such as meditation and exercise to curb the effects of stress. Pregnant women coping with anxiety should contact a counselor or primary health-care provider for help with managing emotional disturbances.

The primary objectives of this study were to assess the feasibility of using whether stress management through meditation as well as exercise interventions in preventing major pregnancy complications.

Narendran et al.²⁵ examined the effects of yoga on pregnancy and its outcomes and 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 complications. Yoga by its holistic approach to health appears to be safe in pregnancy and leads to improved outcomes.

Kiran et al.²⁶ define Brahma Kumaris *Rajayoga* as a method of autogenic relaxation with a spiritual link, providing training in the realization of the true self, contemplation on the divine "supreme being" and a dialogue with the supreme. Autogenic relaxation is defined as a method for influencing one's autonomic nervous system. Kiran further refines the definition of *Rajayoga* meditation as a spiritual based relaxation therapy.

Kiran et al.²⁷ defines *Rajayoga* meditation as a method of meditation based on spirituality involving realization of true conscious of self, the realization of attributes like peace, purity, happiness, bliss, love, power and knowledge and linking the self with "supreme being" by contemplating on divine supreme.

Gupta²⁸ defines Brahma Kumaris *Rajayoga* meditation is a science and art of harmonizing spiritual energy (energy of soul), mental energy (energy of mind) and physical energy (energy of physical body), through the connection with an ultimate source of spiritual energy, i.e., supreme soul for enjoying ever healthy, ever-wealthy and ever-happy life.

Patel and Giorgio²⁹ insist that *Rajayoga* meditation is taught within the context of a lived faith complete with daily teachings, practices and lifestyle observances.

Gupta et al.³⁰ specifies the practical experience of the opening of coronary blockage with unique user-friendly healthy lifestyle-comprehensive healthcare program-*Rajayoga* meditation, *Satwik* low-fat high fiber balanced diet and a daily morning walk with sunrise in Mount Abu open heart trial. It shows the benefits of Brahma Kumaris *Rajayoga* meditation lifestyle proven in angiographically

documented computer-aided design (CAD) patients in the landmark research study on regression of coronary blockages and better control of hypertension, diabetes, obesity, etc through healthy lifestyle-comprehensive healthcare program. Even 100% calcified blockages opened up in persons who sincerely adhered to the prescribed program. *Rajayoga* lifestyle-concept taught by Brahma Kumaris:

Four principles, intrinsic to *Rajayoga*, which underlie the programming ethos are:

- *Self-responsibility through self-empowerment*: The word 'healthy' is derived from two words; 'heal' + 'thy' i.e., to heal yourself. To heal oneself, one needs to be empowered by appropriate and proper information about, soul-mind-body connection, psychological and conventional risk factors, stress management, diet, exercise, sleep, substance abuse, and usual medical care.
- *Self-awareness*: The Hindi word for healthy is 'swasth', which consist of swa meaning 'inner self' and stha mean 'inner self-conscious.' Outer self-consciousness (of body, role or material things, which are ever-changing and mortal) leads to instability and insecurity, which in turn leads to anger, anxiety, depression, type A behavior, isolation and chronic life stresses. Conversely, inner self-consciousness (of spirit, which is enduring and immortal) leads to stability, which in turns to leads to peace, love, and happiness. So, by abstraction, a healthy lifestyle means an 'inner self-conscious lifestyle'.
- *Multi-dimensionality*: The current medical approach addresses only one dimension, the physical body, which might explain why despite medical advancements the epidemic of non-communicable diseases has not been curbed. A human being is not one-dimensional. Therefore, a new model of health, 'soul-mind-body medicine' (three-dimensional health care) is called for. As per this new model, health is a dynamic process of harmony inflow of spiritual energy (knowledge of truth, purity, peace, love, happiness, bliss, and power: of discretion, to judge, to withdraw, to pack up, to tolerate, to face, to accommodate, to cooperate), mental energy (positive TEAM: thoughts, emotions, attitudes and memories) and physical energy (healthy diet, exercise, sleep and medication).
- *Biological clock/circadian rhythm*: When activities are in rhythm with one's biological clock, they reduce energy expense and stress, and prove beneficial for the health of mind, intellect, and body.

All four principles should be sustained as far as possible in daily living.

The three major components of the comprehensive antenatal care program are:

- *Stress-management through rajayoga meditation*: Stress is defined as a mental state in which the internal and external pressure exceeds the inner strength (coping mechanism) leading to sympathetic overactivity and release of stress hormones which in turn leads to a vicious cycle of mental disease. Inner strength can be increased by *Rajayoga*. *Rajayoga* word has been derived from Raja meaning king and yoga meaning union between soul (spiritual energy) and supreme soul (ocean of spiritual energy). *Rajayoga* meditation harmonizes spiritual, mental and physical energy, thereby increasing inner strength to lead a stress-free and healthy life. It enhances an individual's power of determination to manage and practice positive thoughts, emotions, attitudes, memories and adhere to the healthy diet, exercise, sleep, medication. Expert *Rajayoga* teachers from Prajapita Brahma Kumaris Ishwariya Vishwa Vidyalaya Mount Abu, teach *Rajayoga* meditation in three different stages. During stage 1 (inner self-empowerment), patients are provided with knowledge about soul and supreme soul and trained to forge a link with the supreme soul to draw spiritual energy. This is followed by sessions of training in opening and healing the mind. In stage 2 of opening and healing the mind, patients are made to understand the role of non-physical factors like depression, anger, cynicism, hostility, ego, jealousy, hurry, worry, anxiety, fear, isolation, lack of social and emotional support, job and family stress etc, in the development of stress; as these negative traits are acquired from the environment and are not part of the original inner self. They are trained to inculcate the positive mental energy thereby enhancing willpower to adhere to a healthy and happy lifestyle program. In stage-3 by *Rajayoga* meditation, they are asked to focus the inner, radiant spiritual energy on various organs of the body including the baby in utero. A meditation commentary is provided to guide the mind in a positive direction. They are encouraged to maintain an inner self (soul) conscious mental state even while engaged in day-to-day work activities.
- *Low fat, high fiber vegetarian diet*: The essential components of the diet program were: what? (Low fat, high fiber vegetarian), when? (As per biological clock) and how? (proper chewing in the inner self-conscious state). Diet consisted of low fat, cholesterol intake restricted. Soluble fiber from oat bran, fruits, vegetables, sprouted seeds, beans, salads, etc; complex carbohydrates; proteins from soybean and other vegetarian sources; antioxidants from sprouted seeds, fresh fruits, vegetables, and nuts. Beneficial effects of the prescribed diet were explained both to the patients as well as their spouses

by audiovisual means by the experts. Diet was served in silence with light music played to enhance the quality of environmental ambiance. Diet charts were also provided to each patient.

- *Antenatal physical and breathing exercises:* Physical exercises were taught by fitness specialist. The physical exercises were performed while standing, sitting, lying prone or supine on the floor. The physical exercises take each joint in the body through full verge of motion. Stretching, strengthening and balancing each body part. Internal awareness and synchronization of physical postures with breathing is considered critical and important.

Rajayoga lifestyle as taught by Brahma Kumaris includes daily *Rajayoga* meditation practices, positive thinking classes, *Satwik* food (food that is prepared in Godly remembrance and offered to God before taking) and practice of soul consciousness. There have been increasing calls from research bodies in India for further research projects to measure the efficacy of *Rajayoga* meditation and *Rajayoga* lifestyle as adjunct therapy in many medical conditions. At present, there is no study from the organization regarding the role or safety of *Rajayoga* meditation during pregnancy. This study is conducted to test the hypotheses, that stress management in pregnancy using *Rajayoga* meditation as a part of comprehensive antenatal care, whether it would improve the pregnancy and childbirth outcomes. The scientific basis of the study was an attempt to study The Impact of comprehensive antenatal care to improve the gestational age at birth.

MATERIALS AND METHODS

One thousand nine hundred eighty-six women were screened for antenatal care in OPD at Neel Clinic from, March 2015 to April 2017. Out of 1986 screened women, 736 women registered for delivery at Neel Clinic. Two hundred four women were excluded as per exclusion criteria. Five hundred thirty-two patients were matched for age, occupation, education, religion, residential area, socioeconomic status, gravida, and parity. Only 254 patients were willing to follow the CAC, comparing of *Satwik* vegetarian diet, exercise and walking, and meditation and were willing to sign the consent form were enrolled in the study group. Two hundred seventy-eight patients were not willing to follow the CAC were enrolled in the control group. Patients who were unwilling to participate in the study group gave a reason such as:

- Not able to follow *satwik* diet
- Unable to come regularly for exercise and meditation
- Family members disliked the ideas of their participation in the research

The inclusion criteria are as given below:

- Age 18–35 years
- Any gravid (primi or multigravida), any para
- Second/third trimester (18–28 weeks)
- Singleton pregnancy
- No major obstetric or medical complications according to the prenatal check chart as detected at the time of prenatal registration
- Normal extremities and able to undertake physical activities
- Able to listen, speak, read and write in Hindi/Marathi/English
- No prior experience of practicing *Rajayoga* meditation.
- Had not undertaken a regular physical exercise for at least one year.

Medically high-risk pregnancies developed after enrolment continued to be part of the trial and were not excluded.

Exclusion Criteria

- Age less than 18 or more than 35
 - Medically high-risk pregnancies like preeclampsia, heart disease in pregnancy, severe anemia in pregnancy (Hb <5 g %), diabetes in pregnancy, asthma, TB, convulsive disease during pregnancy, medical renal disease.
 - Previous cesarean delivery.
 - History of previous pregnancy loss due to known chromosomal disorders, fetal malformations.
 - *In vitro fertilization* (IVF)
 - Bad obstetric history (BOH) (1) previous h/o more than 1 abortion (2) previous h/o intrauterine fetal death (IUID)
 - Does not believe in the presence of the supreme being.
- The study received approval from the director of the hospital.

- The consent form was kept as a separate sheet. The information was kept completely confidential. The informed consent form was filled from all the subjects participating in this study to take their consent to participate in this study and to present/publish the information collected in a scientific forum, paper, and media or any other form. The information subsequently shared/published would be without personally identifying any individual and maintaining confidentiality.
- The pregnant woman had the freedom to withdraw from the study at any point without it affecting her treatment in any way at the hospital. Comprehensive antenatal care included physical, mental and spiritual care
- Stress management through *Rajayoga* meditation (as taught by Brahma Kumaris)

- Nutritious and *Satwik* food
- Antenatal physical and breathing exercises

All members of the study group were asked to practice the exercises at home at least three times a week, starting after the first practice session and continuing till delivery to ensure compliance with the research protocol. Compliance was ensured by frequent telephone calls and maintenance of strict daily activity charts.

- They were asked to practice *Rajayoga* meditation from the date of entry into the study until delivery. They were asked to meditate for 30 min daily which could be once a day, or split into 2–3 sessions, with total duration being of 30 min/day. The recommended timing for meditation was Amritvela (early hours of the day), Evening meditation, and meditation before sleep.
- Physical exercises were taught by fitness specialist. The physical exercises were performed while standing, sitting, lying prone or supine on the floor. The physical exercises take each joint in the body through full verge of motion. Stretching, strengthening and balancing each body part. Internal awareness and synchronization of physical postures with breathing is considered critical and important. They were asked to follow the following exercises:
 - Walking
 - Breathing exercises
 - Strengthening and mobility exercise
 - Stretching exercises
 - Ergonomics (postural correction)
 - Exercises before labor

Strengthening and mobility exercises included ankle toe movement, Kegel's exercises, static back, static abdomen, pelvic tilting exercises, trunk rolling, cat and camel exercises, straight leg raising (SLR) in supine.

Stretching exercises included back stretching exercises, leg (lower limb) stretching exercises, squat position, butterfly exercise.

Exercises before labor included breathing exercises, positions for labor, squat position, butterfly exercise Exercises had following benefits:

- Pregnancy usually leaves women feeling tired; exercise gives more energy to make through the day.
- Exercise allows better sleep.
- Improves mood, lessens mood swings, improves self-image, and gives some sense of control.
- Prepares for childbirth. Studies show shorter labor, fewer medical interventions, and less exhaustion during labor.
- Subsequently, women were asked to practice comprehensive Antenatal care that is *Rajayoga* meditation and physical breathing exercises at home and was revised and reviewed every 2–4 weeks during their routine antenatal visits.

- Group 2 was the control group and was comprised of those women who were living the life as they normally live with no interventions or education by the researchers. They, however, received normal antenatal care and medical interventions as indicated. They were asked to walk 30 minutes twice a day (standard obstetric advice) during the study period.

- Compliance in both groups was ensured during ANC follow up/telephone calls and strict maintenance of a weekly chart.

- Objectives that were serially measured during the antenatal visits and labor as detailed in the case proforma:

Pregnant women were closely monitored during their routine antenatal visits. The following variables were measured at each visit:

- Blood pressure-a value $\geq 140/90$ mm of Hg on two separate occasions (6 hours apart) or an increase by 15 mm from baseline value after 20th week were considered as PIH.
- Ultrasound scanning to monitor fetal growth IUGR being defined as estimated weight less than the 10th percentile.
- Doppler ultrasound of the uterine and umbilical vessels to calculate the resistance index.

RESULT

Five hundred thirty-two pregnant women were included in the analysis (Table 1) for a comparison of the subject demographic characteristic. No significant difference was found in any of the demographic characteristics, between the two groups. Compared to the control group, the Interventional group (comprehensive antenatal care) had a statistically significant decrease in preterm deliveries (Table 2).

DISCUSSION

In this present study, we evaluated the impact of comprehensive antenatal care to lower the complications such as isolated IUGR ($p < 0.002$) and PIH with associated IUGR ($p < 0.001$). The CAC was started at mid-gestation and continued until delivery. We compared this study group to matched control group who were similar in patient demographic characteristic, but who followed standard obstetric advice, i.e., daily walk for a half hour twice a day. The comprehensive antenatal care group had a statistically significant increase in mean gestation age at delivery and reduced preterm delivery. Given the larger picture of, multiple failed attempts to reduce isolated IUGR and PIH with associated IUGR due to stress and anxiety during pregnancy, in the last decade. This study provides a potential intervention that might improve

Table 1: Demographic and maternal characteristics

Variable	Study group (N = 254)	Percentage (%)	Control group (N = 278)	Percentage (%)	p value
Mean marriage age	26.42	–	26.03	–	0.14*
<i>Education</i>					
Non-graduation	129	50.8	174	62.6	0.26*
Graduation	82	32.3	73	26.3	
Postgraduation	43	16.9	31	11.2	
<i>Occupation</i>					
Employed	69	27.2	59	21.2	0.17*
Unemployed	185	72.8	219	78.8	
<i>Residence</i>					
Urban	183	72.0	176	63.3	
Rural	71	28.0	102	36.7	
<i>Religion</i>					
Hindu	233	91.7	234	84.2	0.30*
Muslim	7	2.8	16	5.8	
Sikh	1	0.4	1	0.4	
Christian	2	0.8	10	3.6	
Buddhist	11	4.3	17	6.1	
<i>Socioeconomic status</i>					
Lower	1	0.4	3	1.1	0.38*
Middle	253	99.6	274	98.6	
High	0	0	1	0.4	
Gravida –1	138	54.3	165	59.4	0.24*
Gravida –2	78	30.7	77	27.7	
Gravida –3	32	12.6	25	9.0	
Gravida >4	6	2.4	11	4.0	
Parity –0	177	69.7	211	75.9	0.35*
Parity –1	72	28.3	49	17.6	
Parity –2	5	2	13	4.7	
Parity >4	0	0	5	1.8	

*There is no statistical significant difference between groups

* $p > 0.05$

Table 2: Pregnancy outcomes

Variable	Study group (N = 254)	Percentage (%)	Control group (N = 278)	Percentage (%)	p value
Pregnancy Induced Hypertension	7	2.8	19	6.8	0.162
Intrauterine growth retardation (IUGR)	11	4.3	59	21.2	0.002*
PIH with IUGR	5	1.9	15	5.3	0.001*

* $p < 0.05$

*Pearson Chi-Square shows statistical difference between groups, p value, and significance

* $p < 0.05$ Univariate analysis between groups, p value, and significance

Statistical analysis was performed using the SPSS statistical software. By applying univariate analysis and Pearson Chi-square, it does not show significant difference statistically as p value is $p > 0.05$ (Table 1: demographic and maternal characteristics).

By applying Pearson chi-square, linear by association and univariate analysis it does show significant difference statistically as p value is $p < 0.05$. (Table 2: pregnancy outcomes)

Complications such as isolated intrauterine growth retardation (IUGR) ($p < 0.002$) and pregnancy-induced hypertension (PIH) with associated IUGR ($p < 0.001$) were also significantly lower in the comprehensive antenatal care group.

Results were considered to be statistically significant if the p-value is $p < 0.05$.

pregnancy outcome. The result from the present study, CAC; suggest that pregnant women should be motivated to adopt this comprehensive antenatal care concept.

Comprehensive Antenatal Care Concept

We speculate that CAC concept its action mediate through there commonly postulated mechanism.

- *Satwik vegetarian diet*: That diet rich in fruits, vegetables, and fiber can take care of poor nutrition and micronutrient deficiency. Poor nutrition and micronutrient deficiency play a role as pregnancy stressor. So *Satwik* vegetarian diet plays an important role in eliminating this pregnancy stressor by taking care of poor nutrition and micronutrient deficiency.
- *Beneficial effects of exercise*: Exercise incorporates relaxation and breathing technique with postures which are adopted by pregnant mother help in reducing stress, anxiety, and depression during pregnancy.
- *Rajayoga meditation*: It may be mediated through an interaction between the autonomic nervous system and the endocrine system. The shift of autonomic balance toward relative parasympathetic predominance, besides causing a marked reduction in secretion of stress hormones like epinephrine, non-epinephrine, and cortisol. *Rajayoga* is also attaining in awareness which produces definite changes in perception, attention, and cognition. During *Rajayoga* meditation the practitioner remains awake and vigilant, but the body enters a state of deep muscle relaxation. It also helps in building strong willpower for compliance to CAC programmer. It teaches a holistic lifestyle modification. It also enhances inner strength to lead a stress-free and healthy life. It might have caused a marked reduction in favorable psychological stressor and modified unhealthy behavioral pattern which in turn may be responsible for the improvement in duration of gestational age at delivery, the possible mechanism that has been postulated.

The etiology of these complications mentioned above is not clearly understood; however, there is increasing evidence that maternal oxidative stress and psychological stress play a strong role. Numerous studies have already proven the remarkable effects yoga has on reducing stress. Stress elevates the heart rate and blood pressure and triggers the sympathetic nervous system. A study out of Harvard University states that "Yoga has been shown to reduce the heart rate, lower blood pressure, and easing respiration. There is also evidence that yoga practices help increase heart rate variability, an indicator of the body's ability to respond to stress more flexible." Recent studies have also shown "Yoga to be effective in reducing oxidative and psychologi-

cal stress." The meditative and relaxing nature of the interventions in this study could be a possible explanation for the significant improvement in hypertensive disorders of pregnancy and IUGR that were observed in the CAC group.

The India study goes on to further discuss their findings: "The reduction in maternal stress could also have:

- Fostered multiple positive downstream effects on the neuroendocrine pathway, metabolic function, and associated inflammatory responses Innes et al.³¹
- Activated the vagal nerve and thereby improved parasympathetic output leading to enhanced cardiac-vagal function, mood, energy state, and related neuroendocrine, metabolic, and inflammatory responses (Bowman et al.,³² Taylor et al.)³³ and/or
- Promoted a feeling of well-being (Rakhshani),³⁴ perhaps by reducing the activation and reactivity of the sympathoadrenal system and the hypothalamic pituitary adrenal (HPA) axis" (Ross and Thomas).³⁵

Previous studies have investigated the effects of acupuncture (Betts et al.³⁶ Borup et al.)³⁷ homeopathy (Hochstrasser and Mattmann),³⁸ Ayurveda (Jayashree),³⁹ yoga (Narendran et al.,²⁵ Rakhshani et al.),⁴⁰ and Qigong (Zhou and Lian)⁴¹ during pregnancy (Bishop et al.,⁴² Kalder et al.,⁴³ Steel and Adams, 2011).⁴⁴ Such interventions have been shown to be effective in reducing occurrences of hypertensive disorders of pregnancy (Hofmeyr et al.,⁴⁵ Zhou and Lian.⁴¹ In the Narendran study also, yoga interventions resulted in significantly less incidents of IUGR (pb0.003, 22.06% vs. 32%), PIH (pb0.025, 17.65% vs. 28%), and preterm labor (pb0.0006, 13.24% vs. 20.75%) in the yoga group. A study of Qi-gong practices, which are similar to yoga exercises, has shown that they can significantly reduce the clinical manifestations of PIH (pb0.01, 90% vs. 55%) (Zhou and Lian).⁴¹

If stress reduction and lowering of maternal blood pressure were the significant results from the yoga practice, it is logical the significant complications, PIH and IUGR, showed improvement.

CONCLUSION

The study finding suggests that comprehensive antenatal care practices by its Holistic approach to health appear to be safe in pregnancy and lead to improved pregnancy outcome. It decreases the complications like PIH and IUGR, therefore the results provide evidence of the benefit of using CAC as an alternative nursing intervention to improve the quality at maternal and child health care. This study provides an index for future research on integrating comprehensive antenatal care in caring for pregnant women with other health condition. The enrolled women

did not have risk feature for poor pregnancy outcomes (low birth weight or prematurity) common in developing countries such as poor socioeconomic status, excessive physical stress, maternal malnutrition or disease. It is possible that the greatest benefits of CAC might be seen in a higher stress environment.

The drawbacks of the study were that, and it was not a randomized controlled trial, no stress scores have recorded either pre- or post- comprehensive antenatal care and the patient's selection bias of self-selected groups. Therefore based on this pilot study we advocate a randomized control trial, in a large population to definitely demonstrate the beneficial effects of comprehensive antenatal care on pregnancy and labor outcomes.

Stress management through *Rajayoga* meditation, nutritional management and exercise may contribute to decreased risk of complications like PIH and IUGR, and eventually would decrease:

- Developmental and behavioral problems in the children, as a toddler and adolescent.
- Risk of developing depression later in life.
- As well as later mental health problems in the mother.
- Fetal origin of adult diseases such as insulin dependent diabetes mellitus, hypertension, and coronary heart disease. Increased exercise during pregnancy would reduce the risk of cesarean delivery.

“Comprehensive antenatal care (CAC) is safe, relatively cheap to implement and would reduce the costs of long-term health care.”

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